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Why Has Growth Not Trickled Down to the Poor? A Study of Nigeria

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Abstract

Despite impressive economic growth and major economic reform policies the search for poverty-reducing growth strategies remains a perennial question in many developing countries as poverty persists unabated. This motivates the current study to investigate empirically growth-poverty nexus in Nigeria spanning between the period 1970 and 2017. The paper attempted to answer the question: why has growth not trickled down to the poor? Time series econometrics were applied to test the cointegrating, short- and long-run dynamics among the variables. The results obtained revealed that growth trickled down to the poor only when high rates of employment growth accompanied high rates of economic growth. In addition to employment, the result also revealed that the form of capital formation, rather than its absolute value, appears to matter to the question of why has growth not trickle down to the poor. Thus, economic growth policies that promote an increase in income in conjunction with a high rates of employment growth are more effective in combating poverty than those that focus only on average income levels.

Keywords: poverty incidence, trickled-down, trickled-up, capital formation, autoregressive distributed lag model, and economic growth

1. Introduction

The past three decades have seen the emergence of many African countries, generally exhibiting growth rates much higher than those in the developed countries (Hari & Hatti, 2016; Fosu, 2017a). Income per capita, for instance, for the continent as a whole has grown steadily over the years, as regional growth exceeds the global average (Page & Shimeles, 2015). However, the extent to which the poor benefit from this growth, particularly, whether this shift in Africa's wealth has lessened poverty, has been a subject of controversy (Shimeles, 2014; Hari & Hatti, 2016). Theoretically, there are two contentious views to this debate. At one end of this argument are those who argued that the economic growth does not improve the lives of the very poor (Todaro, 1997; Nindi & Odhiambo, 2015); but rather, the 'growth processes' tend to 'trickle-up' to the middle classes and the very rich (Todaro, 1997; Norton 2002; Bourguignon 2004; Johannes & Joelle, 2011; Thorbecke, 2013; Lopez & Servén, 2014). This, in turn, as argued in Nindi & Odhiambo (2015) results in a worsening of the distribution of income, which then increases poverty. Discursively, this strand of literature avers that there are reinforcing factors that maintain poverty amongst the poor and impede them from contributing to growth (Nindi & Odhiambo, 2015). Thus, from the point of view of achieving the objective of poverty alleviation, high growth alone is not sufficient, selective intervention will similarly be required.

At the other end of the debate are those who contended that the benefits of rapid growth rates diffuse automatically across all segments of society (Abhayaratne, 2004) through various means such as favourable labour market conditions and improved service provisions by the government (Parel, 2014; Dollar, Kleineberg, & Kraay, 2016; Udoh & Ayara, 2017). Basically, proponents of this view (Aghion & Bolton 1997; Roemer & Gugerty, 1997; Dollar & Kraay, 2002; Norton, 2002; Ravallion & Chen 2003; Bourguignon 2004; Thorbecke, 2013; Nindi & Odhiambo, 2015) believed that as long as an economy is growing the benefits will eventually make their way through the system as the wealth generated through *growth* would *trickle down* to the poor which will eventually benefit all segments of society. As such, poverty reduction policies should be aimed at boosting economic growth.

Empirically, studies have failed to suggest an overall dominance of one view over the other. While some studies (Ravallion , 1997; Roemer & Gugerty, 1997; Deininger & Squire, 1998; Ravallion & Chen, 1997, 2003; Dollar & Kraay, 2002, 2004; Kraay, 2006; Esanov, 2006; Agrawal, 2008; Sala-i-Martin & Pinkovskiy, 2010; Chen & Ravallion, 2010; Ijaiya, Ijaiya, Bello, & Ajayi, 2011; Pérez-Moreno & Weinhold, 2012; Perera & Lee, 2013; McKay, 2013) lent credence to trickle-down theory; several others (Eastwood & Lipton; 2001; Islam, 2004a, 2004b; Son & Kakwani, 2004; Kalwij & Verschoor, 2007a; Donaldson, 2008; Basu & Mallick, 2008; Odhiambo, 2011; Ho & Odhiambo, 2011; Mashindano & Maro, 2011; Nindi & Odhiambo, 2015; Fosu, 2015, 2017), in contrast to 'trickle-down theory', contended that although

growth is necessary for poverty reduction, it is not sufficient. Hence, policies as to redistribution of income and assets have become more increasingly important.

Still, some studies (Bourguignon 2003; Epaulard, 2003; World Bank, 2006; Ravallion, 2009; Kalwij & Verschoor, 2007b; Miles & Scott, 2008; Fosu, 2009, 2014; 2016) stated that the extent to which economic growth results in poverty reduction in a particular country depend on the initial income distribution, and on how it shifts, as the economy grows. The Kuznets inverted U-shaped curve hypothesis best explains this position that poverty tends to increase with economic growth at early stages of development while flattening out sand eventually decreasing at higher levels of economic development. Some others (Balisacan, Pernia, & Asra, 2003; Okoroafor & Chinweoke, 2013) found no evidence of correlation between the two variables.

While the debate is still inconclusive, however, an understanding of the conditions under which each of the hypothesis is valid/invalid is hitherto missing as the focus of most of the empirical literature has been heavily biased towards investigating the dominance of one view over the other. Thus, given the fact that finding an effective means to alleviate poverty has been one of the main driving forces of any policy programme in many developing economies, this paper seeks to deepen an understanding of why growth has not trickled down to the poor in Nigeria. This focus is motivated by the fact that, during the last four decades, the Nigerian economy has recorded substantial real *GDP* growth, with a nominal GDP of worth more than $500 billion, purchasing power parity (PPP) of $1 trillion and per capita income of $2,548 as of 2017. However, despite the impressive growth and major economic reform policies, the search for poverty-reducing growth strategies remains a perennial question as poverty persists unabated with approximately 68 and 84.5 percent of the population living below $1.25 and $2 a day respectively in PPP terms (Gangas, 2017).

Although the literature hold a reservoir of important empirical contributions on the subject, however, most studies (Osinubi, 2006; Akanbi & Du Toit, 2009; Adigun, Awoyemi & Omonona, 2011; Ugwu, 2012; Okoroafor & Nwaeze, 2013; Stephen & Simeon, 2013; Nuruddeen & Ibrahim, 2014; Dauda & Makinde, 2014; Gangas, 2017) focused on how various government policies affect poverty reduction or the impact of poverty on the level of economic growth or if the growth performance is associated with poverty reduction. Little is known about why growth has not trickled down to the poor. This study, thus, fills this gap. The paper is structured as follows. The first section of the paper depicts the introduction. Section two consists the literature review while section three presents the methodology as well as a brief description of data. Section four presents our econometric results, while the section five concludes the paper.

2. A Brief Literature Review

There is an intense debate on whether a high growth of GDP can more often than not help to lessen poverty. There are two views to this argument, namely; the 'trickle down' and 'trickle-up' theories. On the one hand, the 'trickle-down theory' contends that economic growth plays an essential role in poverty reduction in any given country- provided that the distribution of income remains constant (Nindi & Odhiambo, 2015). On the other hand, the 'trickle-up theory' asserts that economic growth does not improve the lives of the very poor; but rather, the 'growth processes' tend to 'trickle-up' to the middle classes and the very rich (Todaro, 1997; Norton 2002; Nindi & Odhiambo, 2015). Numerous studies have explored the implications of these two propositions.

Using, for instance, data for the 1970-1994 period for 12 Latin American countries, Janvry and Sadoulet (2000) analyzed the role of aggregate income growth on changes in urban and rural poverty and inequality. The study showed that income growth is only effective in reducing poverty and inequality if the initial levels of inequality and poverty are not too high and if educational levels are sufficiently high. If these conditions do not hold, the beneficial effects of growth for poverty and inequality reduction are wasted. Aigbokhan (2000) investigated the inequality and poverty profile in Nigeria during the period 1985-1997, using data for the 1985/86, 1992/93 and 1996/97 national household income surveys conducted by the Federal Office of Statistics and found evidence of worsening inequality and poverty in spite of economic growth.

