JOURNAL OF ECONOMIC AND FINANCIAL ISSUES

ISSN: 1119-5177

JOURNAL OF ECONOMIC AND FINANCIAL ISSUES VOLUME 4, NUMBER 1 JUNE, 2018

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JOURNAL OF ECONOMIC AND FINANCIAL ISSUES VOLUME 5, NUMBER 1, JULY, 2019

The Journal of Economic and Financial Issues is published bi-annually in June and December by the Department of Economics, University of Jos, Jos, Nigeria.

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TRADE OPENNESS AND ECONOMIC GROWTH: AN EXAMINATION OF THE TRADE-LED GROWTH HYPOTHESIS IN NIGERIA(1970-2016)

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&

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ABSTRACT

Nigeria's economic policy in the last three to four decades has significantly incorporated measures towards opening the economy more to trade. This has been done with the expectation of a positive effect on growth. This study set out to empirically examine the effects of trade openness on economic growth in Nigeria over the period 1970 to 2016, to ascertain whether or not the trade-led growth hypothesis holds for Nigeria. This was implemented through the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration based on the neoclassical growth accounting model. The results obtained showed no significant short run causality running from trade openness to economic growth, but a negative and significant long run effects of trade openness on economic growth; a 1 percent rise in trade openness would cause a reduction in real GDP by 0.25 percent. This finding disputes the trade-led growth hypothesis for Nigeria. The article therefore, cautions the pace at which the country's economy is being opened to international trade. In addition, the study suggests that for Nigeria to benefit from an outward-oriented policy, the modification of the country's trade composition from a crude oil exports dominant economy to one with high value-added exports is paramount.

Keywords: Economic Growth, Trade Openness, ARDL, Nigeria
JEL Classification: C01, F14,F43, O47

INTRODUCTION

The globalizing world is characterized by an increasingly elaborate web of linkages in markets. This has arisen, in part, due to the fact that the distribution of natural, human, and capital resources required for the efficient production of various kinds of goods and services varies across economies. The interaction of countries in the world economy, therefore, provides the opportunity for sourcing strategies (offering wider access of inputs for firms in the global market) and the supply of many goods and

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services on a competitive basis. However, whether such an interaction actually promotes economic growth for everyone, is a question that has elicited much discussions and has remained one of the main conundrums in economics discipline. This has led to the emergence of the trade-led growth hypothesis; that is, whether trade acts as an engine for economic growth.

The proponents for trade have argued that through freer trade, economic growth would be achieved. This view presupposes that trade openness increases access to goods and services, raises efficiency in the allocation of resources and improves productivity through the diffusion of technology and the dissemination of knowledge (Barro & Sala-i-Martin, 1997). Thus, implying much gains would accrue to developing countries by trading with developed countries. The other view disagrees with the stand that economic growth can significantly be improved upon through adopting trade openness measures but, rather suggests it may just be an avenue for exploiting developing countries. It has been argued that developing countries export primary products that are susceptible to terms of trade shocks (Haussmann, Hwang, & Rodrik, 2007). Hence, it is most likely that trade openness will lead to increases in inflation and the lowering of exchange rates, which may negatively impact on economic growth (Jafari, Samimi, Ghaderi, Hosseinzadeh, & Nademi, 2012).

These conflicting views notwithstanding, it is generally believed that openness to international trade would improve economic growth and development especially, for developing countries. Perhaps this is as a result of the failure of restrictive import-substitution industrialization strategy employed by a greater number of developing countries upon gaining independence and the export-led economic growth experienced by the East Asian countries in the 1970s, partly attributed to their early openness to trade. Thus, most developing countries have implemented measures especially, liberal trade policies towards sharing in the benefits that would accrue from participating in world trade.

Since mid-1980s, Nigeria has taken deliberate steps to open her economy to the outside world through a combination of unilateral, regional and multilateral liberalization initiatives, which have dominated the country's economic policy. This began with the adoption of the International Monetary Fund/World Bank's Structural Adjustment Programme (SAP) in 1986. The opening of the country to trade was an integral element of SAP. Freer trade was espoused on the argument that the nation would have many goods available at relatively cheaper prices than in the domestic market thus enhancing consumers' welfare. In addition, freer trade was anticipated to increase access to more profitable markets in which the country would sell the products of her industries.

The trade openness element of SAP has continued to influence policy in Nigeria. Under the National Economic Empowerment and Development Strategy (NEEDS) introduced in the early 2000s, the opening of Nigeria to trade was also promoted on the basis that it will enhance competitiveness of domestic industries with a view to, among other things, encourage local value addition and promote, as well as, diversify exports. The country's goal to achieve trade openness culminated with the incorporation of the ECOWAS Common External Tariff (CET) in 2008. Since then, trade policy in Nigeria has sustained the country's commitment to the tenets of trade openness as a channel to achieving growth of the economy. More so, Nigeria is a member of the World Trade Organization thus, the country's trade policy complies with the rules of the organization which seek the reduction of trade barriers as a channel to enhancing the economic performance of its member countries.

Nigeria's economy on the other hand, has gone through periods of successes and poor performance. From 1971 to 1975, Nigeria's economy recorded an average growth rate of 5.8%. Within the same period, international trade contributed 31.9% to GDP. The country's average growth rate then fell to 4.1% over the period 1976 to 1980. This notwithstanding, international trade contributed above 41.5% to GDP over the same period. Afterwards, the economy recorded negative growth rates in the first half of the 1980s with an average of -2.6% as the contribution of international trade to GDP also decreased to 32.5%. The economy began to recover in the second half of the 1980s with an average growth rate of 1.5%. Within the same period international trade contributed 42.8% to GDP. In the 1990s, the growth rate only averaged at 2.6% while the country's international trade contribution to GDP averaged 60%. From 2000 to 2015, Nigeria's average economic growth rate and trade performance reached 7.5% and 54.4%, respectively. However, by 2016 the economic growth rate declined to -1.6% as the contribution of international trade in GDP also fell to 11.2% (World Development Indicators, 2018).

From the forgoing, while Nigeria's trade policy over the years has consistently tilted towards openness the country's economic performance has oscillated. Against this backdrop, this article sets out to empirically examine the effects of trade openness on economic growth in Nigeria towards unravelling whether the trade-led growth hypothesis holds for the country. Although empirical studies on the relationship between trade openness and economic growth in Nigeria abound, there is no consensus on whether greater openness to trade stimulates economic growth. Moreover, in majority of the studies, the role of capital and labour is conspicuously omitted from the trade-growth nexus. This article incorporates these variables by constructing a framework based on the neoclassical growth accounting model; thus, providing a robust new finding for Nigeria in this area of economic discuss.

The discussion therein have been structured into six sections. Following the section on introduction section II presents the theoretical framework upon which the article was based on. Section III reviews related literature and Section IV discusses the type and sources of the data used and the outline of the estimation procedure implemented. Section V focuses on the empirical analysis and discussion of the results obtained while Section VI concludes the paper.

THEORETICAL FRAMEWORK

The analysis in this article is based on the neoclassical growth model and the neoclassical trade theory. Assuming the output function in the economy is represented by the following equation:

$$Y = A(t)f(K,L) \quad \text{.....(1)}$$

where Y represents output and *A(t)* stands for all the influences that go into determining Y besides labour *(L)* and capital *(K)* inputs. Changes in *A* over time represents technological progress.

To provide the theoretical explanation for economic growth resulting from trade openness, the article relied on neoclassical theory of trade which states that an economy's output growth will be enhanced upon with freer trade. Hence, the production function in equation 1 is extended by assuming that technological progress can be influenced by trade openness. Therefore, *A* can be specified as follows:

$$A = \emptyset(OP,Z) \quad \text{.....(2)}$$

where *OP* represents trade openness and *Z* stands for other factors that may influence the state of technology. Therefore, taking the total derivative of equation 1with respect to time *(t)* yields:

$$\frac{dY}{dt} = \frac{dZ}{dt}f(K,L,OP) + Z\frac{df(K,L,OP)}{dt} = \frac{dA}{dt}\frac{Y}{Z} + \frac{Y}{f(K,L,OP)}\left(\frac{\partial f}{\partial K}\frac{dK}{dt} + \frac{\partial f}{\partial L}\frac{dL}{dt} + \frac{\partial f}{\partial OP}\frac{dOP}{dt}\right) \quad (3)$$

Dividing equation 3 by Y yields:

$$\frac{\frac{dY}{dt}}{Y} = \frac{\frac{dZ}{dt}}{Z} + \frac{\frac{\partial f}{\partial K}}{f(K,L,OP)}\frac{dK}{dt} + \frac{\frac{\partial f}{\partial L}}{f(K,L,OP)}\frac{dL}{dt} + \frac{\frac{\partial f}{\partial OP}}{f(K,L,OP)}\frac{dOP}{dt} \quad (4)$$

If we denote the rate of growth of output per unit of time $(\frac{\frac{dY}{dt}}{Y})$ by g_y the rate of growth of capital per unit of time $\left(\frac{\frac{dK}{dt}}{K}\right)$ by g_K, the rate of growth of labour per unit of time $(\frac{\frac{dL}{dt}}{L})$

by g_L, and the rate of growth of trade openness per unit of time ($\frac{\frac{dOP}{dt}}{OP}$) by g_{OP}, then equation 4 can be rewritten as:

$$g_Y = g_Z + \frac{\partial f}{\partial K}\frac{K}{f(K,L,OP)}g_K + \frac{\partial f}{\partial L}\frac{L}{f(K,L,OP)}g_L + \frac{\partial f}{\partial OP}\frac{L}{f(K,L,OP)}g_{OP} \quad (5)$$

But, $\frac{\partial f}{\partial K}\frac{K}{f(K,L,OP)} = \frac{\partial Y}{\partial K}\frac{K}{Y}$, $\frac{\partial f}{\partial L}\frac{L}{f(K,L,OP)} = \frac{\partial Y}{\partial L}\frac{L}{Y}$ and $\frac{\partial f}{\partial OP}\frac{OP}{f(K,L,OP)} = \frac{\partial Y}{\partial OP}\frac{OP}{Y}$ (6)

Equation 6 shows the elasticities of output with respect capital, labour and trade openness respectively. Denoting e_{yk} as the elasticity of output with respect to capital input, e_{yl} as the elasticity of output with respect to labour input and e_{yop} as the elasticity of output with respect to the trade openness index, equation 6 can be rewritten as:

$$g_Y = g_Z + e_{yk}g_K + e_{yl}g_L + e_{yop}g_{OP} + \varepsilon \quad (7)$$

where ε is a white noise. Equation 7 is the basic growth accounting equation which shows that growth in output can be accounted for by growth in capital (g_K), growth in labour input (g_L), growth in trade openness (g_{OP}) and other residual growth that represents technological progress (g_Z).

LITERATURE REVIEW

The relationship between trade openness on the one hand, and economic growth on the other, is one of the main puzzles in economics as noconsensus has been reached on whether or not trade openness improves economic growth. A number of empirical studies have established a relationship between trade openness and economic growth. While some of the studies suggest positive effects o trade openness and economic growth others hold that trade openness does not have any significant effect on growth. For instance, Lee (1993) combining an index of trade policy with a measure of openness found a negative relationship between trade openness and growth. On the contrary, Sachs and Warner (1995) provided evidence suggesting that countries that have applied market reforms would experience higher economic growth rates. They put forward that even though trade openness is just one of the stages of market reform process, it can be considered to be a measure that can be used as a proxy for the overall reform programme.

Frankel and Romer (1999) also subscribed to the notion that openness to trade is a crucial determinant of economic growth. They used geographical characteristics to explain that distance among countries plays a significant role in determining the amount of trade. The geographical characteristics considered encompassed

countries' size, distance among countries and existence of common borders. They also used the ratio of exports plus imports to GDP to measure openness. Their findings were that countries which were open to foreign markets because of favourable geographical characteristics had higher economic growth rates.

Dollar and Kraay (2004) employing a sample of sixty eight (68) countries sought to establish the relationship between per capita output and trade openness. They categorized the countries according to the increase of each country's trade to GDP ratio. Twenty four (24) of the countries that reduced their tariffs by up to twenty two (22) per cent had their trade to GDP ratio doubled. On the contrary, the remaining forty four (44) countries that applied smaller reductions in their tariffs experienced lower trade to GDP ratios.

Other studies involving sub-Saharan Africa include those of Olufemi (2004), Nduka (2013), Ademola, Olusuyi, Ibiyemi and Babatunde (2013), Ehinomen and Da'silva (2014), Olasode, Raji, Adedoyin and Ademola (2015), and Keho (2017). Olufemi (2004) examined the causality between openness and economic growth in Nigeria using time series data for the period 1970 – 2000. Employing co-integration and Vector Error Correction Model (VECM) methods the study found only a unidirectional causality from trade openness to economic growth. Nduka (2013) estimated the relationship between trade openness and economic growth in Nigeria for the period 1970 – 2008. The study found significant positive effects of trade openness on economic growth.

Unlike Olufemi (2004) and Nduka (2013), Ademola, et al. (2013) in a similar study for Nigeria spanning the period 1981 – 2009 could not support the notion that trade openness affects economic growth. They found no significant effects of trade openness on growth. However, Ehinomen and Da'silva (2014), in their analysis of the relationship between trade openness and output growth in Nigeria, obtained results indicating that openness to trade enhances growth. Similarly, Olasode, et al. (2015) investigated the impact of trade openness on economic growth in Nigeria. Using data from 1981 to 2012, they obtained results suggesting a positive impact of trade openness on economic growth in Nigeria. Likewise, Keho (2017) examined the impact of trade openness on economic growth for Cote d'Ivoire over the period 1965 – 2014. Employing a multivariate time series methodology, the study found that trade openness has positive effects on economic growth both in the short and long run. Keho (2017) thus concluded that the trade-led growth hypothesis validly applies in the case of Cote d'Ivoire.

DATA AND ESTIMATION PROCEDURE

The analysis in this paper made use of secondary data collected from the International Monetary Fund's International Financial Statistics (IFS) and the World Bank's World Development Indicators (WDI). Time series data on values of capital

formation, imports and exports were obtained from the IFS. Wage employment recorded in numbers, value of nominal GDP and GDP price deflator were sourced from the WDI. To account for price fluctuations in the data all variables recorded in monetary units were deflated to remove the price effect in each period. Furthermore, given that the growth accounting model explains output growth patterns resulting from the growth in factors of production, a log transformation of both the dependent and independent variables was carried out.

To achieve the objective of this paper, equation 7 was estimated. However, before the estimation, the variables were checked for stationarity. This was done to ensure that the appropriate estimation procedure was followed. Then, to validate the results that were obtained, diagnostic tests appropriate for time series analysis were conducted. These included the Jarque-Bera test for normality, the Breusch-Godfrey Serial Correlation LM test, the Breusch-Pagan-Godfrey Heteroscedasticity and the Ramsey RESET test for stability. In the end, the effect of trade openness on economic growth in Nigeria was determined by the sign and magnitude of the coefficientand level of significance of the trade openness variable in the estimated equation following the ARDL cointegration estimation method.

EMPIRICAL FINDINGS

Descriptive Statistics

Table 1 presents a summary statistics of the variables employed in the estimations that follow.

Table 1: Descriptive Statistics

	Variables			
	ln RGDP	**ln CAPF**	**ln WAGEE**	**ln OPEN**
Mean	27.0785	23.0830	17.2488	0.3999
Maximum	27.7292	24.7805	17.8647	4.1246
Minimum	26.1760	20.2253	16.4931	-6.2511
St. Dev.	0.4695	1.4278	0.3855	3.1583
Skewness	0.5939	0.1517	0.2319	0.1475
Kurtosis	2.1931	2.3078	2.0039	1.7439
Jarque-Bera	4.0378	1.1186	2.3642	3.2599
Probability	0.1328	0.5716	0.3066	0.1959
No. of Obs.	47	47	47	47

Note: St. Dev. = Standard Deviation, No. of Obs. = Number of Observations

It can be observed from table 1 that the log of real GDP (RGDP) had an average of 27.08. The maximum value recorded for RGDP is 27.73 and a standard deviation of 0.47. The log of capital formation (CAPF) had a mean value of 23.08 and the deviation around the mean was 1.43. Log of wage employment (WAGEE) recorded

an average of 17.25 and a minimum value of 16.49. For log of trade openness (OPEN), the mean was 0.40 and a maximum value of 4.12. Furthermore, since the probability values of the Jarque-Bera statistic are greater than 0.05, the null hypothesis that the variables are normally distributed cannot not be rejected.

Unit Root Test Results

Prior to the estimations, it was necessary to determine the order of integration of the variables to be used. This is important because the ARDL bounds test requires the dependent variable to be stationary after first difference (integrated of order one, *I* (1)) If any of the variables is *I* (2)) the *F*-test from the bounds test will provide biased results (Pesaran, Shin & Smith, 2001). To check the order of integration, the Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) tests were conducted. The results from the tests are presented in table 2.