Dollar and Kraay (2002) empirically investigated the relationship between overall income growth and growth in the average incomes of the poor using a large sample of developed and developing countries and found that incomes of the poor rise proportionately with (overall) average incomes. Ravallion and Chen (2003) calculated the distributional component of a poverty measure in China in the 1990s, by fixing the mean relative to the poverty line. Abhayaratne (2004) examined the contribution of growth in reducing poverty during 1970-2000 in Malaysia and found that, though, economic growth has contributed significantly in reducing poverty in Malaysia; however, the pattern of growth is an important issue in determining the impact of growth on poverty reduction.

Basu and Mallick (2007) made use of several measures to examine the relationship between economic growth and poverty in India. The study found little evidence to suggest that economic growth led to a reduction in poverty. Agrawal (2008) examined the relation between economic growth and poverty alleviation in the case of Kazakhstan using province-level data. Using Additively Decomposable Poverty Measures, the study showed that provinces with higher growth rates achieved faster decline in poverty. Fanta and Upadhyay (2009) used data on 16 African countries to estimate

the effect of economic growth on poverty levels. They argued that although growth is fundamental to reducing poverty levels in Africa, the growth elasticity of poverty is different among countries. The results suggested that economic growth tends to reduce poverty in Africa. Sala-i-Martin and Pinhovskiy (2010) estimated income distributions, poverty rates, and inequality and welfare indices for African countries for the period 1970–2006 and found that the recent spurt in growth in Africa was accompanied by a symmetrical and sustained reduction in poverty, and thus, had a 'trickle-down' effect.

Focusing on two central issues related to the contrasting experiences of Malaysia and Pakistan regarding poverty reduction, Lokshin, El-Laithy, and Banerji, (2010) assessed changes in poverty and inequality in Egypt between 1995 and 2000 based on the 1995/96 and the 1999/2000 household expenditure survey data. The study observed that in spite of the positive relationship between economic growth and poverty in Egypt, many of the poor were not affected by the substantial growth of the preceding decade.

Young (2012) used estimated of the level and growth of real consumption to investigate changes in poverty in twenty-nine (29) sub-Saharan and twenty-seven (27) other developing countries. The study found that living standards in sub-Saharan countries have improved during the last two decades – thereby implying a reduction in poverty. McKay (2013) analyzed the growth and poverty reduction nexus in 25 of the largest sub-Saharan countries in the last two decades, using information from household surveys. The author found that there has been a significant reduction in poverty in most of these countries. Stephen and Simeon (2013) examined the existence of, if any, relationship between economic growth and poverty in Nigeria. The empirical findings obtained showed that the impressive growth of the economy in recent times has not yielded an improvement in poverty. Nindi and Odhiambo (2015) examined the causal relationship between poverty reduction and economic growth in Swaziland during the period 1980–2011 and found that growth does not Granger cause poverty reduction in Swaziland – either in the short run or in the long run. Gangas (2017) explored the relationship between economic growth and poverty reduction in Nigeria. From the analysis, the findings indicated that the initial level of economic growth is not prone to poverty reduction, while an increase in economic growth is prone to poverty reduction, a situation that can only be sustained and improved upon if certain policy measures are put in place

In summary, from the review of literature above, it is found that though the literature hold a reservoir of important empirical contributions on growth-poverty nexus, however, an understanding of the conditions under which each of the hypothesis is valid/invalid is still missing. Also, while there is a sizeable literature on the nexus, yet, the focus of these literatures has been heavily biased towards regional or cross-country studies. Cross-country regressions are infamous for problem such as omitted variables bias, endogeneity, and so on. In the case of Nigeria, the few existing studies focused on how various government policies affect poverty reduction or the impact of poverty on the level of economic growth or if the growth performance is associated with poverty reduction. Little is known about why growth has not trickled down to the poor.

3. Methodology and Data Description

3.1 Sources and Type of Data

The study makes use of secondary data spanning the period between 1970 and 2017 sourced majorly from the publications of Central Bank of Nigeria Statistical Bulletin (2018), United Nations Statistics Division National Accounts Main Aggregate Database (2018), Penn World Table, version 9.0, and World Development Indicators (2018).

3.2 Model Specification

In order to provide econometric model used in investigating poverty-growth nexus in Nigeria, this study, though augmented by certain improvements and extensions by taking into account the objective of the study, adopted the work of Warr (2000) in which an analytical framework is presented to formalize the relationship between growth and poverty. Thus, the study reviewed first the relationship between aggregate, rural, and urban poverty incidence and then turn to the manner in which each of these measures is affected by economic growth. Changes in aggregate poverty incidence may be decomposed into rural and urban components, as follows. Let N, N^R and N^U depict the total, rural, and urban populations, respectively, where $N = N^R + N^U$. Explicitly, $\alpha^R = N^R/N$ and $\alpha^U = N^U/N$ for the rural and urban shares of the total population, respectively, where $\alpha^R + \alpha^U = 1$. The total number of people in poverty is given by $N_P = N_P^R + N_P^U$, where N_P^R and N_P^U denote the number in poverty in rural and urban areas, respectively. Aggregate poverty incidence is given by

$$P = N_P/N = \left(N_P^R + N_P^U\right)/N = \alpha^R P^R + \alpha^U P^U \quad (1)$$

Where $P^R = N_P^R/N_P$ denotes the proportion of the rural population that is in poverty and $P^U = N_P^U/N_P$ the corresponding incidence of poverty in urban areas. Now, differentiating (1) totally, we obtain a key relationship;

$$dP = \alpha^R dP^R + \alpha^U dP^U + \left(P^R - P^U\right)d\alpha^R \quad (2)$$

From (2), the change in poverty incidence may be decomposed into three parts: (i) the change in rural poverty incidence, weighted by the rural population share; (ii) the change in urban poverty incidence weighted by the urban population share; and (iii) the movement of populations from rural to urban areas weighted by the difference in poverty incidence between these two areas. The last of these terms is described by Anand and Kanbur (1985) and by Ravallion and Datt (1996) as the "Kuznets effect" building on Lewis (1954). As the population moves from rural to urban areas, a change in aggregate poverty incidence will occur even at constant levels of rural and urban poverty incidence, provided that the levels of poverty incidence in these two sectors is different. In growing economies, we expect to find that the rural population share is falling $\left(d\alpha^R < 0\right)$ and that the incidence of poverty in rural areas typically exceeds that in urban areas $\left(\left(P^R - P^U\right) > 0\right)$. Thus, the expected sign of $\left(P^R - P^U\right)d\alpha^R$ is negative. Following Warr (2000), the study now turned to the manner in which poverty incidence is affected by growth and, for simplicity, the study posited initially that the total number of households in poverty, N_P, depends on the aggregate level of real income, Y, and the size of the population, N. Thus;

$$N_P = \varphi(Y, N) \quad (3)$$

The incidence of poverty is defined as;

$$P = N_P / N = \varphi(Y, N)/N \quad (4)$$

By totally differentiating equation 4,

$$dP = \left(\varphi_Y Y/N\right)y + \left(\varphi_N - \varphi/N\right)n \quad (5)$$

Where lower case Roman letters represent the proportional changes of variables represented in levels by upper case Roman letters. Thus $y = dY/Y$ and $n = dN/N$ are the growth rates of aggregate real income and of population, respectively. In the special case where the function $\varphi(\cdot)$ is homogeneous of degree one in Y and N, equation (3) may be written $N_P = \varphi_Y Y + \varphi_N N$ and (5) reduces to

$$dP = \left(\varphi_Y Y/N\right)\left(y - n\right) \quad (6)$$

In this case the change in poverty incidence depends on the GDP per capita growth. We shall impose this assumption and will therefore be estimating expressions of the form

$$dP = \phi^1 + \beta^1\left(y - n\right) \quad (7)$$

The study intends to test whether the coefficient β^1 is significantly greater than zero and whether there are systematic differences in this coefficient when emphasis is placed on the pattern and sources of growth as well as the manner in which the benefits of growth are distributed in Nigeria. The constant term ϕ^1 captures the impact of factors other than growth, which also influence changes in poverty incidence.