Table 2: Results of Unit Root Tests

Series	Level		First Difference	
	ADF	PP	ADF	PP
Log of RGDP	-2.2900	-2.4184	-5.9786	-5.9772
Log of CAPF	-2.0700	-2.0700	-6.9974	-6.9974
Log of WAGEE	2.8201	-4.4847	-5.6826	-6.3395
Log of OPEN	-1.4445	-1.4500	-6.3418	-6.3446

Note: 5% critical values are for both the ADF and PP tests is -2.93

The null hypothesis of the tests has it that a particular series has unit root. The null hypothesis is only rejected when the test statistic is less than the critical value. Hence, from table 2, the logs of real GDP, capital formation and trade openness are non-stationary at levels since their corresponding test statistics are greater than -2.93. The three series only achieved stationarity after being differenced once. On the other hand, the log of wage employment was stationary at levels under the PP test. Given that the log of real GDP is *I* (1) and the regressors are either I (0) or I (1) there is the possibility of a long run relationship among the variables. To establish whether such a long run relationship exists, the ARDL Bounds test was carried out and the results presented in table 3.

Table 3: Result of the ARDL Cointegration Test

ARDL Bounds Test			
***F*-statistic**	**Critical values**		
	Significance	Lower bounds I(0)	Upper bounds I(1)
8.8113	5%	3.23	4.35
	10%	2.72	3.77
Diagnostic Tests			
Test	***F*-statistic**	**Probability**	
Breusch-Godfrey Serial Correlation LM Test	3.3275	0.0767	
Breusch-Pagan-Godfrey Heteroskedasticity Test	0.8819	0.5409	
Ramsey RESET Test	3.6379	0.0647	

Note: Lag length on each variable is selected using the Akaike information criterion (AIC) and Schwarz criterion (SC), maximum lag was set to 5. Critical values are generated under the model with unrestricted intercept and no trend.

Before the result of the ARDL cointegration test was interpreted, the model was evaluated for serial correlation, heteroskedasticity and stability. From the lower part of table 3, it can be observed that the probability values for the Breusch-Godfrey Serial Correlation LM test and Breusch-Pagan-Godfrey Heteroskedasticity test are greater than 0.05 Thus, the null hypotheses of no serial correlation and homoscedasticity were not rejected. Also, the probability value (0.06) of the Ramsey RESET test for stability is greater than 0.05 hence, we fail to reject the null hypothesis that the model is correctly specified. The result of the Cumulative Sum of Recursive Residuals presented in figure A1 in the appendix corroborates the result of the Ramsey RESET test for stability.

The null hypothesis of the ARDL bounds test is that there is no long run relationship (cointegration) among the variables. Given that the computed F-statistic (8.81) of the ARDL bounds test is greater than the upper critical value (4.35) at 5 per cent level of significance, the null hypothesis is rejected. This implies that there is cointegration among growth in real GDP as the dependent variable and growth in capital formation, wage employment and trade openness. Hence, we can further estimate both the long-run and short-run effects of the independent variables on the dependent variable. The result of the long-run effects of capital formation, wage employment, and trade openness on economic growth are as presented in table 4.

Table 4: Long-run Estimates of the ARDL Model

	Dependent Variable: Log of Real GDP	
Independent Variable	**Coefficient**	**t-statistic**
Log of Capital Formation	0.0801	1.0442
Log of Wage Employment	1.7732*	2.1860
Log of Trade Openness	-0.2462*	-2.3000
Constant	5.5506	0.3901
Number of Observations	47	

** significant at 5% level.*

Only the estimated coefficients of the log of wage employment and log of trade openness are statistically significant. However, whereas the coefficient of the log of wage employment has a positive sign, that of the log of trade openness, contrary to expectation, has a negative sign. The results show that holding other variables constant, a 1% increase in wage employment will yield a 1.77% increase in real GDP. On the other hand, if all things remain the same, a 1% rise in trade openness would cause a reduction in real GDP equal to 0.2%. This finding invalidates the trade-led growth hypothesis that suggests expansion of trade increases the level of economic growth. For the short-run dynamics of the effects of capital formation, wage employment and trade openness on economic growth, the results are as shown in table 5.

Table 5: Results of the Short-run Estimation

Independent Variable	Dependent Variable: Δ(Log of Real GDP)	
	Coefficient	t-statistic
Δ(Log of Capital Formation)	0.0274	0.3386
Δ(Log of Wage Employment)	3.0428	0.4718
Δ(Log of Trade Openness)	0.0023	0.0154
Constant	0.0832	0.4124
ECT(-1)	0.2343*	2.1615
Number of Observations	45	

** significant at 5% level.*

From table 5, the elasticities of output with respect to the independent variables in the short-run are all not statistically significant. Thus, in the short-run, capital formation, wage employment and trade openness do not contribute to economic growth. Nonetheless, the coefficient of the error correction term (ECT) is significant and it has the correct sign. This supports the finding of a stable long-run relationship among the variables. Therefore, it can be noted that the system adjusts towards long run equilibrium at the speed of 23.43%.

Overall, the results show that trade openness impedes economic growth in Nigeria. The finding invalidates the trade-led growth hypothesis in the long-run. This finding contradicts those of Olufemi (2004), Nduka (2013), Ehinomen and Da'silva (2014), Olasode, et al. (2015) and Keho (2017), but concurs with those of Lee (1993) and Ademola, et al. (2013). It is noteworthy that majority of the studies did not include capital and labour as explanatory variables in their analysis Thus, their findings may have been subjected to misspecification bias. Another plausible explanation for the current finding would be the structure of the economy of Nigeria. The country relies largely on crude oil exports; the sector accounts for about 70 per cent of Nigeria's export earnings. This scenario has possibly led to the decline of other productive sectors, thus, limiting the potentials of trade openness to spur growth in the economy.

CONCLUSION AND POLICY IMPLICATIONS

Findings from the paper revealed that there exists a long-run relationship between economic growth, capital formation, wage employment and trade openness. While the long-run effects of capital formation on economic growth was not significant, the effects of the other two variables were significant. However, wage employment and trade openness had contrasting effects on economic growth. Whereas growth in wage employment promoted economic growth, growth in trade openness impeded growth. Therefore, the result disputes the trade-led hypothesis.

Drawing from the aforementioned, a number of policy implications have been identified. First, measures that would generate employment should be considered by

the government towards increasing economic growth in the country. This should involve creating an enabling environment in which businesses would thrive. This way more labour would be engaged in productive activities and hence, growth would be enhanced. Second, it is imperative that caution be taken with regard to the pace of opening up of the economy to international trade. Nigeria exports mainly crude oil products in the international market. Over-reliance on this sector is risky and it is more so, given that the sector employs the use of capital intensive processes which do not support employment generation in the economy.For an outward-oriented policy to have a positive effect on Nigeria's economic growth, the country's trade composition should be modified from a crude oil exports dominant economy to one with high value-added exports.

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Appendix

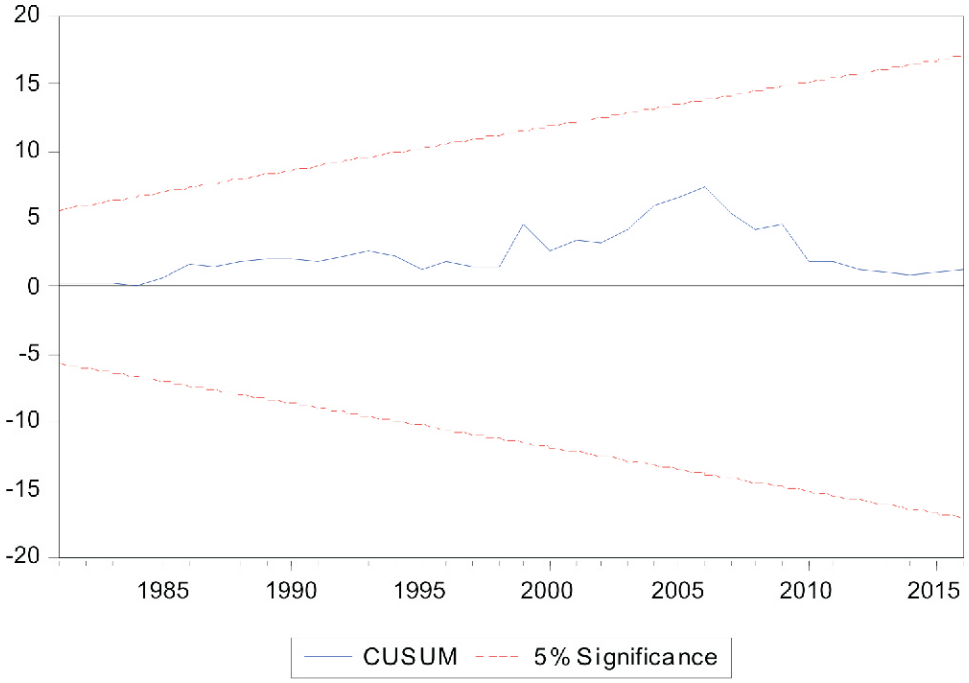

Figure A1: Cumulative Sum of Recursive Residuals for GDP equation

Table A1: Real GDP, Wage Employment, Index of Trade Openness and Capital Formation, 1970 – 2016.

Year	Real GDP (N)	Wage Employment	Idex of Trade Openess	Capital Formation (N)
1970	980,653,519,755	14,549,787	0.0019	882,700,000
1971	1,103,160,344,987	15,301,857	0.0025	1,283,000,000
1972	1,022,771,586,883	16,053,927	0.0027	1,401,000,000
1973	1,023,217,444,413	16,805,997	0.0041	2,506,000,000
1974	757,001,515,931	17,558,067	0.0120	2,956,000,000
1975	567,286,478,580	18,310,137	0.0181	5,020,000,000
1976	550,695,221,283	19,062,207	0.0237	8,107,000,000
1977	542,602,385,969	19,814,277	0.0310	9,421,000,000
1978	442,302,296,822	20,566,347	0.0382	9,386,000,000
1979	402,695,594,142	21,318,417	0.0478	9,095,000,000
1980	337,904,164,332	22,070,487	0.0768	10,980,000,000
1981	279,946,975,212	22,822,557	0.0892	13,320,000,000
1982	288,087,234,697	23,574,627	0.0703	10,870,000,000
1983	258,625,025,563	24,326,697	0.0588	8,925,000,000
1984	236,722,471,332	25,078,767	0.0618	6,577,000,000
1985	283,291,022,741	25,830,837	0.0648	6,020,000,000
1986	454,565,200,089	26,582,907	0.0379	7,323,000,000
1987	554,732,965,587	27,334,977	0.0838	10,660,000,000
1988	548,281,496,803	28,087,047	0.0919	12,380,000,000
1989	653,313,620,311	28,839,117	0.2027	18,410,000,000
1990	735,736,665,393	29,591,187	0.2207	30,630,000,000
1991	766,467,622,671	30,343,257	0.2687	35,420,000,000
1992	799,569,031,720	31,110,398	0.4097	58,640,000,000
1993	825,504,336,910	31,890,084	0.4874	80,950,000,000
1994	633,844,676,977	32,702,474	0.6112	85,020,000,000
1995	295,200,100,545	33,550,648	3.9330	114,500,000,000
1996	233,402,374,563	34,358,961	6.7062	172,100,000,000
1997	237,553,988,159	35,213,877	9.1237	205,600,000,000
1998	258,659,368,272	36,103,052	6.8871	193,000,000,000
1999	936,753,967,364	37,044,267	2.5382	176,300,000,000
2000	803,499,496,299	37,986,000	4.8021	268,900,000,000
2001	920,561,397,058	38,932,683	4.3632	372,100,000,000
2002	740,321,503,392	39,925,510	6.1029	499,700,000,000
2003	787,778,463,667	40,906,807	8.3477	865,900,000,000
2004	1,085,139,440,019	41,748,447	5.2119	1,382,000,000,000
2005	908,742,700,817	42,853,734	8.2289	61,160,000,000
2006	821,315,326,946	43,907,799	15.3534	81,420,000,000
2007	818,935,767,539	45,036,274	16.3790	107,700,000,000
2008	739,880,935,436	46,230,555	21.5603	90,910,000,000
2009	1,038,660,430,341	47,480,439	14.8555	160,800,000,000
2010	554,693,595,266	48,780,752	42.6514	91,830,000,000
2011	543,875,191,416	50,068,829	61.8467	78,760,000,000
2012	531,300,321,497	51,415,818	60.6433	75,670,000,000
2013	528,265,182,859	52,823,715	47.5785	77,000,000,000
2014	540,812,985,858	54,261,143	46.0322	84,110,000,000
2015	655,056,129,127	55,789,427	42.3153	97,930,000,000
2016	588,317,635,839	57,352,349	38.5985	111,800,000,000

THE EFFECT OF GOVERNMENT EXPENDITURE ON THE PROFITABILITY OF MANUFACTURING INDUSTRY IN NIGERIA

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&

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ABSTRACT

This study empirically analysed the relationship between government expenditure and profitability of the manufacturing industry in Nigeria over the years, using time series data from 1980 to 2017 sourced from the Central bank of Nigeria. It applied the Augmented Dickey Fuller unit root test and Autoregressive Distributed Lag (ARDL) co integration, relying on the theoretical backing posited by Solow. Empirical findings signify the robustness of this paper. It was found that an insignificant negative impact relationship exists between government expenditure and the manufacturing industry of Nigeria. The study recommends that for any nation to grow and develop its economy, the expenditure on the manufacturing sector should not be underestimated. Thus, by all available means, the government should improve and encourage the output of the manufacturing sector through the provision of infrastructural facilities that will lower the cost of production of the industry. As part of recommendations, government should improve and encourage manufacturing outputs and improve its expenditure in the manufacturing sector as this will provide the bedrock for economic growth which is badly needed.

Keywords: Government Expenditure, Profitability of Manufacturing industry, Unit Root.

INTRODUCTION

For decades, studies by Alexiou (2009), Okoro (2013) Emerenini and Ihugba (2014), and Nasiru (2012) have been interested in how government expenditure influences entrepreneurship turnover. Until now, research has focused on fiscal policy at the federal level and used macroeconomic outcome measures. Considerably less attention was given to how state and local governments can influence economic outcomes at the micro level. At the micro-level, profitability is more likely to help

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firms to survive, grow, gain competitive power, and reduce external funding needs. In addition to this, profitability, which is one of the most essential performance indicators for all the stakeholders, shows the success of the firm management by affecting firms' decisions concerning savings and investment (Al-Jafariand Al Samman, 2015; Menicucciand Paolucci, 2016; Akben-Selcuk, 2016). Accordingly, exploring the drivers which influence the profitability of publicly traded manufacturing firms in Nigeria is of great importance at both the macro-level and the micro-level.

Industrialization acts as the catalyst that accelerates the pace of structural transformation and diversification of the economy, enabling the country to fully utilize its factor endowment, depending less on foreign supply of finished goods or raw materials for its economic growth, development and sustainability (Ademola, 2012). The contribution of the manufacturing industry of the economy cannot be over emphasized considering its role in building grounds for development, its employment potentials and financial impact on the economy. Apart from laying a solid foundation for the economy, it also serves as import substituting industry, providing ready market for intermediate goods. The manufacturing industry contributes significantly to the nation's economic development by increasing government revenue through tax, improving the standard of living, infrastructural growth, contribution to Gross National Product (GNP), employment generation, and enhancement of manpower development (Adegbite, 2004).

It has been argued that the faster path through which a nation can achieve sustainable economic growth and development is neither by the level of its endowed material resources, nor that of its vast human resources, but technological innovation, enterprise development and industrial capacity. In Nigeria, the downturn of the global oil market of the early 1970s, 1980s, 2008, and 2015, as well as the sharp decline in foreign exchange earnings and government revenue coupled with the global financial crisis that rocked the world economies have adversely affected profitability of manufacturing industries. Problems peculiar to the Nigerian economy include; excessive dependence on imports for consumption and capital goods, dysfunctional social and economic infrastructure, unprecedented fall in capacity utilization and neglect of the agricultural sector, among others. These have resulted in fallen incomes and devalued standards of living amongst Nigerians (Anyanwu, 2004). Although the structural adjustment programme (SAP) was introduced in 1986 to address some of these problems, no notable improvement has been achieved. Despite the measures adopted by Nigeria to mitigate the effects of SAP, the country is still ranked among the poorest nations in the world as revealed by human development indices.