In the theoretical and empirical literature on the analysis of determinants of poverty incidence, the literature points to a number of potential important long-term variables such as government spending, macroeconomic instability, official development assistance (ODA hereafter), employment and gross fixed capital formation. Government spending was included to examine whether various policies and government programs have improved the lives of the poor. Under the Poverty Reduction Strategy Papers (PRSP), assistances were given to countries that achieved success in bringing down poverty levels and achieving the Millennium Development Goals (MDGs). ODA has therefore become an important tool in reducing poverty levels.

Also, the study incorporated inflation to account for macroeconomic instability. Islam (2004) argued that high rate of economic growth is a necessary but not a sufficient condition for poverty reduction. Thus, the pattern, the sources together with the manner in which its benefits are distributed are vital in lessening poverty significantly. As such, in that context, employment plays an essential role. Also, as argued in Basu and Mallick (2007), if economic growth is accompanied by labour-saving devices, then it is unlikely that such growth will be accompanied by a reduction in poverty. Instead, we may observe that economic growth might be accompanied by a rise in inequality and poverty. As such, poverty incidence depends upon the type of capital formation. Based on these arguments, therefore, an econometric representation of equation (7) is augmented as follows:

$$\ln POV_t = \rho_0 + \alpha\left(\partial \ln RGDP_t\right) + \beta\left(\partial \ln INFL_t\right) + \theta \ln GVEP_t + \sigma \ln ODA_t + \phi \ln GFCF_t + \omega \ln EML_t + \varepsilon_t \quad (8)$$

In order to allow for some degree of persistence in the data generating process, equation (8) is further modified as a dynamic Autoregressive Distributed Lag (ARDL). For instance, with the downward trending nature of poverty incidence, it is reasonable to assume that poverty levels of Nigeria in a particular period may depend on that of previous years' levels. How fast poverty levels change at the end of this period may depend on the initial levels of poverty. It also takes time

before policies such as the structural reforms and the PRSP actually affect the lives of the poor. Therefore, there may possibly be long lags between the time policies are implemented and their impacts on economic variables. Also, the study included lags in the model to account for exogenous shocks (e.g. political instability and natural disasters) in the economy which are unavoidable and may have persistent effect over time. Beck and Katz (1996) explained that the inclusion of lag dependent variable as a regressor in the model is also a parsimonious way to account for the continuing effect of explanatory variables in the past. Hence, the dynamic ARDL form of equation (8) after including the lag dependent and independent variables becomes:

$$\begin{aligned}\Delta(\ln POV_t) &= \rho_0 + \sum_{i=1}^{p}\beta_{1i}\Delta(\ln POV_{t-i}) + \sum_{i=0}^{q}\beta_{2i}\Delta(\partial \ln RGDP_{t-i}) + \sum_{i=0}^{r}\beta_{3i}\Delta(\partial \ln INFL_{t-i}) + \sum_{i=0}^{s}\beta_{4i}\Delta(\ln GVEP_{t-i}) + \\ &\sum_{i=0}^{t}\beta_{5i}\Delta(\ln ODA_{t-i}) + \sum_{i=0}^{u}\beta_{6i}\Delta(\ln GFCF_{t-i}) + \sum_{i=0}^{v}\beta_{7i}\Delta(\ln EML_{t-i}) + \delta_1 \ln POV_{t-1} + \delta_2(\partial \ln RGDP_{t-1}) + \delta_3(\partial \ln INFL_{t-1}) \\ &+ \delta_4 \ln GVE_{t-1} + \delta_5 \ln ODA_{t-1} + \delta_6 \ln GFCF_{t-1} + \delta_7 \ln EML_{t-1} + \varepsilon_{2t}\end{aligned} \tag{9}$$

where $\ln POV_t$, $(\partial \ln RGDP_t)$, $(\partial \ln INFL_t)$, $\ln GVEP_t$, $\ln ODA_t$, $\ln GFCF_t$, $\ln EML_t$ and ε_{2t} are the level of poverty, economic growth proxied by GDP per capita growth, inflation rate, government expenditure, official development assistance, gross fixed capital formation (GFCF), employment and white noise residual respectively. Also, the $\beta's$ correspond to the short run effects (elasticities) whereas $\delta's$ capture the long run dynamics (elasticities) of the model, Δ denotes the first difference operator, ρ_0 is the intercept or drift component. Equation (9) is *ARDL* of order (p,q,r,s,t,u,v). It is expected *a priori* that economic growth, government expenditure, employment level and ODA will benefit the poor by giving them better access to goods and services and enhancing their well-being. Expectedly, the relationship between these explanatory variables and poverty is negative, while inflation is detrimental to the well-being of the poor, thus, the expected *a priori* is positive. GFCF may or may not benefit the poor, as such the expected *a priori* is either positive or negative respectively.

In the context of the literature, the conventional standard usually used to measure poverty has been largely categorized into two parts: human- and income-based poverty measures. Life expectancy at birth and the percentage of the population without access to improved water are examples of human-based poverty measures. As argued in Agyemang (2015), a person is considered poor if he is unable to command sufficient resources to satisfy basic needs. The basic human needs include food, clothing and shelter which are very indispensable physical needs in order to ensure continued survival. Thus, income-based poverty measures is based on calculating the headcount ratio, the poverty gap ratio, and severity of poverty measure.

For simplicity, the headcount ratio is incorporated as a measure for poverty incidence which is by far the most widely-used measure in the literature as it denotes the proportion of a population that lives below the minimum level of income deemed adequate in a particular country. Further, due to unavailability of annual time series data on headcount ratio particularly for developing countries, including Nigeria; numerous studies have used different variables as proxies for headcount index. Usually, however, three different variables have been most commonly used to measure poverty: annual income per capita, per capita household final expenditure and per capita final consumption expenditure In this study, following Nindi and Odhiambo (2015), per capita final consumption expenditure is incorporated as a proxy for headcount index. The key reason for this, as shown by previous studies (Odhiambo, 2009, 2011; Kar *et al*, 2011) per capita final consumption expenditure is more stable and reliably reported. Besides, the proxy appears to be consistent with the World Bank definition of poverty: broadly defined as the inability to attain a minimal standard of living measures in terms of basic consumption needs (Kar *et al*, 2011; Odhiambo, 2011).