The factors explaining manufacturing firm profitability for Italy, Switzerland, and Sweden during the period 2003-2011 are studied by Hatem (2014). The empirical findings based on static panel estimation method indicate that profitability of manufacturing firms is positively and significantly associated with growth opportunities for all three countries. Only in the Swedish manufacturing industry, firm size affects profitability positively, whereas firm age influences profitability negatively. The research, therefore, is motivated by the need to cover certain gaps that have been identified from the previous literature reviewed. These include a review of the current relationship between government expenditure and profitability of manufacturing industries in Nigeria up to 2017 in order to add to the debate on the direction and significance of the relationship between the variables as no study has so far gone beyond 2016. Also, the manufacturing output (that is output of manufacturing industries) of Nigeria during the 37-year period under study shall be included in the empirical model to ascertain the degree of the relationship. This is because manufacturing output is one of the critical components that determine the profit of the sector and this has not been captured in the empirical analysis of any study conducted so far in Nigeria. It has also been observed from the literature reviewed that only very few studies used the ARDL methodology that this research has adopted.

Therefore, this study differs from the previous research in several ways. First, the scope of this study will cover up to 2017. Secondly, this study adopts the most robust technique of ARDL bound test modelling technique to find the relationship of the study. Also, the study is different from others in terms of the variables employed. These are the gaps the study intends to fill. In view of this, the objective of this study is to empirically analyse the relationship between government expenditure and profitability of manufacturing industries in Nigeria.

The paper is organized into five sections, given the introduction as section one. The rest of the paper is organized as follows: Section two presents the literature review and theoretical framework. Section three serves as the methodology adopted for this study. Presentation and analysis of results is in section four, while conclusion and recommendation are contained in section five.

LITERATURE REVIEW

On empirical ground, there are mixed findings on the impact of government expenditure on growth. Several empirical studies are country-specific, using time series data across several years, while others are cross-country, utilizing panel or cross sectional data. Numerous studies have been conducted to examine the relationship between government expenditure and profitability of manufacturing industries for a long period. While some have confirmed the existence of positive and

significant relationship between government expenditure and profitability of manufacturing industries, others revealed evidence of a negative relationship hence giving a stance to the positive relationship hypothesis (Çakir and Küçükkaplan, 2012; Akben-Selcuk, 2016; Eedes, 2003; Dipak and Ata, 2003). On the other hand, some studies provide evidence in support of the negative relationship between the two series (Enebong, 2003; Martínez, Stöhr, and Quiroga, 2007). This might be as a result of the scope of the study, the country being studied, the econometric methodology and models used in the studies.

Starting with the work of Aschauer (1989) who found that national public infrastructure had an enormous impact on private sector performance, the surprising magnitude of his results fostered research on the economic effect of public spending, not only at the national, but also at local levels. Munnell (1992) and Munnell and Cook (1990), for example found positive effects on state-level output, but they argued that the effect of public capital diminishes if the geographic area narrows. Indeed, small regions cannot capture all the benefits of the infrastructure investment because of leakages. Their findings were corroborated by Berechman, Ozmen and Ozbay (2006). It is generally found that local public spending has a positive economic effect. Three specific types of local spending have been considered as productive (Brülhart, Jametti, &Schmidheiny, 2012) and are often encountered in the literature (Fisher, 1997), that is, spending on education, highways and safety. These spending categories are said to improve firm productivity. Firms in the hospitality industry can also benefit from local spending, since it can serve as an input in the service process, and enhance the attractiveness of the region for customers and they can improve the quality of life. Therefore, a region can become more attractive for tourism, which may in turn heighten demand and hence positively affect firm profitability.

In Nigeria, there is controversy as to the role of government expenditure on economic growth. For instance, Omitogun and Ayinla (2007) attempted to establish whether there is a link between fiscal policy and economic growth in Nigeria using the Solow growth model estimated with the use of ordinary least squares (OLS) method. It was found that fiscal policy has not been effective in the area of promoting sustainable economic growth in Nigeria. Nurudeen and Usman (2010) analysed the impact of government expenditure on economic growth in Nigeria and found that government total capital expenditure has negative effect on economic growth. Also, comparing the relative effectiveness of fiscal versus monetary policies on economic growth in Nigeria, Adefeso and Mobolaji (2010) suggested that the effect of monetary policy is more prominent than fiscal policy on economic growth in Nigeria.

Ighodaro and Okiakhi (2010) disaggregated government expenditure into general administration, and community and social services in examining the effect of government expenditure on economic growth in Nigeria using time series data. They found that both components of government expenditure have negative impact on economic growth.

Ekpo (1995) found that capital expenditure on transport, communication, agriculture, health and education positively influenced private investment in Nigeria, which invariably enhanced the growth of the overall economy. In the same vein Ogbole, Sonny and Isaac (2011) focussed on the comparative analysis of the impact of fiscal policy on economic activities in Nigeria during regulation and deregulation, using the econometric methods of cointegration and error correction model. The study indicated that there is a difference in the effectiveness of fiscal policy in stimulating economic growth during and after regulation period. They recommended that government fiscal policy should focus more on redirecting government expenditure towards production of goods and services so as to enhance GDP growth.

On the issue of manufacturing sector development in Nigeria, Ajayi (2011), in a study of the collapse of Nigeria's manufacturing sector in Nigeria, used cross-sectional research design and found out that the main cause of collapse in the Nigerian manufacturing sector is as a result of low implementation of Nigerian budget especially in the area of infrastructure. This means that low implementation of fiscal policy affects the level of growth in this sector. In the same vein, Rasheed (2010) investigated the productivity in the Nigerian manufacturing subsector using cointegration technique and an error correction model. The study indicated the presence of a long-run equilibrium relationship index for manufacturing production. Determinants of productivity include; economic growth, interest rate spread, bank credit to the manufacturing subsector, inflation rates, foreign direct investment, exchange rate and employment rate.

Sangosanya (2011) used panel regression analysis model and Gibrat's law of proportionate effect in investigating firm growth dynamics in the Nigerian manufacturing industry. The study observed that the manufacturing firm's finance mix, utilization of assets to generate more sales, abundance of funds reserve and government policies are significant determinants of manufacturing industry growth in Nigeria.

Dipak and Ata (2003) summed up the economic scenario on the role of the manufacturing sector by identifying the main hurdles that mostly and historically affect its development and growth. These barriers include insecurity, political instability, market-distorting state-owned monopolies, weak infrastructure and unavailability of finance while Adenikinju (2003) added excessive bureaucracy and rampant corruption.

In Turkey, Çakir and Küçükkaplan (2012) estimated the determinants of the profitability of 122 manufacturing firms quoted in Borsa İstanbul by using panel data analysis for the 2000-2009 period. In their study, they concluded that higher current ratio and higher leverage ratio are associated with lower profitability. On the other hand, stock turnover, asset turnover, and quick ratio had a positive impact on the profitability of quoted manufacturing firms.

Financial determinants of profitability of 78 manufacturing firms for the period 2000-2011 in Turkey were explored by Korkmaz and Karaca (2014) by using panel data analyses. Based on their findings, they concluded that tangible asset-to-long-term liabilities ratio, debt-to-total asset ratio, net sales-to-current asset ratio, and fixed asset-to-total asset ratio are the main financial ratios affecting return on assets. The factors affecting profitability of all Turkish publicly quoted firms during 2005-2014 were explored by Akben-Selcuk (2016). Based on the result of panel data analysis, she concluded that firms' return on asset is negatively related to financial risk and research and development costs but positively related to growth, level of liquidity, international sales and size.

On a sample of 15 listed industry firms in Turkey in the years between 1997 and 2013, Kocaman, Altemur, and Aldemir (2016) tried to identify the factors affecting the profitability by employing fixed effects panel data model. Econometric results show that while profitability is positively and significantly associated with net profit margin and receivables turnover, it is negatively and significantly correlated with financial leverage and asset tangibility.

In another study, using a sample of 136 Turkish manufacturing firms traded on the Borsa Istanbul Stock Exchange during 2005-2012, Doğan and Topal (2016) examined the factors explaining the profitability. Estimation results obtained from pooled OLS regression analysis suggest that firm size is positively associated with return on asset, whereas financial risk is negatively connected to return on asset. However, the effect of firm age and liquidity level is trivial.

With the aim of assessing the profitability determinants of 11,682 firms operating in manufacturing and service sector during 1993-2001, Goddard, Tavakoli, and Wilson (2005) considered a panel data of 5 European countries (France, Italy, Spain, Belgium, and the UK). Their dynamic panel data results show that while gearing ratio and size of firm in terms of total assets had a negative impact on profitability measured by return on asset, the variables like past profitability, liquidity level, and market share had a positive effect on profitability.

Using a sample of 175 listed firms in Chile during the period of 1995-2004, Martínez, Stöhr, and Quiroga (2007) examined the impact of selected firm characteristics on firm profitability by using ordinary least square method. They concluded that while larger size significantly increases the profitability, the variables such as debt ratio and firm age are negatively and significantly associated with the profitability variable.

METHODOLOGY

In most empirical works on the issue of public expenditure, profitability of manufacturing sector or manufacturing sector growth is regarded as an integral part of economic growth and it is viewed as a long run phenomenon. The paper adapts a modified version of Emmanuel and Oladiran (2015) and Devarajan, et al, (1996) using profitability of manufacturing industry as dependent variable, while government expenditure (X) is explanatory variables. The control variable is the RGDP. The model specified for the study is expressed as:

PMI = f (GEXP, GDP) ……………………………………..,. (1)

The analysis of the data has been done using the EVIEWS 9 econometric package.

ADF Unit Root Test

Consider a variable Y that has unit root represented by a first-order autoregressive AR (1):

$$\text{fl}\, Y_t = a + \beta Y_{t-1} + \sum_{j=i}^{p} y_j + \Delta Y_{t-j} + \text{fl}_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (2)$$

$$\text{fl}\, Y_t = a + \beta T + \text{fl} y_{t-1} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (3)$$

Where α and β are parameters, εt is assumed to be a white noise, ΔY_{t-j} expresses the first difference of the variable with p lag, $\Delta Y_t = Y_t - Y_{t-1}$. Y is a stationary series if $-1 < p < 1$. If p =1, y is a non-stationary series; if the process is started at some point, the variance of y increases steadily with time and goes to infinity. If the absolute value of p is greater than one, the series is explosive.

Cointegration – ARDL-Bounds Testing Procedure

In this regard, by applying the model suggested by Pesaran et al. (2001) the recently developed Autoregressive Distributed Lag (ARDL)-Bounds testing approach is used to examine the relationship between government expenditure and profitability of manufacturing industries. The ARDL modelling approach was originally introduced by Pesaran and Shin (1999) and later extended by Pesaran et al. (2001).

$$\text{fl}LPMI_t = \alpha_o + \alpha_1 LPMI_{t-i} + \alpha_2 LGEXP_{t-i} + \alpha_3 LGDP_{t-i} + \text{fl}\, b_1 \text{fl} LPMI_{t-I} + \text{fl}\, b_2 \text{fl} LGEXP_{t-I} + \text{fl}\, b_3 \text{fl} LGDP_t + \psi ECM_{t-I+} \varepsilon_{t1} \ldots\ldots\ldots\ldots (4)$$

In the above equation, LPMI = natural logarithm of profitability of manufacturing industries, LGEXP = natural logarithm of government expenditure, LRGDP= natural logarithm value of real growth domestic product as a proxy for economic growth; α_0 = constant parameter, fl b_i= vector of the coefficients of the variables in the model, ε= the white noise error term and fl represents the flrst difference operator. The parameters bs are the short-run coefflcients and αs are the corresponding long-run multipliers of the underlying ARDL model.

The null hypothesis, $H_0 : \alpha_1 = \alpha_2 = \alpha_3 = 0$, indicates the absence of a long run relationship. The alternative hypothesisis $H_1: \alpha_1 \text{fl} \alpha_2 \text{fl} \alpha_3 \text{fl} 0$

PRESENTATION AND DISCUSSION OF RESULTS

The results presented in Table 1 clearly indicate that all series exhibit unit root property using ADF test statistics. They are I(1) and I(0) series and, therefore, achieve stationary at first difference using 1 per cent level of significance. The results imply that all series have to be differenced once in our models in order to avoid spurious results. However, first difference only account for short run relationship among series and this problem is addressed by investigating whether cointegration exists among the series. The unit root test is reported in table 1.

Table 1. ADF Unit Root Test Results of Nigeria's Annual Series (1980-2017)

Variables	Levels/ First Difference	ADF test statistic	
		Without trend	With trend
LPMI	Level	-0.38	-1.41
LGEXP	Level	-0.35	-2.25
LGDP	Level	-5.23*	-5.25*
ΔLPMI	First Diff	-5.69*	-5.64*
flLGEXP	First Diff	-7.23*	-7.09*
flLGDP	First Diff	-9.66*	-9.52*
Mac-Kinnon Critical Values			
1%		-3.83	-4.53
5%		-3.03	-3.67
10%		-2.66	-3.28

Note:* indicates level of significance at 1%, ** at 5% and *** at 10%.
Whereas fl is used as difference operator.

The unit root tests on the variables at their level and first difference values has been conducted and the degree of integration is confirmed through ADF test. The results of these tests are reported in Table 1. The results of ADF show that profitability of manufacturing industries and government expenditure indexes arenon-stationary at level values, while economic growth index was found to be stationary at 1% critical level. As stated earlier, it is necessary to first perform unit root tests on the variables in order to ensure that none of the variables is integrated of order two I(2) or beyond, therefore, ARDL bound cointegration analysis is justified. According to Kubalu, Mustapha & Muhammad (2016), in presence of I(2) variables the computed F-statistics of the bounds test are rendered invalid because they are based on the assumption that the variables are I(0) or I(1) or mutually cointegrated.

Cointegration Analysis of Human development/Economic growth

Having established the unit root properties of the variables, the combination of non-stationary variables could, however, be stationary if these series share a common long-run equilibrium relationship. In this case, these variables are said to be cointegrated. Thus, given the time series characteristics of the variables, this study investigated further, employing automatic inbuilt asymptotic critical values of F-statistics test at 10%, 5%, 2.5% and 1% in E-views, by comparing asymptotic lower critical bound I(0) and upper critical bound I(1) values using ARDL methodology proposed by Pesaran et al. (2001). Through the result of the Bounds F-Test for co-integration (that is, the existence of a long term linear relation) as shown in the table 2, cointegration is established.

Table 2 Bounds F-Test for Cointegration 1980-2017.

Variables	Function	F-Statistic
LPMI	FLPMI(LPMI|GEXP,LGDP)	3.985412*
Asymptotic critical value		
Significance	I(0) Bound	I(1) Bound
10%	2.63	3.35
5%	3.1	3.87
2.5%	3.55	4.38
1%	4.13	5

Source: Researchers' computation using EVIEWS 9 software.

*indicates the level of significance at 1%, ** 2.5%, ***5% and ****10%

The results of the bounds test for cointegration alongside critical values are reported in Table 2. The bounds test indicates that cointegration is only present when LPMI, which is proxy for natural logarithm of profitability of manufacturing industries,is the dependent variable and the long run forcing variables are government expenditure and LGDP, which is proxy for economic growth index.This is because the computed F-statistics FLPMI (LPMI| LGEXP, LGDP) is 3.99, which is higher than the upper bound critical value at 5% significance level, suggesting the rejection of the null hypothesis that there is no long run relationship between government expenditure and profitability of manufacturing industries.

Analysis of the impact of government expenditure on profitability of manufacturing industries (PMI)

Table 3 presents the coefficients/multipliers of GEXP on PMI. Having determined the existence of impact relationship when profitability of manufacturing industries proxy with PMI serves as dependent variable, the impact coefficients are estimated using the associated ARDL and ECM.

Table 3 Results of Estimated Impact Coefficients Using ARDL Approach.

Regressor	Coefficient	Std Error	T-Ratio	P-Value
Dependent variable; LPMI				
LGEXP	-2.158700	12.866322	-0.167779	0.8682
LGDP	3.966345	20.278201	0.195597	0.8466

Source: Researchers' computation using EVIEWS 9 software.

*indicates the level of significance at 1%, **5% and ***10%

The ARDL model is estimated by automatic selection of maximum lag length of 4 and using Akaike information criteria in selecting the optimum lag order for the model. The specification finally selected is ARDL (1, 3, 4) and the derived impact elasticities are presented in Table 3. The long run impact of government expenditure on profitability of manufacturing industries is around -2.158700 and is statistically non significant, meaning that a decrease in government expenditure index will decrease profitability of manufacturing industries by 2.15%. The impact of economic growth on profitability of manufacturing industries is 3.966345 and is also statistically non significant. Therefore, an increase in economic growth will increase profitability of manufacturing industries in Nigeria by 3.96%.

Impact of Government Expenditure on the Profitability of Manufacturing Industry in Nigeria.

The results of the short run dynamic coefficients associated with the long run relationships obtained from the cointegrated equation (error correction model) are presented in Table 4. The signs of the dynamic impacts are maintained to the long run.

Table 4 Error Correction Representation for the Selected ARDL Model.