Finally, to strengthen the robustness of this analysis so as to deepen an understanding of the circumstances under which the 'trickle down' hypothesis holds, the study found it desirable to include the interaction term $(\partial \ln RGDP_t \times \ln EML_t)$, in order to assess the effect of employment on the impact of economic growth and *vice versa*. In this case, the study re-specified the baseline specification (i.e. equation 9) to exclude either $(\partial \ln RGDP_t)$ or $(*\ln EML_t)$ in order to avert potential multicolinearity drawbacks. The two alternative specifications estimated apart from the baseline model earlier specified are as follows:

$$\begin{aligned}\Delta(\ln POV_t) &= \rho_0 + \sum_{i=1}^{p}\alpha_{1i}\Delta(\ln POV_{t-i}) + \sum_{i=0}^{q}\alpha_{2i}\Delta(\partial \ln RGDP_{t-i}) + \sum_{i=0}^{r}\alpha_{3i}\Delta(\partial \ln INFL_{t-i}) + \sum_{i=0}^{s}\alpha_{4i}\Delta(\ln GVEP_{t-i}) + \\ &\sum_{i=0}^{t}\alpha_{5i}\Delta(\ln ODA_{t-i}) + \sum_{i=0}^{u}\alpha_{6i}\Delta(\ln GFCF_{t-i}) + \sum_{i=0}^{v}\alpha_{7i}\Delta(\partial \ln RGDP_{t-i} \times \ln EML_{t-i}) + \theta_1 \ln POV_{t-1} + \theta_2(\partial \ln RGDP_{t-1}) + \\ &\theta_3(\partial \ln INFL_{t-1}) + \theta_4 \ln GVE_{t-1} + \theta_5 \ln ODA_{t-1} + \theta_6 \ln GFCF_{t-1} + \theta_7(\partial \ln RGDP_{t-i} \times \ln EML_{t-1}) + \varepsilon_{3t}\end{aligned} \tag{10}$$

$$\Delta(\ln POV_t) = \lambda_0 + \sum_{i=1}^{p} \sigma_{1i} \Delta(\ln POV_{t-i}) + \sum_{i=0}^{q} \sigma_{2i} \Delta(\ln EML_{t-i}) + \sum_{i=0}^{r} \sigma_{3i} \Delta(\partial \ln INFL_{t-i}) + \sum_{i=0}^{s} \sigma_{4i} \Delta(\ln GVEP_{t-i}) + \sum_{i=0}^{t} \sigma_{5i} \Delta(\ln ODA_{t-i}) + \sum_{i=0}^{u} \sigma_{6i} \Delta(\ln GFCF_{t-i}) + \sum_{i=0}^{v} \sigma_{7i} \Delta(\partial \ln RGDP_{t-i} \times \ln EML_{t-i}) + \rho_1 \ln POV_{t-1} + \rho_2 (\ln EML_{t-1}) + \rho_3 (\partial \ln INFL_{t-1}) + \rho_4 \ln GVE_{t-1} + \rho_5 \ln ODA_{t-1} + \rho_6 \ln GFCF_{t-1} + \rho_7 (\partial \ln RGDP_{t-i} \times \ln EML_{t-1}) + \varepsilon_{4t} \quad (11)$$

The signs of α_{7i} and σ_{7i} (short-run impacts), θ_7 and ρ_7 (long-run dynamics), are expected to remain negative. This is because high rates of economic growth accompanied by high rates of employment growth with rising productivity and *vice versa* is expected to benefit the poor by giving them better access to goods and services, thereby enhance their well-being.

4. Empirical Results and Discussion

4.1 Unit Root, Lag Length Selection, and Bounds Tests Results

In order to avert spuriousness of the result the empirical analysis began with the assessment of the stationarity conditions of the variables employed by applying the Phillips Perron (PP) and Augmented Dickey-Fuller (ADF) unit root tests. Both tests statistics were done for two alternative specifications at 1%, 5% and 10% level of significance. First it was tested with intercept but no trend, and then it was tested with both intercept and trend. The results are presented in Tables 1 and 2 in Appendix 1. As can be seen from the tables, at 5% level of significance, both tests consistently suggest that apart from economic growth proxied by GDP per capita growth and inflation rate which were stationary at level, all other variables become stationary when converted to first differences, suggesting that each is integrated of order 1.

After the determination of the stationarity conditions of the variables employed, in evaluating the specified ARDL models (9, 10, and 11), the possible existence of long-run relationship among the variables was also tested. However, before the test was applied, it was necessary to determine the appropriate lag length in order to avoid the problem of misspecification and loss of the degrees of freedom. Following the literature, VAR lag order selection criteria attributed to Hannan-Quinn information criteria (HIC), the Log Likelihood (LL), the Schwarz information criteria (SIC), Final Prediction Error (FPE) criteria and the Akaike information criteria (AIC) were considered. However, Liew (2004) posited that the Akaike Information Criterion (AIC) and Final Prediction Error (FPE) are superior than the other criteria under study in the case of small sample (60 observations and below), in the manners that they minimize the chance of under estimation while maximizing the chance of recovering the true lag length. Thus, given that there were 47 observations, the optimal lag order two (for models 9 and 11) and one (for model 10) were carefully chosen. The results are presented in table 3 in Appendix 1.

Hence, with that maximum lag lengths setting, during the analysis: 1,458 different ARDL models specifications for equation 9; 1,458 different ARDL models specifications for equation 10; and 1,458 different ARDL models specifications for equation 11 were considered and the most suitable model ARDL (1, 0, 2, 0, 0, 0, 0) for equation 9, ARDL (1, 0, 0, 0, 0, 0, 0) for equation 10 and ARDL (1, 0, 2, 0, 0, 0, 0) for equation 11 were selected for this study. Figures 1, 2 and 3 in Appendix which provide graphs of the AIC of the top twenty models (for models 9, 10 and 11 respectively) depict the relative superiority of the selected models against alternatives. Having determined the optimal lag length, thus, in the third step, the study applied Bounds F-test to equations 9, 10, and 11, in order to establish cointegrating relationship among the series. The results of the bounds are shown in table 4 in Appendix 1. As can be seen from the table, at 5% level of significance, the study rejects the null hypotheses of no long-run relationships among the examined variables. This empirical evidence rules out the possibility of estimated relationship being spurious.

4.2 Estimated Long Run Elasticities for the Selected ARDL Models

Having determined the existence of long run relationship among the variables, the long run and short run elasticities coefficients were estimated. The estimated long-run dynamics of the selected ARDL models along with the short-run coefficients are presented in tables 5 and 6 respectively in Appendix I. As can be seen from the table 5 in respect of the estimated models, the impressive economic growth experienced in Nigeria over the last three and halve decades has been unevenly distributed and has not been benefited the poor. In other words, the so-called "trickle down" hypothesis which underlying the view that economic growth alone will take care of poverty alleviation is not supported in Nigeria. This conclusion was arrived at based on the fact that economic growth proxied by GDP per capita growth had positive and significant effect on poverty incidence as shown by the *t*-statistic and *p*-value. As it were, for instance, with respect to the first specification (that is model 9), the coefficient of the economic growth is positive (0.205093) and statistically significant with probability value $p = 0.0000$ which is less than 0.05 (5%) level of significance and t-statistic $t = 11.370924$. This result is similar to the findings of Aigbokhan (2000), and Stephen and Simoen (2013) for the case of Nigeria.

More so, a cursory look at the table 5 in Appendix 1 showed that the elasticity coefficient of inflation rate has the expected sign and is statistically significant as shown by the *t*-statistic and *p*-value. With respect to the first specification, for example, as can be observed, holding other things constant, a one percent increase in inflation rate will bring about 0.00448 percent increase in poverty incidence. This increase in poverty incidence resulting from the increase in inflation rate suggests that the income of the poor does tend to be associated with macroeconomic stability. Similar findings were also observed in other studies (see for instance, Chani *et al*, 2011 for the case of Pakistan; Aiyedogbon and Ohwofasa, 2012 for the case of Nigeria).

Additionally, on the impact of government expenditure on poverty alleviation in Nigeria, an insight from the result obtained suggests that government expenditure has been inactive at significantly alleviating poverty incidence in the country. From the table 5, for instance, with respect to the model 9, it is observed that the elasticity coefficient of government expenditure is positive (2.114874) and statistically significant with probability value $p = 0.0000$ which is less than 0.05 (5%) level of significance and t-statistic $t = 14.744592$. This evidence of a positive effect of government expenditure on poverty incidence undoubtedly depicts the Nigerian economy where in spite of the increased economic growth achieved over the years and the rising level of government expenditure, poverty persists unabated. This result is in line with the findings obtained by Bruckner and Pappa (2012), and Nwosa (2014) but in contrast to those obtained by International Monetary Fund (2010); Monacelli, Perotti, & Trigari, (2010); and Auerbach & Gorodnichenko (2012).

Also, on the effect of official development assistance (ODA) on poverty alleviation, according to the three specifications, ODA, as can be seen from the table 5, has not been properly managed to derive maximum benefits for the enhancement of peoples' welfare, particularly the lives of the very poor, during the period under review. As it is depicted in the table 5, the results obtained revealed that the elasticity coefficient of ODA had non-significant positive effect on poverty incidence as shown by the *t*-statistic and *p*-value. Similar findings were also observed in other studies (see for instance Ekpo & Afangideh, 2012; Ugwuanyi, Ezeaku, & Ibe, 2017) but in contrast to that obtained by Woldekidan (2015).

Furthermore, the elasticities coefficients of both employment and gross fixed capital formation have expected signs and are statistically significant. That is, while employment reduces poverty, a rise in gross fixed capital formation raises it. As can be observed, premised on the results depicted in the table 5, on the effect of employment on poverty incidence, it is evident that the creation of productive employment plays a vital role as a route out of poverty. As shown in the table, regarding the model (9) specification, for instance, for a one-percent point increase in employment level, holding other things constant, 1.271963 percent poverty incidence reduction is induced in the long-run. Equally, according to the first specification, with regard to the elasticity coefficient of gross fixed capital formation the result obtained revealed that, all other things being equal, a one percent increase in gross fixed capital formation raises poverty incidence by 0.204969 percent in the long run, suggesting that economic growth in Nigeria appears to have been accompanied by labour-saving devices; and as such, it is unlikely that such growth will be accompanied by a reduction in poverty. An insight from these findings therefore suggests that, first of all, the high rates of economic growth Nigeria has experienced over the years appears to have been driven by oil production whose activity is rent seeking in nature, and which at best employs less than 2% of the population, rather than the agriculture, industrial, and service sectors that can absorb the large unemployed population.

Secondly, from the point of view of achieving the goal of poverty reduction, high growth alone is not sufficient; the pattern, the sources together with the manner in which its benefits are distributed are vital in lessening poverty significantly. As such, in that context, employment plays an essential role. Economic growth policies that promote an increase in income in conjunction with a high rates of employment growth are more effective in combating poverty in Nigeria than those that focus only on raising average income levels. In essence, an economic growth that emphasized labour-intensive strategy is generally more effective in reducing poverty. Thirdly, there is the need for government to implement a broad set of employment generating policies that can help lessen unemployment in the country. Besides, policies should be put in place to strengthen the existing employment promotion programmes.

Finally, in order to reconfirm these results on the elasticity coefficients of both employment and gross fixed capital formation so as to deepen an understanding of the circumstances under which the 'trickle down' hypothesis holds, the study found it desirable to include the interaction term $\left(\partial \ln RGDP_t \times \ln EML_t\right)$, to assess the effect of employment on the impact of economic growth and *vice versa*. In this case, the study re-specified the baseline specification (i.e. equation 9) to exclude either $\left(\partial \ln RGDP_t\right)$ or $\left(\ln EML_t\right)$ in order to avert potential multicolinearity drawbacks. The results of the specifications (10) and (11) are also depicted in the table 5.

From the estimated model (10), as shown by the table 5, as anticipated, the elasticity coefficient of the interactive term is negative and statistically significant as revealed by the *t*-statistic and *p*-value, while the elasticity coefficient of economic growth proxied by GDP per capita growth remains positive and significant. These findings, thus, suggest that a higher level of employment would increase the poverty alleviation efficiency of economic growth at a rate of 0.205093

percentage points per each percentage point increase in the employment level. Conversely, from the estimated model (11), as can be observed, as expected, the coefficient of the interactive term is negative and statistically significant, while the coefficient of employment remains negative and statistically significant. These results, therefore, suggest that a higher level of economic growth would increase the poverty alleviation efficiency of employment level at a rate of 0.62032 percentage points per each percentage point increase in economic growth. Similar findings were also observed in other studies (see for instance, Islam, 2004; Khan, 2007).

Since the ARDL models were estimated by simple least squares, all of the views and procedures available to equation objects estimated by least squares are also available for ARDL models. The R^2, the adjusted R^2, the F-statistic and the Durbin-Watson statistic for the selected models are depicted in panel B of table 5 in Appendix I. As can be observed from the table 5, the F-statistic which measures the overall significance of the estimated models were statistically significant, implying that the models are fit and appropriate for the empirical estimates. Again, as observed the explanatory power (R^2) of the model is high. Moreover, the Adjusted R^2 which measures the proportion of variation in poverty incidence that is jointly explained by the explanatory variables after the effect of insignificant regressor has been removed is also high. Besides, the Durbin-Watson statistic which is used to test for autocorrelation of residuals in the model, in particular, the first order autocorrelation revealed the absence of serial autocorrelation.

In order to check the robustness of the estimated regression results and also ensure that the estimated models possessed the desirable BLUE properties, different post-estimation diagnostic tests (the Breusch-Godfrey serial correlation LM test, ARCH test for heteroskedasticity, Jacque-Bera normality test and Ramsey RESET specification test) were undertaken. All the tests disclosed that the estimated model possessed the desirable BLUE properties.

4.3 Estimated Short Run Elasticities for the Selected ARDL Models

The estimated short-run elasticities coefficients of all the three ARDL specifications are presented in table 6 in Appendix I. In all the three specifications, as can be observed, discursively, the coefficients of the error correction terms, ECT (-1), are all negative and statistically significant at 5% level, indicating that short-run disequilibrium is corrected in the long-run equilibrium. According to the first specification (that is model 9), the short-run elasticity coefficient of economic growth proxied by GDP per capita growth is negative and significant at 5% level. However, with respect to the second specification (that is model 10), when the study re-specified the baseline specification (i.e. equation 9) to exclude employment level in order to avert potential multicolinearity downsides, economic growth has a negative but insignificant short-run impact on poverty incidence, still signifying that economic growth policies that promote an increase in income in conjunction with a high rates of employment growth are more effective in combating poverty in Nigeria than those that focus only on raising average income levels.

Consistent with theoretical explanations and the long-run findings, the table 6 indicates that the elasticities coefficients of both inflation rate and official development assistance have expected signs and are highly statistically significant (as shown by their *t*-statistics and *p*-values). Surprisingly, unlike its long-run positive significant impact, premised on the first and second specifications (that is models 9 and 10), the short-run elasticities coefficients of government expenditure are found to be negative and significant at 5% level. However, with respect to the third specification (that is model 11), the coefficient of government expenditure is found to be positive and significant at 5% level, suggesting that although an upsurge in public spending increases the economic activities and output which in turn lessens poverty incidence, however, for government expenditure to have meaningful impact on poverty alleviation there is need for public subsidies in critical infrastructures with positive spill-over effects on the economy. Similar findings were also observed in other studies (see for instance, Mehmood and Sadiq, 2010).

However, unlike its long-run positive significant impact, gross fixed capital formation has a negative and significant short run impact on poverty incidence, suggesting that poverty alleviation depends upon the type of capital formation rather than its absolute value, which will determine the growth of employment and will be reflected in the poverty incidence. Similar results were obtained in Basu and Mallick (2007) for the case of India. As anticipated and in consistent with the long run findings, the elasticity coefficient of the interactive term was also found to be an important determinant of poverty alleviation in Nigeria. This result corroborates the earlier empirical findings. Lastly, in terms of the short-run effect of employment on poverty incidence, as can be observed from the table 6, unlike its long-run positive significant impact, there exists a negative but statistically insignificant relationship at 5% level, signifying that eradicating poverty, in Nigeria, is not essentially a question of generating employment opportunities but then, in the meantime, ensuring that both the quality and quantity of available work is such that it can lead to poverty alleviation. Nigeria, as is the case in other parts of Sub Saharan African economies, engages in an intensive production of primary commodities and depend exclusively on the export of these goods. Consequently, employment is of low quality. This result supports studies by Kraay (2004), Bell & Newitt, (2010); and Dursun & Ogunleye, (2016).