Cointegrating Form

Regressor	Coefficient	Std Error	T-Ratio	P-Value
CointEq(-1)	-0.015419	0.003829	-4.026450	0.0005*
Cointeg = LPMI – (-2.1587*LGEXP + 3.9663*LGDP + 3.2780) ARDL Model Econometric Creteria: R^2 = 949182, Adjusted R^2 = 927087, DW = 1.915707, F -Stat = 42.95947, Prob F-stat = [0.000000]				

Source: Researchers' computation using EVIEWS 9 software.

*indicates the level of significance at 1%, **5% and ***10% .

From table 4, the error correction mechanism/term ECM(-1) estimated -0.015419 (0.0005) is highly significant, is well specified and has the correct sign, and implies a fairly high speed of adjustment to equilibrium after a shock. Meaning that about 1.5 percent departure from long run equilibrium is corrected in the short run. The negative sign in the ECM(-1) confirms the existence of co-integrating relationship. Approximately 2% of disequilibria from the previous year's shock converge back to the long run equilibrium in the current year. The R^2 (coefficient of determination) shows that 95% of the total variation in the dependent variable, profitability of manufacturing industry, can be explained by the explanatory variables, and the slight drop to about 93% after adjusting for degree of freedom is still significant. The Durbin-Watson statistic of 1.92 shows the absence of serial autocorrelation meaning that there is independence of observations in the error terms. The F-statistic reported in the lower panel of the table gives the goodness of fit of the model. The F-statistic is approximately 42.96 with a Probability of 0.000000. The significance of this value implies that the data used in the estimation fitted well into the regression equation, hence the model is adequate in explaining the impact relationship of Government Expenditure on the Profitability of Manufacturing Industry in Nigeria. That is, the independent variables jointly have a significant influence on the dependent variable.

CONCLUSION AND RECOMMENDATIONS

The main objective of the study is to empirically analyse the relationship between government expenditure and profitability of manufacturing industries in Nigeria using annual time series data over the period of 1980 to 2017. An ARDL-VECM bounds cointegration testing procedure that allows testing for a level relationship

irrespective of the order of integration of the underlying series has been applied on the data. The results of this study are found to be in line with past empirical research conducted on the subject matter in the context of other economies. It supports findings of a significant negative impact of government expenditure on profitability of manufacturing industries by confirming a negative relationship between government expenditure and measures of profitability of manufacturing industries. The existence of stable long-run relationship between government expenditure and profitability of manufacturing industries in Nigeria is confirmed through Bounds F-test. This result indicates that government expenditure can be treated as a long run forcing variable explaining profitability of manufacturing industries. This is contrary to studies conducted by Çakir and Küçükkaplan (2012), Akben-Selcuk (2016), Eedes (2003), and Dipak and Ata (2003). Again, this is contrary to studies found in the literature for the Nigerian economy, such as, Ighodaro and Okiakhi (2010) and Rasheed (2011), which suggest that government expenditure deepen profitability of manufacturing industries only if the government policy framework of infrastructural development is given more attention.

However, this study is consistent with the works of Enebong (2003), Martínez, Stöhr, and Quiroga (2007). This result is not surprising for the case of Nigeria mainly because of lower budgetary allocation for infrastructural facilities and poor quality of infrastructure. Thus, the long run negative impact of government expenditure on profitability of manufacturing industries in Nigeria is most likely to be as a result of low budgetary allocation by government.

The study, therefore, recommends that for any nation to grow and develop its economy, especially Nigeria, focused expenditure on the manufacturing sector should not be underestimated.Thus, by all available means, the government should improve and encourage the output of the manufacturing sector through the provision of infrastructural facilities that will lower the cost of production of the industries. Also, it is recommended that government should improve and encourage manufacturing outputs and improve its expenditure in the manufacturing sector geared towards economic growth and export beyond the oil sector.

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SHORT-TERM INFLATION RATE FORECASTING IN NIGERIA: AN AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) AND ARTIFICIAL NEURAL NETWORK (ANN) MODELS

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&

Paul Terhemba Iorember [2]

ABSTRACT

The trend of price movements in Nigeria has been a fluctuating one showing wide gaps between the target and actual rates of inflation. This development is not only worrisome but it also creates uncertainties in the economy, weakens investors' confidence and affects expectations which are mainly adaptive.This study, therefore, attempted a forecast of the short term inflation rate in Nigeria using the autoregressive integrated moving average (ARIMA) and the artificial neural network (ANN) models to forecast the monthly rate of inflation. The aim is to compare the predictive ability of the two forecasting models and conduct inflation forecast up to December, 2018. The study found that ANN has higher predictive or forecasting ability compared to ARIMA (1 1 1). Also, the results of the forecasted monthly inflation for 2018 showed that inflation rate will be slightly lower in the early months but, again, rise marginally in the later months. The study, therefore, recommends that monetary authorities should think in the direction of using Artificial Neural Networks (ANN) in conducting short-term inflation forecasts in Nigeria.

Keywords: Inflation, Forecast, ARIMA, Neural Network, Box-Jenkins
JEL CLASIFICATION: E31, C53, C89

INTRODUCTION

Price stability, as one of the key macroeconomic objectives of every nation, is the central function of monetary authorities the world over. This is due to the devastating effect of fluctuating prices on both aggregate demand and aggregate supply, which form the basis of every monetary policy. In Nigeria, the trend of price movements has been a fluctuating one, showing wide gaps between the target and actual rates of inflation. For example, the target inflation for 2014, 2015 and 2016 were 7.50%, 8.00% and 11.90%, respectively, while the actual inflations for the three years were 7.55%, 9.55% and 18.55%, respectively. This development is not only worrisome but also creates uncertainties in the economy, weakens investors'

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confidence and affects expectations, which are mainly adaptive. This is because, if workers expect a future rise in inflation, they are more likely to bargain for higher wages to compensate for increased cost of living. Similarly, if firms are expecting a rise in the cost of raw materials, they are more likely to increase prices of products to protect their profit margins. These, therefore, make accurate predictions imperative for necessary policy direction and economic adjustments.

Several researches have been conducted on inflation rate forecasts/predictions using various solution techniques over the years. These techniques are broadly grouped into statistical and soft computing techniques. Meyler, Kenny and Quinn, (1998) identified some of the statistical approaches to include autoregressive integrated moving average (ARIMA), also called the Box-Jenkins approach; generalized autoregressive conditional heteroskedasticity (GARCH) and several other ARCH-type models. However, the ARIMA model is most widely used. Its application is not embedded within any underlying economic theory or structural relationship; it essentially relies on past values of the series as well as previous error terms for forecasting (Tabachnick & Fidell, 2011; Meyler, et al, 1998). Similarly, the artificial neural network (ANN) is most common among other soft computing techniques and has been used extensively in areas such as Economics (Adebiyi, Adewumi & Ayo, 2014). ANN is a data-driven method with few restrictions or assumptions. The model has also been found to have high predictive accuracy (Nakamura, 2005). Also, ANN models have been found to be very efficient and effective in solving non-linear problems including those in the real world (Khashei & Bijari, 2010). This is in sharp contrast to the conventional approaches for time series predictions, such as ARIMA, which assumes that the series are generated from linear processes which may not always be true, and as such, might be inappropriate for most real-world problems that are nonlinear (Zhang, Patuwo & Hu, 1998; Khashei, Bijari & Ardali, 2009).

This study, therefore, attempted a forecast of the short-term inflation rate in Nigeria using ARIMA and ANN models to forecast the monthly rate of inflation. The aim is to compare the predictive ability of the two forecasting models and conduct inflation forecast up to December, 2018. This will guide inflation modelers and financial experts in making inflation rate predictions and forecasts decisions. It will also provide workers and firms with hints that will assist them in negotiating their wages and making product pricing decisions, respectively.

Therefore, to achieve this objective, the study has been organized into 5 sections with the introduction as section1. Section 2 is the literature review. Section 3 deals with the methodology of the study, sources of data and model specification. Section 4 is presentation of empirical results and discussion of findings. Section 5 is the concluding remarks and policy recommendations.

RELATED LITERATURE AND EMPIRICAL REVIEW

Literature is relatively scanty on inflation rate forecasts using ANN. Nakamura (2005) evaluates the usefulness of neural networks for inflation forecasting using U.S data. The study found ANN useful for inflation forecasting and that ANN model perform well relative to the autoregressive models. However, several empirical researches have been conducted in the area of short-term forecasting using ARIMA models. Akdogan, Beser, Chadwick, Ertug, Hulagu, Kosem, Ogunc, Ozmen, and Tekalti (2012) produced short-term forecasts for inflation in Turkey, using a large number of econometric models such as the univariate ARIMA models, decomposition based models, a Phillips curve motivated time varying parameter model, a suit of VAR and Bayesian VAR models and dynamic factor models. Their result suggests that the models, which incorporate more economic information, outperformed the random walk model at least up to two quarters ahead. Also, Ho and Xie (1998), using the ARIMA framework, concluded that the ARIMA model is a viable alternative that gives satisfactory results in terms of its predictive performance.

Alnaa and Ferdinand (2011) used ARIMA approach to estimate inflation in Ghana using monthly data from June 2000 to December 2010. They found that ARIMA (6,1,6) is best for forecasting inflation in Ghana. Also, Suleman and Sarpong (2012) employed an empirical approach to modelling monthly consumer price index (CPI) data in Ghana using the seasonal ARIMA model. Their result showed that ARIMA model was appropriate for modeling Ghana's inflation rate.

In Nigeria, Adebiyi, Adewumi and Ayo (2014) examined the different types of inflation forecasting models including ARIMA and showed that ARIMA model was modestly successful in explaining inflation dynamics in Nigeria. Similarly, Doguwa and Alade (2013) in a study on short-term inflation forecasting models for Nigeria using seasonal ARIMA (SARIMA) and SARIMAX found that the forecasting performance up to eight months ahead of the models based on the weighted sum of all items CPI components is relatively bad. For forecast of food inflation up to ten months ahead, SARIMA is recommended, but for eleven to twelve months ahead, the SARIMAX model performed better. However, the SARIMA model for core inflation consistently outperformed the SARIMAX model and should, therefore, be used to forecast core inflation.

METHODOLOGY

The study employed the methodologies of ARIMA and ANNs in forecasting short-term inflation rate in Nigeria. The ARIMA models have three model parameters, one for the AR(p) process, one for the I(d) process, and one for the MA(q) process, all combined and interacting among each other and recomposed into the ARIMA (p,d,q) model. The ARIMA models are applicable only to a differenced stationary data

series, where the mean, the variance, and the autocorrelation function remain constant through time. In the event a series is stationary in levels, the ARIMA model is reduced to ARMA. On the flip side, the Non-linear Autoregressive (NAR) Neural Network version of ANN that is based on the back-propagation and Levenberg-Marquardt algorithms was employed for the forecast.

Sources of Data

To set the platform for the forecast and comparison of the forecasting accuracy between the ARIMA and the ANN forecasting approaches, secondary data of monthly inflation was obtained from the Central Bank of Nigeria data portal. The sample covers from January 2007 to December 2017 (132 observations). The dataset is used for the estimation, prediction and as well used as holdout for the out of sample forecast.

Specifying the ARIMA Model

The ARIMA (p d q) approach combines two different specifications (called processes) into one equation. The first specification is an autoregressive process (hence the AR in ARIMA), and the second specification is a moving average (hence the MA in ARIMA).

An autoregressive (AR) model is one in which Y_t depends only on its lags or past values. That is, a *p*th-order autoregressive process expresses a dependent variable as a function of its own lags or past values, expressed as:

$$Y_t = \phi_0 + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + ... + \phi_p Y_{t-p} + \varepsilon_t \quad \text{.....} \quad (1)$$

Where

$Y_{t-1}, Y_{t-2}, ..., Y_{t-p}$ is the response variable at time $t-1, t-2, ..., t-p,$ respectively.

Y_t is the response (dependent) variable being forecast at time t

$\phi_1, \phi_2, ..., \phi_p$ are the parameter estimates

ε_t is the error term at time *t*

A moving average (MA) model is one in which Y_t depends only on the past values of the white noise disturbance (error) terms. That is, a q th-order moving-average process expresses a dependent variable *q* error terms, as in:

$$Y_t = \mu + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + ... + \theta_q \varepsilon_{t-q} \text{ ---------- } 2$$

Where

Y_t is the response (dependent) variable being forecasted at time t

μ is the constant mean of the process

$\theta_1, \theta_2, \ldots \theta_q$ are the estimated parameters.

$\varepsilon_{t-1}, \varepsilon_{t-2}, \ldots, \varepsilon_{t-q}$ are the errors in previous time periods.

To create an ARIMA model, we began with an econometric equation with no independent variables ($Y = \phi_0 + \varepsilon_t$) and added to it both the autoregressive (AR) process and the moving-average (MA) process.

$$Y_t = \varphi_0 + \underbrace{\varphi_1 Y_{t-1} + \varphi_2 Y_{t-2} + \ldots + \varphi_p Y_{t-1}}_{\textit{Autoregressive (AR)}} + \varepsilon_t + \underbrace{\theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \ldots + \theta_q \varepsilon_{t-q}}_{\textit{Moving Average (MA)}} \text{ ---------- 3}$$

Where ϕs *and* θs are the coefficients of the autoregressive and moving average processes, respectively.

Following Box and Jenkins (1976), an ARIMA model for inflation rate in Nigeria may be specified thus:

$$INF_t = \phi_0 + \phi_1 INF_{t-1} + \phi_2 INF_{t-2} + \ldots + \phi_p INF_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \ldots + \theta_q \varepsilon_{t-q} \text{ -----4}$$

Where INF_t is the inflation rate series. In order for the series to be estimated, the time series must be stationary. A nonstationary series is converted into a stationary series by differencing the series until it becomes stationary. That is, successive differences are taken until the series is stationary. The number of differences required to be taken before a series becomes stationary is denoted with the letter d. In practice, d is rarely more than two (2) (Makridakis, Wheelwright, & Hyndman, 1998).

For the first difference;

$$INF^*_t = \Delta INF_t = INF_t - INF_{t-1} \text{ ---------- 5}$$

Where INF* is the first-differenced stationary series.

If the first difference does not produce a stationary series then first difference of this first-differenced series can be taken (second differencing). The resulting series is a second-difference transformation;

$$INF_t^{**} = (\Delta INF_t^*) = INF_t^* - INF_{t-1}^* \text{ ----------6}$$

Where INF** is the second-differenced stationary series.

Hence, the first step in determining the ARIMA model is to determine the order of integration *(d)*. *d* is equal to 0 if the *INF* series does not need to be differenced to make it stationary; d is equal to 1 if the *INF* series needs to be differenced one time to make it stationary and d is equal to 2 if the *INF* time series needs to be differenced two times to make it stationary. This process is carried out using time series plot and the

Augmented Dickey-Fuller test. If the original series is stationary and d, therefore, equals 0, the 'I' in ARIMA vanishes and the technique reduces to ARMA. It, therefore, follows that ARIMA (1 0 1) is the same as ARMA(11).

Next, we determined p and q by plotting the correlogram and observing the autocorrelation function (ACF) and partial autocorrelation function (PACF). Alternatively, the choice of p and q can be determined by selecting as many combinations of p and q as possible and choosing the model with fewer parameters. This is determined by information criteria such as the AIC, BIC and HQC defined as:

$$AIC = Log\left(\frac{rss}{n}\right) + \left(2 * \frac{k}{n}\right) \text{ ---------- } 7$$

$$BIC = Log\left(\frac{rss}{n}\right) + \left(Log(n) * \frac{k}{n}\right) \text{ ---------- } 8$$

$$HQC = Log\left(\frac{rss}{n}\right) + \left(2 * Log(Log(n)) * \frac{k}{n}\right) \text{ ---------- } 9$$

Where *AIC* = Akaike information criterion, *BIC* = Bayesian information criterion and *HQC* = Hannan-Quinn criterion, *k* = the number of coefficients estimated, *rss* = residual sum of squares and n = the number of observations. These criteria are also referred to as *in-sample evaluation criteria*.

Following the estimation of an ARIMA *(p,d,q)* model, the residuals would be checked to see if they are serially uncorrelated, via their own ACF and PACF and the Portmanteau Q white noise test.

Specifying the ANN Model

This study employed a NAR neural network with back-propagation learning algorithm to predict inflation rate in Nigeria. The NAR neural network performs a non-linear functional mapping from past observations to the future value as follows:

$$y(t) = f(y)(t-1),..., y(t-d)) \text{ ---------- } 10$$

Where *y(t)* a is the future value, *y(t - 1)* is the immediate lag of the variable and *d* is the number of lags of the variable.

The network architecture of the problem in equation 10 is presented as Figure 1 and was trained using the famous Levenberg-Maquardt algorithm.