5. Conclusion and Recommendations

Despite impressive economic growth and major economic reform policies the search for poverty-reducing growth strategies remains a perennial question in many developing countries as poverty persists unabated. This motivates the current study to investigate empirically growth-poverty nexus in the context of Nigerian economy spanning between the period 1970 and 2017. The paper attempted to answer the question: why has economic growth not trickled down to the poor? Time series econometrics was applied to test the cointegrating, short run and long run dynamics among the variables. The result obtained revealed that growth trickled down to the poor only when high rates of employment growth accompanied high rates of economic growth. In other words, economic growth can only unswervingly address the issue of poverty incidence provided it is also complemented by growth in employment.

In addition to growth in employment, the result obtained also revealed that the form of capital formation, rather than its absolute value, appears to matter to the question of why has growth not trickle down to the poor. The theoretical view that growth only will take care of poverty incidence seems to rest on the supposition that owing to the existence of a very large surplus of labour, the upsurge in the growth of employment is unlikely to be accompanied by the occurrence of capital-labour substitution in the foreseeable future. Thus, an economic growth that emphasized labour-intensive strategy (in terms of an increase in employment and improvement in the opportunities for productive activities among the poor) is generally more effective in reducing poverty.

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Appendix I

Table 1.

Augmented Dickey-Fuller (ADF) Test with Intercept only

Variable	Level						1st Diff					
	Test Statistic	Critical Values			P-Values	Remarks	Test Statistic	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
lnPOV	-0.56648	-3.581152	-2.926622	-2.601424	0.8679	NS	-4.78201	-3.581152	-2.926622	-2.601424	0.0003	I(1)
dlnRGDP	-5.92105	-3.577723	-2.925169	-2.600658	0.0000	I(0)	***	***	***	***	***	I(0)
dlnINFL	-3.6156	-3.577723	-2.925169	-2.600658	0.0090	I(0)	***	***	***	***	***	I(0)
lnGVEP	-1.91301	-3.581152	-2.926622	-2.601424	0.3236	NS	-7.43675	-3.581152	-2.926622	-2.601424	0.0000	I(1)
lnODA	-0.69221	-3.577723	-2.925169	-2.600658	0.8387	NS	-6.06835	-3.584743	-2.928142	-2.602225	0.0000	I(1)
lnGFCF	-0.21363	-3.577723	-2.925169	-2.600658	0.9293	NS	-4.80958	-3.581152	-2.926622	-2.601424	0.0003	I(1)
lnEML	0.488115	-3.581152	-2.926622	-2.601424	0.9845	NS	-4.83893	-3.581152	-2.926622	-2.601424	0.0003	I(1)
dlnRGDP*lnEML	-5.88672	-3.577723	-2.925169	-2.600658	0.0000	I(0)	***	***	***	***	***	I(0)

Augmented Dickey-Fuller (ADF) Test with Trend and Intercept

Variable	Level						1st Diff					
	Test Statistic	Critical Values			P-Values	Remarks	Test Statistic	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
lnPOV	-1.81424	-4.170583	-3.51074	-3.185512	0.6816	NS	-4.73644	-4.170583	-3.51074	-3.185512	0.0021	I(1)
dlnRGDP	-5.97579	-4.165756	-3.508508	-3.18423	0.0000	I(0)	***	***	***	***	***	I(0)
dlnINFL	-3.62059	-4.165756	-3.508508	-3.18423	0.0387	I(0)	***	***	***	***	***	I(0)
lnGVEP	-0.95348	-4.170583	-3.51074	-3.185512	0.9405	NS	-7.81777	-4.170583	-3.51074	-3.185512	0.0000	I(1)
lnODA	-3.42706	-4.170583	-3.51074	-3.185512	0.0602	NS	-6.07321	-4.17564	-3.513075	-3.186854	0.0000	I(1)
lnGFCF	-2.63135	-4.180911	-3.515523	-3.188259	0.2691	NS	-4.75439	-4.170583	-3.51074	-3.185512	0.0020	I(1)
lnEML	-2.03361	-4.170583	-3.51074	-3.185512	0.5678	NS	-4.87526	-4.170583	-3.51074	-3.185512	0.0014	I(1)
dlnRGDP*lnEML	-5.94915	-4.165756	-3.508508	-3.18423	0.0001	I(0)	***	***	***	***	***	I(0)

Source: Author's computation using E-view 9 (2018)

NS denotes nonstationary at level

Table 2.

Philips-Peron (PP) Test with Intercept only

Variable	Level						1st Diff					
	Test Statistic	Critical Values			P-Values	Remarks	Test Statistic	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
lnPOV	-0.44591	-3.577723	-2.925169	-2.600658	0.8924	NS	-4.8021	-3.581152	-2.926622	-2.601424	0.0003	I(1)
dlnRGDP	-5.92867	-3.577723	-2.925169	-2.600658	0.0000	I(0)	***	***	***	***	***	I(0)
dlnINFL	-3.5075	-3.577723	-2.925169	-2.600658	0.0120	I(0)	***	***	***	***	***	I(0)
lnGVEP	-1.73301	-3.577723	-2.925169	-2.600658	0.4085	NS	-7.4069	-3.581152	-2.926622	-2.601424	0.0000	I(1)
lnODA	-0.70865	-3.577723	-2.925169	-2.600658	0.8345	NS	-5.39612	-3.581152	-2.926622	-2.601424	0.0000	I(1)
lnGFCF	-0.28814	-3.577723	-2.925169	-2.600658	0.9188	NS	-4.73257	-3.581152	-2.926622	-2.601424	0.0004	I(1)
lnEML	1.183799	-3.577723	-2.925169	-2.600658	0.9976	NS	-4.62652	-3.581152	-2.926622	-2.601424	0.0005	I(1)
dlnRGDP*lnEML	-5.89742	-3.577723	-2.925169	-2.600658	0.0000	I(0)	***	***	***	***	***	I(0)

Philips-Peron (PP) Test with Trend and Intercept

Variable	Level						1st Diff					
	Test Statistic	Critical Values			P-Values	Remarks	Test Statistic	Critical Values			P-Values	Remarks
		1%	5%	10%				1%	5%	10%		
lnPOV	-1.78081	-4.165756	-3.508508	-3.18423	0.6981	NS	-4.75307	-4.170583	-3.51074	-3.185512	0.0020	I(1)
dlnRGDP	-5.97571	-4.165756	-3.508508	-3.18423	0.0000	I(0)	***	***	***	***	***	I(0)
dlnINFL	-3.44912	-4.165756	-3.508508	-3.18423	0.0571	I(0)	***	***	***	***	***	I(0)
lnGVEP	-1.20486	-4.165756	-3.508508	-3.18423	0.8979	NS	-7.76726	-4.170583	-3.51074	-3.185512	0.0000	I(1)
lnODA	-2.75798	-4.165756	-3.508508	-3.18423	0.2195	NS	-5.41522	-4.170583	-3.51074	-3.185512	0.0003	I(1)
lnGFCF	-1.95087	-4.165756	-3.508508	-3.18423	0.6122	NS	-4.67452	-4.170583	-3.51074	-3.185512	0.0025	I(1)
lnEML	-1.92303	-4.165756	-3.508508	-3.18423	0.6268	NS	-4.63388	-4.170583	-3.51074	-3.185512	0.0028	I(1)
dlnRGDP*lnEML	-5.94698	-4.165756	-3.508508	-3.18423	0.0001	I(0)	***	***	***	***	***	I(0)

Source: Author's computation using E-view 9 (2018)

NS denotes nonstationary at level

Table 3.