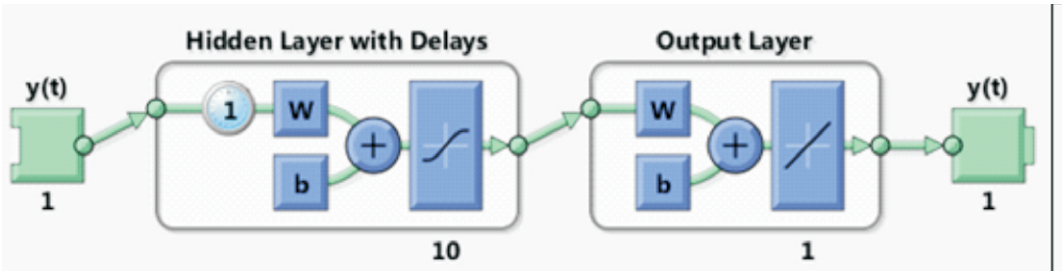


Figure 1: Network Architecture for Non-Linear Autoregressive Neural Network

Note that one of the objectives of this study is to determine which of the models is more precise and reliable for inflation forecasts. To achieve this objective, the quality of the obtained forecast from the competing models is tested using mean squared error defined as;

$$MSE = \frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 \quad \text{---------- 11}$$

This measure is useful when comparing different methods of the same set of data and is used to compare the forecast performances between the forecast methods.

RESULTS AND DISCUSSION OF FINDINGS

First, we determine the order of integration d using ADF unit root presented in Table 1.

Table 1: Augmented Dickey Fuller Unit Root Test

Augmented Dickey-Fuller (ADF) TEST			
Level			
Series	Without Constant	With Constant	With Constant and Trend
Inflation	0.188733 (0.7411)	-2.30081 (0.1717)	-2.30846 (0.4287)
First Difference			
Series	Without Constant	With Constant	With Constant and Trend
Inflation	-3.34432 (0.0008083)	-3.4293 (0.01003)	-3.4325 (0.04711)

Source: Authors' Computation using Gretl

Note: Values in Parenthesis are Probabilities

The unit root results in Table 1 reveal that inflation series has to be differenced one time to be stationary, hence, the order of integration d is equal to 1. The test without constant is selected on the basis of least probability values.

To determine p and q, we plotted the correlogram of the series and visually inspected the patterns of the ACF and the PACF shown in Figure 2.

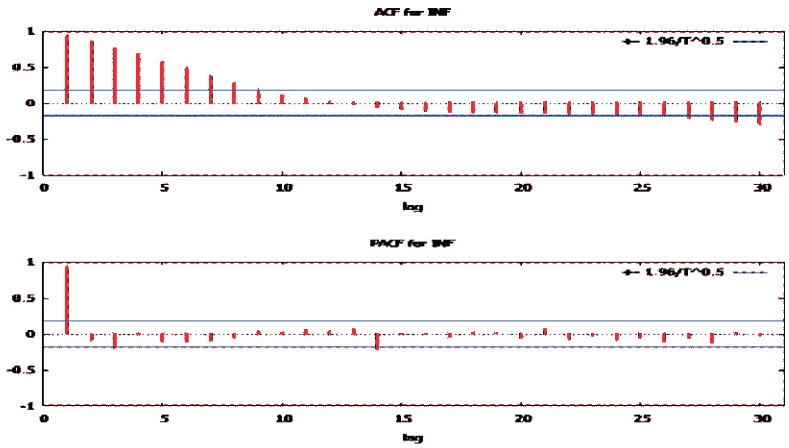


Figure 2: Correlogram showing Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF)

At a glance, both the ACF and PACF contain a pattern. The ACF is decaying and the PACF is decaying which points to the fact that p = 1 and q = 1. Since we have already determined that d = 1, the ARIMA model becomes ARIMA (1 1 1). The result of the estimated ARIMA (1 1 1) is presented in Table 2.

Table 2: Results of ARIMA (1 1 1) Model

Parameter	*Coefficient*	*Std. Error*	*z*	*p-value*	
Const	0.0467543	0.107447	0.4351	0.66346	
phi_1	0.748265	0.181845	4.1149	0.00004	***
theta_1	-0.651256	0.199622	-3.2625	0.00110	***

Source: Excerpt from Gretl

**** indicates significance at 5% level*

The results of the ARIMA (1 1 1) model indicates that, both the AR component (Phi_1) and MA component (theta_1) are statistically significant, implying that the choice of ARIMA (1 1 1) is appropriate and ideal.

Next, we conducted the dynamic forecasts using observations from January 2007 to December 2016 to create forecasts for the next 12 months in 2017 (hold-out period) and the results presented in Table 3 and Figure 3

Table 3: Actual and Predicted Inflation for 2017

Time	Actual(%)	Predicted(%)
Jan -17	18.72	18.67
Feb -17	17.78	18.82
Mar -17	17.26	17.77
Apr -17	17.24	17.21
May -17	16.25	17.22
Jun -17	16.10	16.15
Jul -17	16.05	16.03
Aug -17	16.01	16.01
Sep -17	15.98	15.99
Oct-17	15.91	15.98
Nov -17	15.90	15.91
Dec-17	15.37	15.91

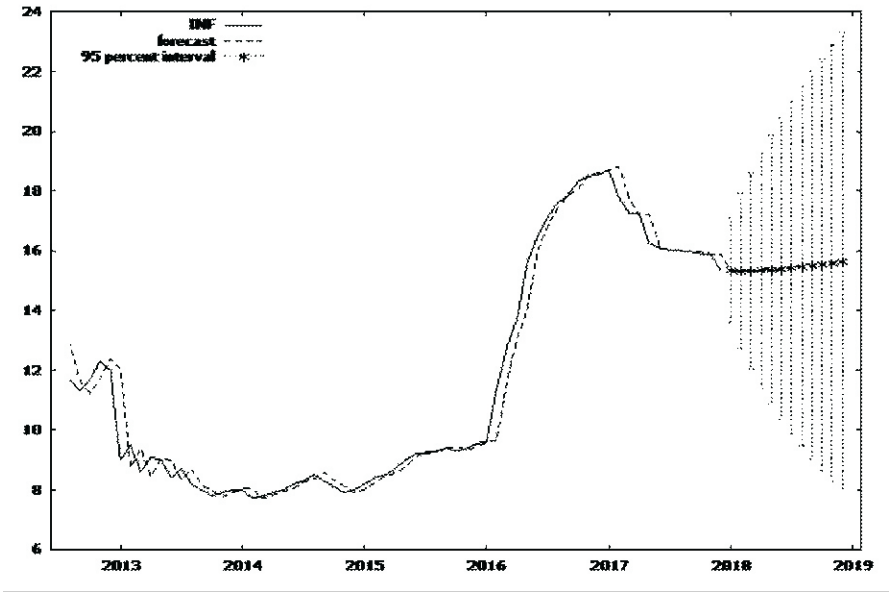
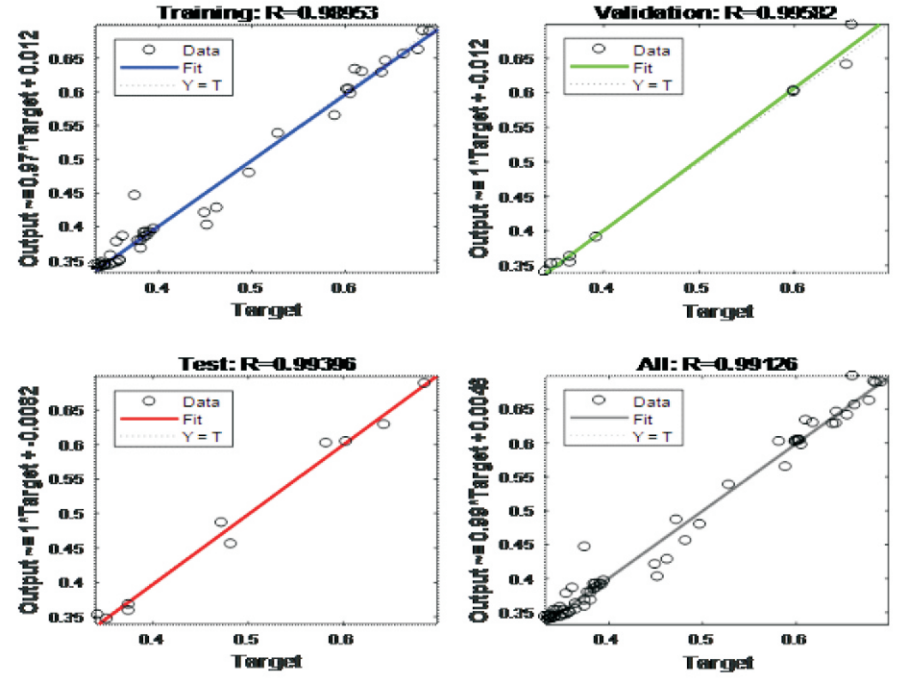


Figure 3: Actual and Forecast Inflation

The darker line represents the actual values, the doted line represents the forecasts and the last 12 observations are the forecasts for the hold-out period. It is evident from the figure that actual inflation mimics forecast inflation over the years. Furthermore, inflation rate is expected to be relatively stable all through year 2018.

Artificial Neural Network

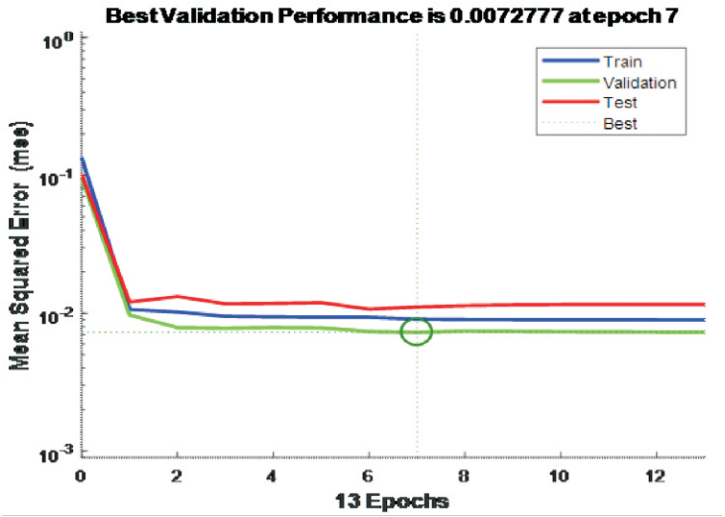
On the side of the ANN, the results of the network training, validation and test is presented in Figure 4.



Source: Matlab Output

Figure 4: Training Regression of the Proposed Model

The regression plot in Figure 4 represents the training, validation, testing data and a combination of all the three. The dashed lines in each of the quadrants represent optimal results (output approximates targets). The 450 solid line represents the best fit linear between output and target. The R measures the extent of the relationship between output and target with values range of 0 – 1. Values closer to one are preferable. The model or network was trained using the famous Levenberg-Marquardt algorithm and the performance or predictive power was evaluated using mean square error shown in Figure 5



Source: Matlab Output

Figure 5: Training Performance of the Proposed Model

The model has high predictive power given the marginal value of the Mean Squared Error (MSE). The result of the estimated model is shown in Table 4 and Figure 6

Table 4: Actual and Predicted Inflation for 2017

Time	Actual(%)	Predicted(%)
Jan -17	18.72	18.67
Feb -17	17.78	18.95
Mar -17	17.26	17.33
Apr -17	17.24	16.81
May -17	16.25	16.95
Jun -17	16.10	15.84
Jul -17	16.05	16.05
Aug -17	16.01	15.06
Sep -17	15.98	16.04
Oct -17	15.91	16.03
Nov -17	15.90	15.97
Dec -17	15.37	15.99

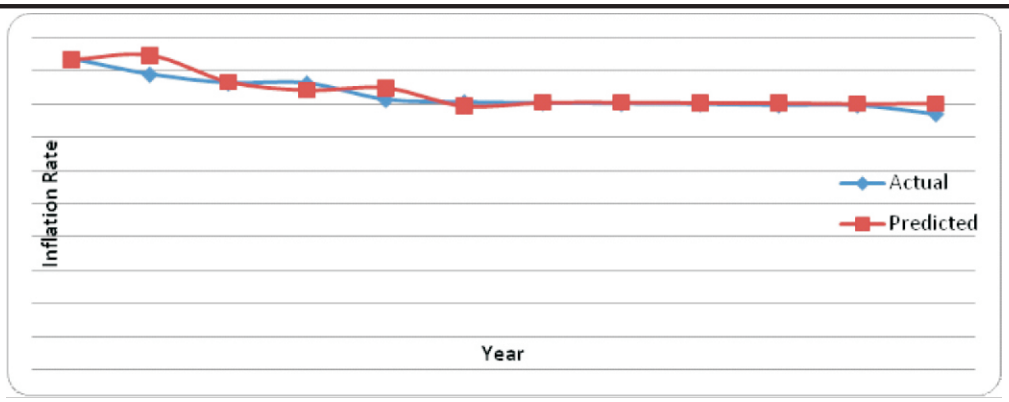


Figure 6: Actual vs. Forecasted Inflation for 2017

Table 4 and Figure 6 clearly revealed that values of actual and predicted inflation are closely related For instance, there is no difference between the predicted value and the actual value in July 2017. This further explains the high predictive power of the ANN model in forecasting inflation rate in Nigeria.

Table 5: Comparison between ARIMA and ANN Forecasts (Within-Sample and Out -of-Sample Forecasts)

	With-in-Sample Forecast				Out-of-Sample Forecast	
Time	Actual	ARIMA Predicted	ANN Predicted	Time	ARIMA Forecast	ANN Forecast
Jan-17	18.72	18.67	18.67	Jan-18	15.34	14.86
Feb-17	17.78	18.82	18.95	Feb-18	15.33	14.61
Mar-17	17.26	17.77	17.33	Mar-18	15.33	14.48
Apr-17	17.24	17.21	16.81	Apr-18	15.35	14.88
May-17	16.25	17.22	16.95	May-18	15.37	15.25
Jun-17	16.10	16.15	15.84	Jun-18	15.40	15.56
Jul-17	16.05	16.03	16.05	Jul-18	15.43	15.18
Aug-17	16.01	16.01	15.06	Aug-18	15.47	15.27
Sep-17	15.98	15.99	16.04	Sep-18	15.51	15.24
Oct-17	15.91	15.98	16.03	Oct-18	15.55	15.23
Nov-17	15.90	15.91	15.97	Nov-18	15.59	15.35
Dec-17	15.37	15.91	15.99	Dec-18	15.63	15.40

Source: Authors' Compilation

Evaluation of the Forecasting Ability of the Models

The ARIMA model reports several forecast evaluation statistics such as MSE, mean absolute error, mean percentage error, Theil's statistic, bias proportion and regression proportion. However, this study only made use of the MSE, which is also common to ANN, in the evaluation of the forecasts. The MSE for the ARIMA model is 0.21625, while that of the ANN model is 0.007277. Hence, the ANN model is believed to be more appropriate judging from the rule of the thumb – the model with smaller values of MSE has higher forecasting ability. This finding is consistent with the findings of Nakamura (2005) and Adebiyi, Adewumi and Ayo (2014) who found that ANN models are superior to autoregressive models.

CONCLUSION AND RECOMMENDATIONS

The study attempted a forecast of short-run inflation rate in Nigeria using ARIMA (1 1 1) and ANN. The identification of the ARIMA model was conducted using Augmented Dickey-Fuller and correlogram while the NAR neural network was designed with back propagation learning algorithm and trained using Levenberg-Marquardt algorithm. The results of the two models were evaluated using mean squared error evaluation statistics. The study found that the ANN has a higher predictive or forecasting ability compared to ARIMA (1 1 1). Also, the results of the forecasted inflation for 2018 showed that, inflation rate will be slightly lower in the early months but again, rise marginally in the later months. The study, therefore, recommends that monetary authorities should think in the line of using ANN in conducting inflation forecasts in Nigeria given its higher predictive and forecasting ability.

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AN ASSESSMENT OF THE EFFECT OF ENVIRONMENTAL DEGRADATION ON NIGERIA'S ECONOMY

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ABSTRACT

The study analysed the relationship between environmental degradation and economic activities in Nigeria between 1980 and 2016. The motivation for this study is the need to understand whether such a relationship affects the natural environment positively or negatively, and by implication, sustainable economic growth and welfare of people through health outcomes or capacity of the environment to benefit both the present and future generations, as economic activities are being pursued. This study, hence, seeks to investigate the short run and long run dynamics between environmental degradation and economic activities in Nigeria. Secondary data were employed to carry out bound test based on autoregressive distributed lag (ARDL) methodology. Findings from the analysis revealed that economic activities had cointegrating relationship with environmental degradation during the period under consideration. In addition, carbon (Co_2), and Sulfur dioxide (So_2) had negative and statistically significant effects, while particulate matter (PM_{10}) had positive and statistically significant effect on economic activities in the Nigerian economy. Based on these findings, it was recommended that there should be greater investment in protecting the environment and precautionary measures put in place by way of policies to prevent consequential divergence between the two in the future. In order to realize sustainable development, effective environmental policies should be pursued alongside economic growth policies. Core environmental policies should be adopted to address the need for clean production methods, reforms to improve the signals received by economic agents and the adoption of ecologically friendly means of production. It is important for government to formulate emission reduction policies and increase investment in pollution abatement since this is needed for economic growth and sustainability .

Key words: Environmental Degradation, Sustainability, Economy EL: Q51

INTRODUCTION

The economy of a country hinges on various aspects of past, present and future potential activities which affect the natural environment as well as the people within a defined geographic entity. A nexus is postulated to exist between these activities, natural endowment, economy and the peoples' welfare. An economy is the whole

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gamut of economic activities in a geographic location (a city, country or region) and how these activities affect the life and welfare of the people thereof. At the initial stage, the structure of an economy depends largely on nature's endowments within a geographic entity. The tendency is for the environment to be exploited in pursuit of economic growth and if care is not taken, such economic growth might be unsustainable on the long run because the environment might deliver lesser returns (Goodland, 1995). This becomes an issue to grapple with for the economic managers, particularly, as it relates to economic activities in the haulage system, factory waste disposal, energy production and consumption among others.

Increase in aggregate output is one of the goals of macroeconomic policy. It is perceived as an important route out of unemployment, financial exclusion and even social problems of crimes. For a country to achieve the desired level of economic growth, it must have the necessary productive resources such as physical inputs like labour, capital and other natural resources. The utilization of natural resources in the growth process often leads to the degradation of the environment (Barnett & Morse, 2013).

Due to the vital link between environmental degradation and economic growth, considerable attention has been paid to environmental degradation – growth nexus in both policy and academic cycles. It is argued that the environment influences economic activity both indirectly, through restrictions and abatements, and directly, through its impact on production (Barnett & Morse, 2013). The effects of dependence on the environment differ across sectors and countries. While production in developed countries has become more and more independent of the environment, developing countries still have a large share of their production in sectors where the environment is a crucial factor. Ultimately, most production depends on the environment; if not directly, then indirectly through infrastructure and supply of inputs (Liang, Qu and Xu 2016).

Many developing countries struggle with unemployment, poverty and environmental degradation. There often seems to be a conflict when fighting these conditions. To take care of the environment requires resources that otherwise could be used on food production, education and health (Bergstrom and Randall, 2016). It seems that the conflict between these challenges and environmental degradation mainly occurs in the short run, so that it corresponds to a traditional consumption-investment problem.

According to Alam and Mahal (2014), economic growth is associated with negative externalities such as environmental degradation. They opined that the speed of modernization, urbanization, and industrialization has led to serious environmental concerns in developing countries. Over the past few decades, natural resources have

depleted remarkably resulting from accelerated pace of economic and social transformation. Economic and social changes such as large increase in population, shift of population from rural to urban areas, increase in mechanized and chemical agriculture, industrial production, capital accumulation, and innovative technologies have transformed the country's natural resource base, both as a source of factor inputs and as a by- product of pollution associated with economic activity. Continuous acceleration and unabated environmental degradation in a country is dangerous for the sustainability of human development being the foundation for long-term economic growth.

Environmental degradation may have negative effects on economic development through several channels, such as migration, economic growth, health, conflicts and agriculture. Some authors like Aunan and Pan (2004) and Künzli, Jerrett, Mack, Beckerman, LaBree, Gilliland and Hodis (2005) found that air quality degradation has a specific negative effect on mortality or morbidity, while others like Gangadharan and Valenzuela (2001) found an effect on all causes of mortality. It has been shown that environmental degradation may be a factor of migration. Drabo and Mbaye (2011) show that climate change intensifies migration through scarcity of land and water, and conflicts for natural resources.

While both environmental conservation and economic growth are important for human existence, there is an ongoing debate as to whether they can be achieved simultaneously (Hediger, 2006). The question is how much of the environmental resources should be exploited in order to ensure rapid economic growth. Environmental degradation has been a source of numerous challenges some of which undermine the macroeconomic objectives of economic growth and poverty alleviation through job creation. The climatic change crisis, which is responsible for global warming, threatens the very existence of humanity and availability of enough natural resources to ensure the sustainability of economic growth. The experience of newly industrialized countries shows that they are more polluted today than they were two to three decades before now, while cities in older industrial countries are cleaner than they were over the same time horizon. This apparent irony raises the question of whether higher income levels (economic growth) result in a better or worse environment.

There is an argument that countries should be allowed to economically grow out of environmentally damaging activities. A well-known hypothesis that provides support for a policy that emphasizes economic growth at the expense of environmental protection is the environmental Kuznets curve (referred to also as EKC hypothesis). This hypothesis postulates that countries in their development process will see their levels of environmental degradation increase until some income threshold is met and then afterwards decrease, which suggests an inverted U-

shaped relationship between different pollutants and per capita income. If this relationship holds, then economic growth could be a powerful way for improving environmental quality in developing countries in that it will be possible for countries to economically grow out of environmentally damaging activities. If the relationship does not hold, environmental conservation initiative could be a useful instrument of economic policy to ensure sustainable development.

During the last decades, one of the greatest challenges facing developing countries like Nigeria has been the effects or consequences of environmental degradation (e.g., desertification, solid and hazardous waste, soil degradation, pollution, deforestation, biodiversity and climate change). Hence, in recent times, environmentally-friendly economic growth has become increasingly important. As the world population grew, the need for more resources also increased. In order to meet the increasing demand for these resources, more industrial activities also grew around the world. These increased industrial activities over the years did not consider the resulting environmental degradation such as water, air and land pollution. The degradation was not considered along with the intended industrial growth, thus, the value proposition of much economic activity ignored these "costs". Typically, the enterprises (transporters, factories and other carbon emitting sources) that produced these negative effects on the environment were not held accountable for them. They externalized these costs and the society suffers.

In Nigeria, many ecosystems have been adversely affected to the point where they can no longer withstand or recover from natural disasters resulting from human activities such as global warming, flooding and extreme weather conditions. This study, hence, seeks to research into the need for policies to address environmental degradation by exploring the relationship between environmental degradation and economic growth in Nigeria looking into the short run to long run dynamics between the latter and the former over 1980 to 2016. In doing so, the study has been organized into seven sections. The foregoing is followed by a review of some relevant literature after which theoretical stance and model specification are presented. The fourth section presents data and methodology while the fifth presents the estimate of the model and findings. The sixth section is the summary.

REVIEW OF LITERATURE

Environmental degradation is the deterioration of the environment through the depletion of natural resources such as air, water and soil, and the destruction of ecosystems and the extinction of wildlife (Carley and Christie, 2017). Environmental degradation may be defined as any change or disturbance to the environment. It can also be described as the erosion of the quality of natural environment caused directly or indirectly by human activities (Tietenberg and Lewis, 2016). Environmental degradation is the disintegration of the earth or

deterioration of the environment through consumption of natural gifts, for example, air, water and soil, the destruction of environments and the eradication of wildlife (Chopra, 2016). It is characterized as any change or aggravation to nature's turf seen to be pernicious or undesirable. Ecological effect or degradation is created by the consolidation of an effectively substantial and expanding human populace, constantly expanding monetary development or per capita fortune and the application of asset exhausting and polluting technology. It occurs when the earth's natural resources are depleted and the environment is compromised in the form of extinction of species, pollution in the air, water and soil, and rapid growth in population (Chopra, 2016).

Drucker(2017) noted that environmental degradation is one of the largest threats that is being looked at in the world today. The United Nations International Strategy for Disaster Reduction characterizes environmental degradation as the lessening of the limit of the earth to meet social and environmental destinations, and needs. Environmental degradation can happen in a number of ways. At the point when environments are wrecked or common assets are exhausted, the environment is considered to be corrupted and harmed. There are a number of different techniques that are being used to prevent this, including environmental resource protection and general protection efforts (Cole and Grossman, 2018).

Environmental degradation is a result of the dynamic inter-play of socio-economic, institutional and technological activities. Environmental changes may be driven by many factors including economic growth, population growth, urbanization, intensification of agriculture, rising energy use and transportation (Millennium Ecosystem Assessment, 2005). Environmental degradation such as land degradation and pollution of water, air or soil is brought about by the misuse of resources, poor planning, poor infrastructure and poor governance and monitoring. Such mismanagement of resources and industrial accidents/pollution is on the increase worldwide to such an extent that ecosystem services are being compromised in all the regions of the world (Millennium Ecosystem Assessment, 2005). When these factors are considered within the global environmental change phenomena such as climate change (change in rainfall patterns, sea-level rise, increased frequency of heat waves, and so forth, depending on location) it can be foreseen that more of the global population will be facing environmental stresses in the future. Environmental degradation from local to global scales can also be coupled with increased exposure to environmental hazards (such as floods, droughts, hurricanes) and will thus increase the risks these hazards pose to local populations. Generally, the causes of environmental degradation could be classified into three, namely, social, economic and institutional factors.

Studies conducted on the impact of environmental degradation on economic growth

in both developed and developing economies seem to reach mixed conclusions. Some of these studies (Grossman and Krueger, 1991; Panayotou, 1993; Selden and Song, 1994; Galeotti and Lanze, 2003) have confirmed the existence of an EKC for different measures of environmental degradation while others report a monotonically increasing or decreasing relationship between pollution and per capita income.

Grossman and Krueger (1991), while investigating the environmental impacts of North American Free Trade Agreement (NAFTA) based on the GEMS dataset, used a cross-section sample of comparable measures of air pollutants for urban areas in 42 countries to explore the relationship between air quality and economic growth. They found out that for SO_2 and dark matter (fine smoke) concentration increase with per capita GDP at low levels of national income but decrease with GDP at higher levels of income, depicting an inverted u-shaped relationship, with the turning points for both SO_2 and dark matter at around $4000-5000. However, for suspended particles (SPM), the relationship is monotonically decreasing. They argued that at the initial stages of growth there was an increase in environmental deterioration followed by an improvement phase. Their work popularized and led to the wide acceptance of the EKC hypothesis (Grossman and Krueger, 1995).

A study on the income-environment relationship for countries at various income levels by Shafik and Bandyopadhyay (1992) revealed that this relationship differs amongst the developed and developing nations. Therefore, the EKC hypothesis cannot be generalized across countries.

Lean and Smyth (2010), using vector error correction model, found the existence of a non-linear relationship between Carbon dioxide emissions and economic growth over the period 1980-2006 in five ASEAN countries. They further found that in the long run, environmental degradation Granger causes economic growth.

Ahmed, Herve and Zhao (2012), using OLS estimation of time series data for 34 years (1975-2008) for Maldives, found that a strong positive correlation exists between environmental pollution and economic growth. Regarding causality, they found GDP per capita Granger causes carbon emissions. However, reverse causality has been found by Menyah and Wolde-Rufael (2010) using data from South Africa for 41 years (1965-2006) and bounds test approach to co-integration.

Chang (2010) using vector error correction model found bi-directional causality between carbon dioxide and GDP for China. Also Ang (2007) using co-integration and vector error-correction models found the existence of a unidirectional causality from output growth to carbon dioxide emissions in the long run for France for the period of 1960-2000. However, Ghosh (2010) using ARDL bounds testing approach

could not find any long term relationship between growth and carbon dioxide for emissions in India, though the study found a short run bi-directional causality among these two variables.

Halicioglu (2009), using multivariate model and co-integration technique, found bidirectional causality between carbon emissions and income, both in the short and long run in the case of Turkey. Sari and Soytas (2009) analyzed five OPEC countries (Algeria, Indonesia, Nigeria, Saudi Arabia and Venezuela) to understand the relationship between carbon emissions, income, energy and total employment. They used the ARDL model and found out that variables are co-integrated only in Saudi Arabia. Ighodaro (2010) and Dantama, Abdullahi and Inuwa (2012),using co-integration technique could not find the existence of causal relationship considering the annual data of carbon dioxide per capita and GDP per capita for Nigeria.

Day and Grafton (2003) investigated the relationships between growth and environment in Canada using per capita GDP and several environmental indicators. The core study finding is that both environmental and income changes influence the relationship in Canada. In Kenya, Kamande (2007) investigated the relevance of the EKC for environmental conservation. The relationship was modelled using per capita carbon emissions, population growth, per capita GDP and technology data from 1960 to 2006. The study did not find that an EKC exists in Kenya.

Shahbaz, Dube, Ozturk and Jalil (2010) investigated the EKC in Portgual using an ARDL framework using annual data from 1971 to 2008. The findings showed that the EKC exists, thus environmental degradation increases with trade growth, urbanization and energy consumption and then eventually declines. Chuku (2011) also undertook a study on environmental degradation in Nigeria using an autoregressive distributed lag (ARDL) framework with data from 1960 to 2008. Their model was also extended to include trade openness and key sectors in the Nigerian economy. The study found that there was no evidence of an EKC model but rather an N-shaped relationship.

Olusegun (2009) investigated the relationship between economic growth and carbon dioxide emissions in Nigeria using time series data. The study revealed no causal or long-term relationship between CO_2 per capita and GDP per capita. The EKC is predicted as an inverted U-shaped relationship. This means that with an increase in GDP per capita, CO_2 emission rises but then declines at a point when income per capita is high enough and investments in pollution abatement are being pursued.

Friedl and Getzner, (2003) examined the relationship between economic development and carbon dioxide emissions for Austria and found a cubic (N-shaped) relationship. Egli (2004) used time series data for Germany to explore the EKC

hypothesis. The results of the traditional reduced-form specification do not support the EKC hypothesis.

Theoretical Framework and model specification

In answering the research question of how environmental degradation and economic activities are related in the Nigerian economy from 1980 to 2016, GDP is chosen as an indicator for economic activities while particulate matter (PM 10), Sulphur-di-oxide (SO_2) and carbon (CO_2) emissions were chosen to account for environmental degradation as they emanate mostly from economic activities and have the tendency to impede sustainable development as they exceed tolerable limit in the atmosphere. This study adopted the Solow (1956) growth model as modified by Mankiw, Romer and Weil (1992). This model extended the linkage between growth and other macroeconomic aggregates. Using a production function approach, it states that the growth rate of output is principally determined by the following factors: the rate of growth of gross labour and/or the rate of growth of its quality, multiplied by the labor income share; the rate of growth of gross capital input and/or the rate of growth of its quality, multiplied by the capital income share; and change in technology or total factor productivity (TFP). The chosen indicators of environmental degradation in this study go to affect the rate of growth of the quality of labour through their health implications. This fits in to the framework of Mankiw et al. (1992). This framework is given as:

$Q = f(K, L, T)$..... 1

Where: Q= Output Growth; L= Labor; K= Capital Formation/Investment; T= Technology. In this study, the production function below is modified to incorporate the environmental degradation variables. Moreover, environmental degradation can indeed affect the rate of growth of labour as well as the quality of labour, and by implication, the level of output in an economy. Hence, the model for this study is as follows:

$GDP = f($ 2

$CO_2, SO_2, PM)$

Thus, relying on Ghosh (2010),

$$\Delta InGDP = \beta_0 + \beta_i \sum_{1}^{m} \Delta CO_{2t-i} + \beta_j \sum_{1}^{r} \Delta SO_{2t-j} + \beta_v \sum_{1}^{p} \Delta PM_{t-v} + \lambda_1 CO2_{t-1} + \lambda_2 SO2_{t-1} + \lambda_3 PM_{t-1} + \lambda_5 lnGDP_{t-1} + \varepsilon \quad \text{..... 3}$$

$InGDP$ is Natural log of GDP

CO_2 is Carbon-dioxide Emission

SO_2 is Sulfur-dioxide Emissions

PM is Particulate Matters

β_0 is Intercept Term

β and fl are Slope Parameters

ε is Error Term

The values of m, r and P are determined based on Schwarz Information Criterion

(SIC) model selection criterion because it is a consistent model selector. The specified equation for this study is, in the words of Pesaran, Shin and Smith (2001), a conditional error correction model (ECM) or an unrestricted ECM as compared to the traditional ECM.

The gross domestic product (GDP) is a macroeconomic indicator used to measure the volume of output produced in the economy on an annual basis. The GDP series was transformed into its natural logarithm. It is an important factor in measuring welfare/standard of living in an economy. Its growth has implications for jobs, wealth creation, and etcetera.

Carbon-dioxide (CO_2) Emissions. This is carbon-dioxide emissions per capita which are measured in metric tons of carbon. It is expected to rise with the GDP. As the country gets industrialized and manufacturing activities take place in large volume and transportation uses more of carbon fuel, CO_2 emission rises and the environment gets degraded. This reduces the prospect for future economic growth if necessary mitigating policies are not put in place.