Lag Length Selection Criteria Results for Model 9					
Lag	LR	FPE	AIC	SC	HQ
0	NA	0.439489	19.04295	19.32122	19.14719
1	475.3727	1.40E-05	8.663577	10.88975*	9.497515*
2	73.25160*	1.29e-05*	8.431057*	12.60513	9.99469
Lag Length Selection Criteria Results for Model 10					
Lag	LR	FPE	AIC	SC	HQ
0	NA	1055.543	26.8269	27.10517	26.93114
1	408.6968*	0.194372*	18.20216*	20.42833*	19.03609*
2	64.85087	0.234213	18.24063	22.4147	19.80426
Lag Length Selection Criteria Results for Model 11					
Lag	LR	FPE	AIC	SC	HQ
0	NA	132.2284	24.74962	25.02789	24.85386
1	475.9415	0.004149	14.35528	16.58145*	15.18922*
2	73.50757*	0.003781*	14.11450*	18.28858	15.67814

Source: Author's computation using E-view 9 (2018)

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table 4.

Results of Bound Test Approach to Cointegration for Model 9			
Significance	Critical Value Bonds		Computed F-Statistic
	Lower Bound I(0)	Upper Bond I(1)	
10%	2.12	3.23	***5.544234***
5%	2.45	3.61	
2.5%	2.75	3.99	
1%	3.15	4.43	
Results of Bound Test Approach to Cointegration for Model 10			
Significance	Critical Value Bonds		Computed F-Statistic
	Lower Bound I(0)	Upper Bond I(1)	
10%	2.12	3.23	***4.841452***
5%	2.45	3.61	
2.5%	2.75	3.99	
1%	3.15	4.43	
Results of Bound Test Approach to Cointegration for Model 11			
Significance	Critical Value Bonds		Computed F-Statistic
	Lower Bound I(0)	Upper Bond I(1)	
10%	2.12	3.23	***5.601233***
5%	2.45	3.61	
2.5%	2.75	3.99	
1%	3.15	4.43	

Source: Author's computation using E-view 9 (2018)

Table 5. Estimated Long Run Elasticities for the Selected ARDL Models (Regress and: InPOV)

Explanatory Variables	Model 9 ARDL (1, 0, 2, 0, 0, 0, 0)	Model 10 ARDL (1, 0, 0, 0, 0, 0, 0)	Model 11 ARDL (1, 0, 2, 0, 0, 0, 0)
dlnRGDP	0.205093*	0.461422*	
	{0.018037}	{0.179141}	
	[11.370924]	[2.575744]	
	{{0.0000}}	{{0.0139}}	
dlnINFL	0.00448*	0.004486*	0.29166*
	{0.001195}	{0.001224}	{0.128637}
	[11.15570]	[3.666688]	[2.267303]
	{{0.0006}}	{{0.0007}}	{{0.0295}}
lnGVEP	2.114874*	0.277429*	1.338337*
	{0.143434}	{0.054768}	{0.407276}
	[14.744592]	[5.065514]	[3.286067]
	{{0.0000}}	{{0.0000}}	{{0.0023}}
lnODA	0.008062*	0.006843*	0.000317*
	{0.023853}	{0.024650}	{0.025531}
	[0.337974]	[0.277607]	[0.012425]
	{{0.7372}}	{{0.7828}}	{{0.9902}}
lnGFCF	0.204969*	0.39048*	2.006973*
	{0.072615}	{0.13552}	{0.934259}
	[2.822658]	[2.88135]	[2.148197]
	{{0.0077}}	{{0.0084}}	{{0.0385}}
lnEML	-1.271963*		-1.272636*
	{0.564214}		{0.564637}
	[-2.254399]		[-2.253899]
	{{0.0304}}		{{0.0304}}
dlnRGDP*lnEML		-0.205093*	-0.62032
		{0.018169}	{0.277307}
		[11.288130]	[-2.236954]
		{{0.0000}}	{{0.0316}}
C	16.8828	-1.978429	0.039698
	{8.470859}	{0.937611}	{42.748029}
	[1.993045]	[-2.110074]	[0.000929]
	{{0.0539}}	{{0.0413}}	{{0.0093}}
Goodness-of-fit Measures			
R^2	0.99837	0.998111	0.99837
Adjusted R^2	0.997962	0.997772	0.997962
F-statistic	2449.336	2943.931	2449.366
Prob (F-statistic)	0.0000000	0.0000000	0.0000000
Durbin-Watson Stat	2.208047	1.928485	2.208187
Diagnostic Statistical Checking			
Breusch- Godfrey serial correlation LM test	2.099504*** {{0.3500}}	2.349267*** {{0.3089}}	2.106215*** {{0.3489}}
Breusch-Pagan-Godfrey test for heteroskedasticity	13.05810*** {{0.1600}}	16.43203*** {{0.0214}}	13.07159*** {{0.1594}}
ARCH test for heteroskedasticity	0.066579*** {{0.7964}}	1.828744*** {{0.1763}}	0.066796*** {{0.7961}}
Jacque-Bera normality test	0.963618** {{0.617665}}	2.031365** {{0.362155}}	0.965316** {{0.617141}}
Ramsey RESET specification test	[1.259019] {{0.2164}}	[0.136331] {{0.8923}}	[1.258518] {{0.2165}}

Notes:

1. { }, [ ] and {{ }} denote Std. Error, t-Statistic, Probability respectively
2. ***, ** and * depict Obs R-squared, Jacque-Bera Statistic and Coefficient respectively

Source: Author's computation using E-view 9 (2018)

Table 6. Estimated Short Run Elasticities for the Selected ARDL Models (Regress and: InPOV)

Explanatory Variables	Model 9 ARDL (1, 0, 2, 0, 0, 0, 0)	Model 10 ARDL (1, 0, 0, 0, 0, 0, 0)	Model 11 ARDL (1, 0, 2, 0, 0, 0, 0)
ECM(-1)	-0.198341*	-0.198341*	-0.198341*
	{0.070349}	{0.0755}	{0.088632}
	[-2.819384]	[-2.627022]	[-2.2378]
	{{0.0074}}	{{0.0122}}	{{0.0315}}
D(dlnRGDP)	-0.057848*	-0.057848*	
	{0.002547}	{0.178061}	
	[-22.715352]	[-0.324877]	
	{{0.0000}}	{{0.7470}}	
D(dlnINFL)	0.347108*	0.347108*	0.057848*
	{0.001195}	{0.001224}	{0.001157}
	[290.48249]	[283.689334]	[50.01243]
	{{0.0000}}	{{0.0000}}	{{0.0000}}
D(lnGVEP)	-0.182038*	-0.182038*	0.347108*
	{0.053015}	{0.054768}	{0.07888}
	[-3.433686]	[-3.323803]	[4.400466]
	{{0.0014}}	{{0.0019}}	{{0.0001}}
D(lnODA)	0.100377*	0.100377*	0.305151*
	{0.023853}	{0.02465}	{0.025519}
	[4.208085]	[4.072011]	[11.958041]
	{{0.0001}}	{{0.0002}}	{{0.0000}}
D(lnGFCF)	-0.305151*	-0.305151*	-0.398064*
	{0.06324}	{0.13552}	{0.072629}
	[-4.82527]	[-5.048253]	[-5.480774]
	{{0.0000}}	{{0.0000}}	{{0.0000}}
D(lnEML)	0.398064*		0.585027*
	{0.060915}		{0.564637}
	[6.534796]		[1.036111]
	{{0.0695}}		{{0.3071}}
D(dlnRGDP*lnEML)		-0.398064*	-0.123035
		{0.010271}	{0.000158}
		[-38.756124]	[-781.118273]
		{{0.0000}}	{{0.0000}}

Notes: *, { }, [ ] and {{ }} denote Coefficient, Std. Error, t-Statistic, Probability respectively

Source: Author's computation using E-view 9 (2018)