So_2 Emissions: This is sulfur-dioxide emissions per capita which are measured in metric tons of carbon. It is produced as a by-product of the burning of fossil fuels contaminated with sulfur compounds. When sulfur dioxide combines with water and air, it forms sulfuric acid, which is the main component of acid rain, which can cause deforestation. We expect SO_2 to rise with the GDP. Economic growth will lead to more emission of SO_2 to the point where high income level of the society will be good enough to deploy clean technologies that will reduce the emission.

Particulate Matters (PM 10). Amicroscopic solid or liquid matter suspended in the earth's atmosphere. Recent studies indicate that PM pollution can cause lung irritation, which leads to increased permeability in lung tissue. It is expected to rise with the GDP. The rise in these variables holds negative implications for GDP on the longrun through declining environmental condition and health outcomes, and economic growth in the economy will not be sustainable.

METHODOLOGY AND DATA

The design for this study is quantitative as it analysed the relationship between economic activities and environmental degradation. Co-integration and error correction models were used to test for long run and short run dynamics between the endogenous and exogenous variables in the model specified. In particular, the Pesaran et al. (2001) auto-regressive distributed lag (ARDL) approach was followed to achieve the objective of the study. The recent literature on co-integration is concerned with the analysis of the long run relationship between integrated - I(d) -

series, but particularly I(1) variables, and its basic idea is that in the presence of I(1) variables, the traditional ARDL approach (a model of de-trended series as stationary distributed lag or autoregressive distributed lag) is no longer applicable. Accordingly, a number of other estimation and hypothesis testing measures have been advanced for the analysis of I(1) variables (Engle and Granger, 1987; Johansen, 1991). The Pesaran et al. (2001) ARDL approach was adopted because its test statistics generally perform much better in small samples than the test statistics computed using the asymptotic formula that explicitly takes account of the fact that the regressors are I(1). Furthermore, it permits the combination of the deferent order of integration (I(0) and I(1)) among the variables in a model. The data employed for the study span over 1981 to 2016. They were sourced from the Central Bank of Nigeria (CBN) 2016 statistical bulletin and World Development Indicators (WDI) database. This study focused on the analysis of time series for the Nigerian economy.

Model Estimates

The use of ARDL is based on the assumption that none of the time series in the specified model is I(2). Accordingly, the time series were tested for unit root and the result as summarised in Table 1 shows that the condition is satisfied.

Table 1: Summary of Unit Root Test

Variables	ADF Test Statistic	Critical Value 1%	Integration order	PP Test Statistic	Critical Value 1%	Integration Order
Gdp	-6.289387	-4.2436	I(1)	-6.529237	-4.2436	I(1)
C02	-8.454767	-4.2436	I(1)	-23.12138	-4.2436	I(1)
S02	-5.805568	-4.2529	I(1)	-7.407665	-4.2436	I(1)
PM	-5.785047	-4.2349	I(0)	-5.834818	-4.2349	I(0)

Source: Authors' computations

The bounds test procedure was followed and the estimate for Wald test for coefficients restriction shows that the value of F-statistic is 5.77. The intercept of the specified model was not constrained, and there is no linear trend term included in the model. Given k = 3, the lower and upper bounds for the F-test statistic at the 10%, 5%, and 1% significance levels are [2.72, 3.77], [3.23, 4.35], and [4.29, 5.61] respectively. Since the value of F-statistic is above the upper bound at the 1% significance level, it implies that there is evidence of a long-run relationship between economic activities as measured by GDP and chosen indicators of environmental degradation in Nigeria. The t-statistic (-3.92) on the one period lag of GDP which is negative and statistically significant at 1%, further confirms co-integration.

The I(0) and I(1) bounds test F-statistic is 16.58, which is greater than 1% critical value bounds. This result confirms that there is a long-run relationship between economic activities and chosen indicators of environmental degradation in Nigeria.

In line with the requirement that the ARDL model be stable and free from serial correlation, stability test and serial correlation LM test were carried out and the result as presented in the appendix shows that the model is stable as all the moduli on the AR-root graph are within the unit circle while the LM serial correlation test suggests that the error series are not correlated.

In addition to the confirmation of co-integrating relationship between economic activities and environmental degradation in Nigeria, carbon dioxide and Sulphur dioxide emissions as well as particulate matters together with their contemporaneous lags took on negative signs and were statistically significant with only the current value of PM being positive and statistically significant. This implies that so far, both carbon and Sulphur emissions have not posed threat to the Nigerian economy. However, the level of PM 10 pollution has been rising with GDP in recent time and the rising trend is significant for that matter. The policy implication of this finding is that the government and relevant stakeholders need to be on their guard to ensure that carbon and Sulphur emissions are not allowed to drift away from the current trend with economic activities in the country. In addition, particulate matter seems to be the challenge for now as it is rising with the level of economic activities in the country. There is, therefore, need to step up effort at extenuating the effect of this because of its effect on the health of people and, consequently, on economic growth sustainability.

CONCLUSION AND RECOMMENDATIONS

This study has assessed the role of economic activities in environmental degradation in Nigeria. Activities in the services and manufacturing sectors (haulages, energy generation through fossil fuels and discharges from factory plants) have degrading effects on our environment. If the environment continues to be degraded unchecked, its contribution to production activities is likely to diminish and, hence, development will be impeded. The findings from this study based on the available data, indicate that the chosen indexes of environmental degradation are not at an alarming level. This is in line with the findings of Chuku (2011) and Olusegun (2009). It is being said that prevention is better than cure.

Therefore, relevant authorities and stakeholders need to pursue economic growth and development alongside sound environmental policies such that development can be sustained for the future generations. Environmental issues are fluid across international boundaries, which, perhaps, accounts for the negative impact being felt by way of flooding, rising temperature, desertification, etcetera. Furthermore, that a co-integrating relationship does exist between GDP and these chosen environmental degradation variables means the duo are moving together, though, for now, in the opposing direction, possibly due to where the country is in terms of industrialization. Therefore, as the country seeks to industrialise, it should do it with a mindset of

achieving a greener economy in order to maximize gains from increased frequency of economic activities in the country. It is important to strengthen institutions responsible for maintaining environmental standards and also invest in educating Nigerians on the need to protect the environment so that the relationship between CO_2 and SO_2, as it is now, can be sustained. Measures should be put in place to address rising level of PM 10 in the Nigerian air.

It is further recommended that since economic activities seem not to be adversely affected by environmental degradation at the moment, there is the need to put precautionary measures in place by way of policies to prevent divergence between the two in the future. Core environmental policies should be adopted to address the need for intensified environmental preservation, adoption of clean production methods, reforms to improve the signals received by economic agents and provision of the right incentives for protecting the resilience of ecological systems and the adoption of ecologically friendly means of economic growth. It is important for government to formulate emission reduction policies and increase investment in pollution abatement since this will be beneficial towards attaining economic development. There is the need for government to intensify the implementation and adherence to environmental regulations. In addition, greater democratic means should be used to positively influence the demand and lobby for better environmental policies.

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Appendix A: Unit root test

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.289387	0.0000
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(C02) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.454767	0.0000
Test critical values:	1% level	-4.243644	
	5% level	-3.544284	
	10% level	-3.204699	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(S02) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.805568	0.0002
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: NOX has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.212703	0.0008
Test critical values:	1% level	-4.234972	
	5% level	-3.540328	
	10% level	-3.202445	

*MacKinnon (1996) one-sided p-values.

Appendix B: VAR (1 2) Model

Vector Autoregression Estimates
Date: 07/23/18 Time: 15:11
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LNGDP	C02	S02	PM
LNGDP(-1)	0.822290	1.881825	0.189160	799.8573
	(0.20990)	(2.37436)	(1.72564)	(853.234)
	[3.91749]	[0.79256]	[0.10962]	[0.93744]
LNGDP(-2)	0.120285	-0.296602	-0.952986	-362.0609
	(0.21877)	(2.47465)	(1.79853)	(889.271)
	[0.54983]	[-0.11986]	[-0.52987]	[-0.40714]
C02(-1)	0.000213	0.319577	-0.045434	-32.96782
	(0.01775)	(0.20084)	(0.14597)	(72.1720)
	[0.01197]	[1.59121]	[-0.31127]	[-0.45680]
C02(-2)	0.012061	0.042889	0.050573	33.51514
	(0.01659)	(0.18763)	(0.13637)	(67.4252)
	[0.72714]	[0.22858]	[0.37086]	[0.49707]
S02(-1)	-0.011853	-0.064578	0.648944	101.5551
	(0.02446)	(0.27665)	(0.20106)	(99.4152)
	[-0.48465]	[-0.23343]	[3.22754]	[1.02152]
S02(-2)	0.023879	0.291968	0.175106	-149.2045
	(0.02506)	(0.28343)	(0.20599)	(101.853)
	[0.95301]	[1.03011]	[0.85005]	[-1.46490]
PM(-1)	5.83E-05	0.000169	0.000449	-0.000681
	(4.7E-05)	(0.00053)	(0.00038)	(0.18918)
	[1.25252]	[0.32136]	[1.17293]	[-0.00360]
PM(-2)	-1.32E-05	0.000117	0.000585	-0.119596
	(4.8E-05)	(0.00055)	(0.00040)	(0.19682)
	[-0.27198]	[0.21440]	[1.47043]	[-0.60765]
C	0.239792	2.476616	11.34881	-2877.500
	(0.52680)	(5.95907)	(4.33094)	(2141.41)
	[0.45518]	[0.41560]	[2.62040]	[-1.34374]
R-squared	0.979392	0.780121	0.693997	0.307446
Adj. R-squared	0.973051	0.712466	0.599843	0.094353
Sum sq. resids	4.698708	601.2281	317.5757	77639189
S.E. equation	0.425111	4.808759	3.494918	1728.040
F-statistic	154.4538	11.53086	7.370826	1.442775
Log likelihood	-14.52179	-99.42631	-88.25679	-305.3770
Akaike AIC	1.344102	6.195789	5.557531	17.96440
Schwarz SC	1.744049	6.595736	5.957477	18.36434
Mean dependent	14.85567	47.11143	17.32514	2509.960
S.D. dependent	2.589579	8.967851	5.524864	1815.826

Determinant resid covariance (dof adj.)	1.02E+08
Determinant resid covariance	31176769
Log likelihood	-500.6171
Akaike information criterion	30.66383
Schwarz criterion	32.26362

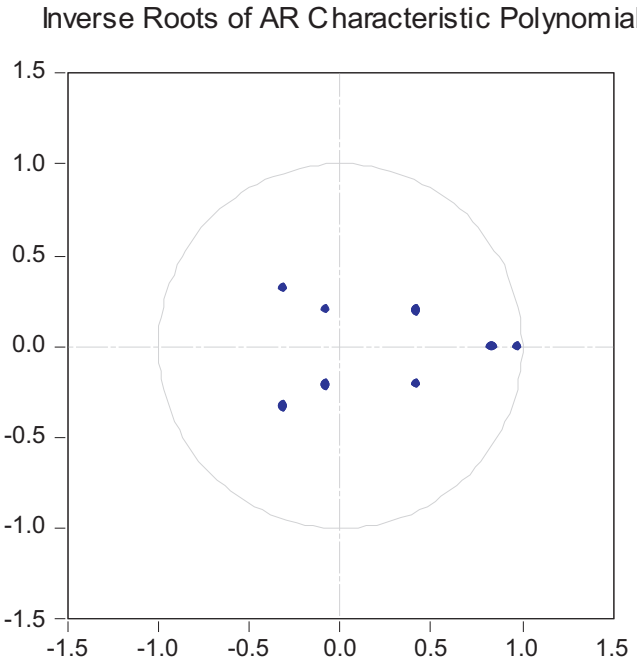
Appendix C: VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LNGDP C02 S02 PM
Exogenous variables: C
Date: 07/23/18 Time: 14:24
Sample: 1980 2016
Included observations: 34

Lag	LogL	LR	FPE	AIC	SC
0	-584.5399	NA	1.27e+10	34.61999	34.79957
1	-496.2014	150.6950*	1.82e+08*	30.36479*	31.26265*
2	-487.8434	12.29124	2.99e+08	30.81432	32.43046
3	-473.9242	17.19426	3.77e+08	30.93672	33.27115

* 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

Appendix D: Inverse Roots of AR Polynomial



Appendix E: ARDL MODEL

Dependent Variable: D(LNGDP)
Method: ARDL
Date: 07/23/18 Time: 15:03
Sample (adjusted): 1985 2016
Included observations: 32 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): D(C02) D(S02) D(PM)
Fixed regressors: LNGDP(-1) C02(-1) S02(-1) PM(-1) C
Number of models evalulated: 250
Selected Model: ARDL(1, 2, 2, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(LNGDP(-1))	-0.305106	0.173129	-1.762299	0.0984
D(C02)	-0.018641	0.013040	-1.429490	0.1734
D(C02(-1))	-0.042962	0.016321	-2.632260	0.0188
D(C02(-2))	-0.025769	0.014470	-1.780854	0.0952
D(S02)	-0.112154	0.023408	-4.791213	0.0002
D(S02(-1))	-0.107027	0.030994	-3.453130	0.0035
D(S02(-2))	-0.060039	0.026811	-2.239345	0.0407
D(PM)	0.000111	4.28E-05	2.586102	0.0207
D(PM(-1))	-0.000363	9.18E-05	-3.957616	0.0013
D(PM(-2))	-0.000220	6.70E-05	-3.284026	0.0050
D(PM(-3))	-0.000197	5.61E-05	-3.516341	0.0031
D(PM(-4))	-0.000134	4.31E-05	-3.115192	0.0071
LNGDP(-1)	-0.393537	0.100284	-3.924240	0.0014
C02(-1)	0.018890	0.019036	0.992336	0.3368
S02(-1)	0.003782	0.016088	0.235087	0.8173
PM(-1)	0.000627	0.000135	4.658354	0.0003
C	3.775233	0.803906	4.696112	0.0003

R-squared	0.730493	Mean dependent var	0.265760
Adjusted R-squared	0.443019	S.D. dependent var	0.414609
S.E. of regression	0.309428	Akaike info criterion	0.796631
Sum squared resid	1.436184	Schwarz criterion	1.575303
Log likelihood	4.253907	Hannan-Quinn criter.	1.054739
F-statistic	2.541073	Durbin-Watson stat	2.060594
Prob(F-statistic)	0.039124		

*Note: p-values and any subsequent tests do not account for model selection.

Appendix F: The serial correlation test
(six lags accepts the hypothesis of no serial correlation)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.535801	Prob. F(2,13)	0.5976
Obs*R-squared	2.436913	Prob. Chi-Square(2)	0.2957

Appendix G: ARDL Bounds Test

ARDL Bounds Test
Date: 07/23/18 Time: 15:05
Sample: 1985 2016
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	16.58162	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Test Equation:
Dependent Variable: D(LNGDP,2)
Method: Least Squares
Date: 07/23/18 Time: 15:05
Sample: 1985 2016
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(C02,2)	-0.018641	0.013040	-1.429490	0.1734
D(C02(-1),2)	0.025769	0.014470	1.780854	0.0952
D(S02,2)	-0.112154	0.023408	-4.791213	0.0002
D(S02(-1),2)	0.060039	0.026811	2.239345	0.0407
D(PM,2)	0.000111	4.28E-05	2.586102	0.0207
D(PM(-1),2)	0.000552	0.000151	3.653038	0.0024
D(PM(-2),2)	0.000332	9.22E-05	3.596265	0.0026
D(PM(-3),2)	0.000134	4.31E-05	3.115192	0.0071
LNGDP(-1)	-0.393537	0.100284	-3.924240	0.0014
C02(-1)	0.018890	0.019036	0.992336	0.3368
S02(-1)	0.003782	0.016088	0.235087	0.8173
PM(-1)	0.000627	0.000135	4.658354	0.0003
C	3.775233	0.803906	4.696112	0.0003
D(C02(-1))	-0.087372	0.030420	-2.872201	0.0116
D(S02(-1))	-0.279220	0.066862	-4.176026	0.0008
D(PM(-1))	-0.000804	0.000227	-3.543593	0.0029
D(LNGDP(-1))	-1.305106	0.173129	-7.538328	0.0000

R-squared	0.879168	Mean dependent var	-0.004101

Appendix H: Wald Test

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	5.771380	(4, 15)	0.0051
Chi-square	23.08552	4	0.0001

Null Hypothesis: C(13)=C(14)=C(15)=C(16)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(13)	-0.393537	0.100284
C(14)	0.018890	0.019036
C(15)	0.003782	0.016088
C(16)	0.000627	0.000135

Restrictions are linear in coefficients.