Appendix II

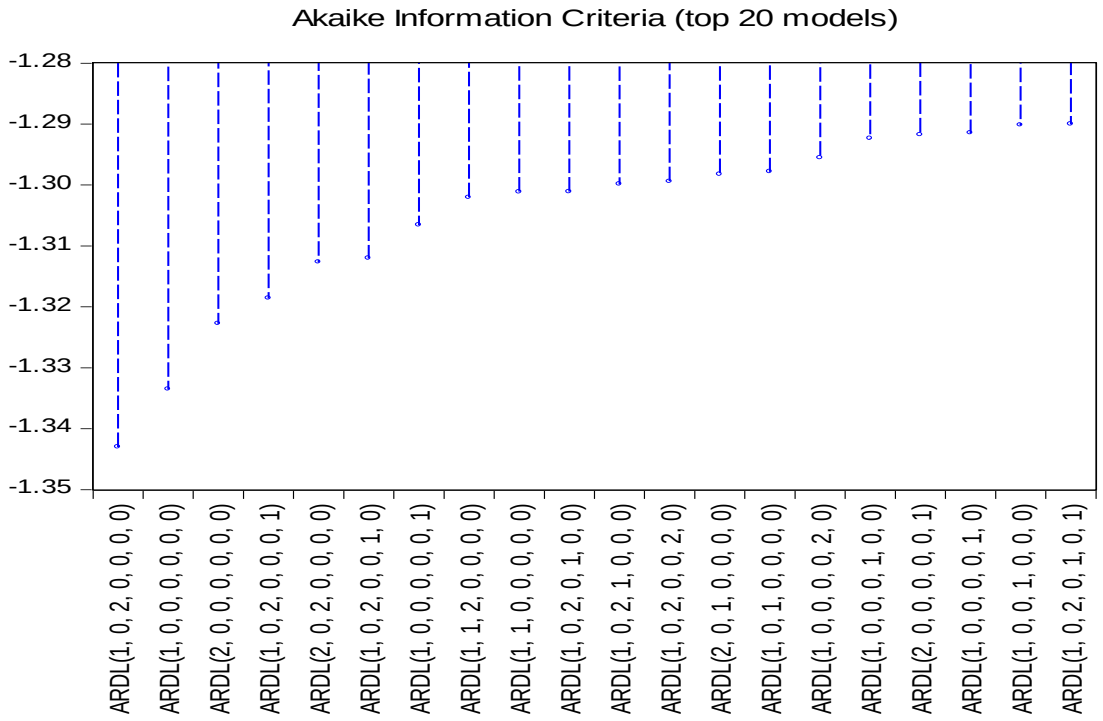

Figure 1. Model Selection Graph (Summary of the top 20 models selection) for Model 9

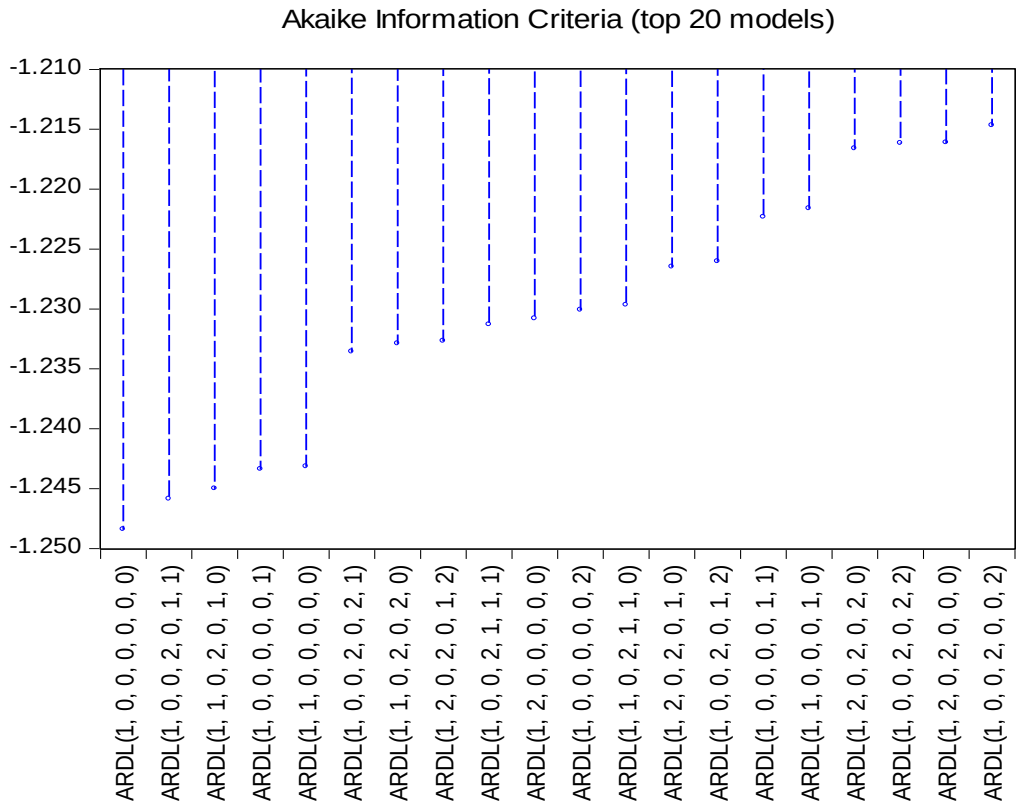

Figure 2. Model Selection Graph (Summary of the top 20 models selection) for Model 10

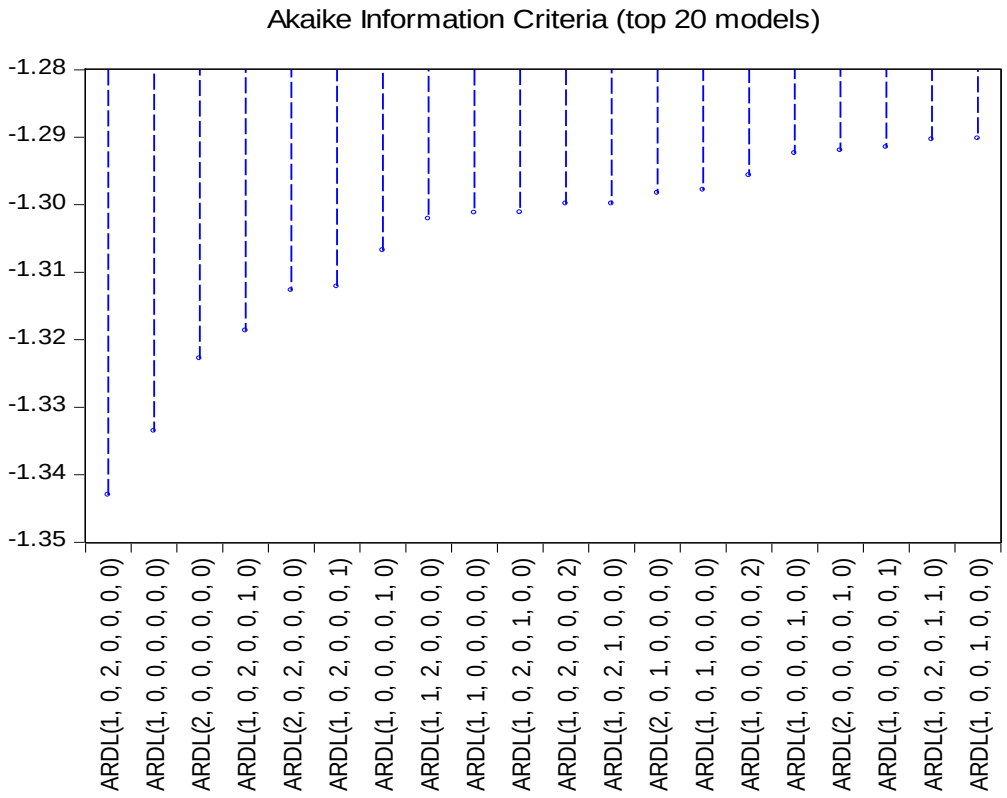

Figure 3. Model Selection Graph (Summary of the top 20 models selection) for Model 11