Appendix I: Time series

year	LnGDP	C02	S02	NOx	PM
1980	10.8124	30.45	8.4	4813.7	276.9
1981	10.771	31.498	8.9	7214	322.4
1982	10.80099	33.45	9.5	8215.6	349.9
1983	10.88007	32.12	10	8112.6	374.6
1984	10.99579	34.56	10.2	8007.6	496.9
1985	11.12592	34.511	9.4	4221.4	556.7
1986	11.14399	37.438	10	5672.1	611.5
1987	11.56384	37.34	14	7949.1	866.8
1988	11.84284	38.045	16.6	8438.7	9331.2
1989	12.28672	38.223	20.4	6789.1	1219.4
1990	12.49706	38.481	25.3	7029.6	1057.7
1991	12.65121	39.593	20	7049.6	1408.7
1992	13.18555	40.754	24.8	8093.1	1700.6
1993	13.43552	41.957	31.7	11198.7	1452.4
1994	13.71	43.206	20.5	9761.7	1089.1
1995	14.47469	44.509	20.2	7386.4	1339.3
1996	14.80977	45.827	19.8	7582.7	1403.7
1997	14.84583	47.159	17.8	7733.9	2614.4
1998	14.81188	48.574	18.2	9975.6	2854.3
1999	14.97679	50	20.3	9751.1	2694.1
2000	15.33767	50.532	21.3	6080.2	3144.4
2001	15.3684	53.078	23.4	9486.6	4881
2002	15.74882	54.67	24.8	8982.9	1686.6
2003	15.95405	56.31	20.7	6974	1720
2004	16.25009	57.999	19.2	6600.7	1931.9
2005	16.49463	58.045	17.9	5710	3301
2006	16.73677	61.712	16.9	9775.2	2574.4
2007	16.84358	64.221	16.9	7507.6	2383.9
2008	16.98697	38.481	15.5	8207.3	2291
2009	17.06115	49.454	18.4	9418.5	3884.8
2010	17.13159	50.212	17.6	4556.7	4329.3
2011	17.14416	55.35	16	6657.8	4869.6
2012	17.16533	57.439	16.8	7065	2692.2
2013	17.18076	55.32	16.7	7876	4561.7
2014	19.49038	48.437	7	6132.3	4288.7
2015	19.51562	56.906	9.6	8903.8	3904.5
2016	19.50012	54.987	8.98	8896.1	3982.3

IMPACT OF HEALTH EXPENDITURE ON ECONOMIC GROWTH IN NIGERIA

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ABSTRACT

This paper empirically investigated the impact of health expenditure on economic growth in Nigeria. The paper used Real Gross Domestic Product (RGDP) as a proxy for economic growth, which is the dependent variable and the independent variables are Health Expenditure, Life Expectancy Rate, and Mortality Rate. The study established that there exists a long run relationship between economic growth and health expenditure in Nigeria when tested for co-integration. The Error Correction Mechanism (ECM) which is the methodology used showed that the disequilibrium in the economy can be adjusted back to equilibrium at a speed of 24.25%. The R^2 showed a 51% level of significant relationship between economic growth and health expenditure. The relationship between the dependent variable and mortality rate showed a negative and significant relationship of -988.95% while Life Expectancy Rate and Health Expenditure showed a negative and nonsignificant relationship of -97.5% and -2.9%, respectively. The paper recommends that more resources should be invested in the health sector to adjust the negative nature of the relationships that exist. This will help to provide all the available drugs needed in the health sector, thereby, reducing the cost of treatment to patients and out of pocket spending. Proper monitoring of the health sector expenditure should be done to reduce the issue of sharp practices in the sector like diverting of the drugs or purchasing of low quality drugs for the health centres.

Key Words: Health Expenditure, Real Gross Domestic Product, Error Correction Mechanism

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INTRODUCTION

Globally, there is increasing recognition of the human resources in the economic development of any economy among policy makers and academics alike. For instance, Leon (1972) posited that a nation with abundant physical resources will not benefit unless human resources put them to use. This view was supported by Gomos (2016) who noted that without human capital, human progress would be minimal; as plans, offices, computers, automated equipment, and internet that any organization may install remain unproductive except for human efforts and direction. Harbison (1973) argued that human resources, not capital or income, not material resources constitute the ultimate basis for the wealth of a nation. He explained that capital and natural resources are passive factors of production while human beings are the active agents who accumulate capital, exploit natural resources and build social, economic and political organizations and carry forward national development.

Due to the importance of the human resource to national development, there is strong advocacy for human resource development among scholars. This perception is on the assumption that with well-developed human resource, other challenges of development would be resolved. One of the developments of human resource is through investment in the healthcare system.

"Health is wealth", goes the popular saying and, therefore, better healthcare is a primary human need. The health sector is critical to social and economic development with ample evidences linking productivity to the quality of healthcare. In line with this, World Health Organization (WHO, 2015) argued that fifty per cent of economic growth differentials between developed and developing countries is attributed to ill-health and low life expectancy. Developed countries spend a higher portion of their Gross Domestic Product (GDP) on healthcare because they believe that their residents' health can serve as a major drive for economic activities. In Nigeria, the vision of becoming one of the leading economies of the world by the year 2020 will closely be tied to the development of its human capital through the health sector.

The role of healthcare spending in stimulating economic growth has been suggested in Mushkin's (1962) health-led growth hypothesis. According to him, health is a type of capital; thus, investment in health can increase income and lead to overall economic growth and development. This assertion was supported by Elmi and Sadeghi (2012), that health can affect the economy through its impact on human and physical capital accumulation. Since healthcare is a major component of human capital investment, rising national health care spending would tend to raise labour productivity, quality of life and general welfare. Healthcare spending has also been found to prolong life expectancy and reduce morbidity and infant mortality rates; this is supported by Murthy and Okunade (2009). Therefore, it can be stated that health is a significant form of human capital development and there is a close relationship between the health level of a society and economic development.

With the development of a country's economy, its people tend to place greater value on the quality of life, thereby having higher expectation of medical services, particularly in developed countries with higher national income (Wang, 2011). In line with these, Bedir (2016) posited that increasing healthcare expenditure in a country causes an increase in social security, progress, safety, and welfare, which lead to labour efficiency. Healthcare expenditure helps people with abnormal conditions to recover and return to work quickly. In general, healthier people can work harder and longer, and also think more clearly (Amiri, 2012).

Investment in health is not only desirable but also an essential priority for most societies, both developed and developing economies. Despite the growing body of evidence on the benefit of health investment, it has remained low in most developing countries. The proportion of health expenditure to GDP has remained below European Union (EU) average of 9-10% in many developing countries (Atun & Gurol, 2005). According to Scheffer in Temitope and Satope (2013), the old way has been to develop a country first, then spend resources on health. The new approach is that, if you want a country to develop economically, you must first spend a fair amount of money on healthcare in the process of development. This underscores the importance of investing in the health of a nation, particularly, Nigeria.

Funding for healthcare in Nigeria is from a variety of sources, which include government, the private sector, international donor agencies, out-of-pocket expenses, and non-governmental organisations (NGOs); this paper focuses on government funding. The government incurs the bulk of healthcare expenditure in Nigeria, which comprises of budgetary allocations from the government at all levels (Mathias, Dickson & Bisong, 2013). A higher unemployment rate and prices of goods and services are particularly more difficult economic situations for the majority of the poor population and have severe consequences on the health status of Nigerians. This paper is segmented into five parts, the introduction as presented above. The other parts include section two, which is literature review, section three is methodology, section four is data presentation and interpretation of findings, and section five takes care of conclusion, and recommendations.

LITERATURE REVIEW

According to Lichtenberg (2004), more public health services could enhance the level of life expectancy. An increase in government spending does not only lead to longer life and hence, faster economic growth as reinforced by that long life, but implies a larger workforce, which can also foster growth. A study by WHO (2010) revealed that a healthy person does not only work efficiently but is also able to devote more time to economic activities that increase productivity. It is estimated that health improvements account for a one-third increase in GDP growth (Bloom, Canning & Sevilla, 2004). Improved health status augments a country's human capital. The

prevalence of large-scale health problems such as high infant mortality rate and low life expectancy are as a result of scarce health resources and infrastructure. In this regard, adequate and efficient health spending remains crucial in improving health status, and the role of government is critical. Health is, thus, an important input in health production function. Nigeria's spending in the health sector is lower than 10% of GDP and this trend has continued since independence. Even though growth in terms of income per capita is significant over the past few years, this has less impact on health spending and, hence, significantly low health status of the population. Poor expenditure on the health sector in most developing countries is worsened by an inverted nature of health expenditure pyramid.

The drive to develop the health sector has prompted the Nigerian government over the years to channel a huge amount of money to the sector in order to provide a well-equipped and functional health sector to meet world standard which will bring about growth in the economy. The government health expenditure as a percentage of GDP in Nigeria was 4.8% in 1995. This increased to 5.6% in 1999 and 7.5% in 2003. It decreased to 5.74% in 2008; increased to 6.08% in 2009 and again reduced to 5.07% in 2010 (World Bank, 2010). Nigeria is yet to find a solution to most of the health challenges in the country, incessant outbreaks of Lassa fever, high maternal and child deaths, poor primary health facilities, lack of functioning cancer machines, malnutrition, poor health emergency responses, among others. Nigeria does not allocate enough funds for health interventions. This again has been shown in the 2017 national budget where only 4.17% was allocated to the health sector (Martins, 2017). Given this background, it becomes imperative to assess how public health expenditure has contributed to the improvements in health outcomes in Nigeria.

Nigeria is among the developing nations with poor health outcomes with its attendant problems. The health status of Nigeria is still considerably low and below that of some countries in West Africa (Onisanwa, 2014). Low life expectancy at birth, high rate of infant and maternal mortality, malaria and tuberculosis afflictions are some of the characteristics of Nigeria's health status. Life expectancy at birth in Nigeria was estimated at only 48 years in 2007, compared with 56 in Ghana. This is complemented by the high numbers of women who die of complications during pregnancy or childbirth. Although the global maternal mortality ratio of below 400 maternal deaths per 100,000 live births in 2008 is at a tolerable level, the maternal mortality ratio for Nigeria was 1,100 per 100,000 live births, which is still on the high side when compared to 560 and 910 in Ghana and Guinea respectively (WHO, 2010). The prevalence of HIV/AIDS infection among adults aged 15 and above has contributed significantly to Nigeria's low life expectancy, which was estimated at 2,886 per 100,000 people. It is above the prevalence rate in Ghana (1,722), but below that of Cameroon (4,580), (WHO, 2010). Also, the per capita income in Nigeria is low, with more than half the population living below the poverty line.

Thus, provision of adequate funding for healthcare either by the household or the government remains a difficult task.

In Nigeria, bad budget management has been identified as one of the main reasons for ineffective public spending in the country. While the increase in budgetary allocation to social services is highly desirable in a developing nation like Nigeria, it is by itself not sufficient to guarantee an enhancement in service delivery. In Nigeria, for example, despite the huge government expenditure on health provision, the health status of Nigerians is consistently ranked low. Nigeria's overall system performance was ranked 187th position among 191-member states by World Health Organization (WHO) in 2000. The country's rate of infant mortality (91 per 1,000 live births) is among the highest in the world (National Health Policy, 2004). Nigeria was also ranked 152 in human development indices (UNDP, 2016). It, therefore, becomes imperative to find out if governance has an impact on the effectiveness of health expenditure in Nigeria.

However, it is expected that the budgetary allocations to health sector would improve health outcome and reduce all kinds of mortality rates. Ichoku and Fonta (2006) observed that increased budgetary allocation to health has assisted some heavily indebted poor countries to fight poverty and raise the standard of living of people in these countries. Remarkably, the federal budgetary component of health expenditure has increased over the years. It increased from 1.7% in 1991 to 7.2% in 2007 (WHO, 2009; NHS, 2011). Nevertheless, the budgetary allocation for health is still below the 15% signed by the Nigerian government in Abuja declaration (WHO, 2009). Given this level of government spending, it will be very difficult to provide adequate essential healthcare services and with the unpredictable changes of the oil prices in the world market and low tax base, healthcare will always be at the peril of underfunding by the Nigerian government. Low level of life expectancy is explained by inadequate finances meant for the health sector in Nigeria. This is blamed on the uneven distribution of finance and facilities, especially at the primary healthcare level.

In a healthcare study by Australian Institute of Health and Welfare (AIHW, 2017), healthcare expenditure occurs when money is spent on health, goods, and services. This spending occurs at different levels of government, as well as by non-governmental entities such as private health insurers and individuals. Public health is characterized by planning and intervening for better health in populations rather than focusing on the health of the individual. These efforts are usually aimed at addressing factors that determine health and the causes of illness rather than their consequences, with the aim of promoting health or preventing illness. Public health services are vital to the overall health status and well-being of the nation. Improving them can result in major economic and social benefits as well as minimizing future demand on health services over time.

Empirical Review

The interactions between healthcare expenditure and economic growth have received a lot of attention from scholars internationally and nationally. This paper reviewed the related analysis of the relationships between health expenditure and growth.

In a study conducted by Ilori and Ajiboye (2015) on the impact of health expenditure on economic growth in Nigeria, using time series data spanning from 1981 to 2013,ordinary least square regression analysis, Auto-regressive Distributed Lag (ARDL) Model approach and Error Correction Mechanism (ECM) were employed as the estimating techniques to test the existence of long-run relationship between the variables.The result showed that gross capital formation and total health expenditure determine in part the level of economic growth in Nigeria with a positive impact, while life expectancy rate indicates negative impact on the growth contrary to theoretical economic expectation for the period covered by their study. Their study recommended that government should encourage savings and investments in the economy, increase expenditures on health provisions, which will induce the level of labour productivity, and place priority on the issues of security of lives and properties so as to pave way for growth and development of the Nigerian economy.

Bedir (2016), in his paper investigated the relationship between health expenditure and economic growth in some developing countries. Using panel data for 16 countries, he found out that there is a rising health expenditure per capita in all the countries in the panel. Moreover, the result revealed that health expenditure per capita (HEXP) grows more rapidly than the capital income growth rate (INC) for the countries. The causality test employed showed that in Europe, Middle East, and Russia, one-way causality exists from HEXP to INC and also found that in Hungary and South Africa. A one-way causality exists from INC to HEXP and for Greece, Poland, United Arab Emirate (UAE), and Indonesia. Empirically, the result has indicated that income to a greater extent explained the variation of health expenditure in the countries under study. It is evident, therefore, that the role played by health expenditure in Nigeria was not given attention.

Aguayo-Rico and Iris (2010) examined the impact of health on economic growth for 13European countries, 12 African countries, 16 American countries, and 11 Asian countries over the period 1970-80 and 1980-90 using ordinary least square (OLS). The authors found that health capital has a significant effect on economic growth, especially with a variable that captures all the determinants of health. Some other studies on health and economic growth conducted earlier found a positive relationship between the two.

Lustig (2006) in a study on the direct relationship between health and growth in Mexico uses 1970-1995 data, used life expectancy and mortality rates for different age groups as health indicators. He observed that health is responsible for

approximately one-third of long-term economic growth. He considered health to be an asset with an intrinsic value as well as instrumental value. Good health according to him is a source of wellbeing and highly valued throughout the world.

Adeniyi and Abiodun (2011) analysed the effects of health expenditure on Nigeria's economic growth. Using data on life expectancy at birth, fertility rate, capital and recurrent expenditures between 1985 and 2009, they argued that if funds are judiciously expended in the health sector, the effects of this expenditure on economic growth will be direct and substantial, thus, the need to improve the quality and type of health provided. Odior (2011) using an integrated sequential dynamic computable general equilibrium (CGE) model, examined the potential impact of an increase in government expenditure on health in Nigeria. The result showed that the re-allocation of government expenditure to the health sector is significant in explaining economic growth in Nigeria, thus, the need for government to invest in health services. Ogundipe and Lawal (2011) examined the impact of health expenditure on economic growth in Nigeria. Using the OLS technique, they found a negative effect of total health expenditure on economic growth.

METHODOLOGY

There are numerous studies that attempted to investigate the impact of health expenditure on economic growth. However, most of these studies are largely cross-country in nature and devoid of results necessary for the country-specific solution. One of such in Nigeria is a study conducted by Ilori and Ajiboye (2015) on the impact of health expenditure on economic growth in Nigeria, using time series data spanning from 1981 to 2013 with its attendant result. This study intends to fill the gap by studying the extent and magnitude of health expenditures contributions to the growth of Nigerian economy from 1981 to 2015. This study will fill the gap of time frame to see whether there have been changes from the one conducted by Nigerians previously.

This paper relied on secondary data to estimate the specified models of the work. Data were collected on Real Gross Domestic Product, Life Expectancy Rate, Health Expenditure and Mortality Rate variables in the Nigerian economy spanning from 1981- 2015, a period of thirty-four (34) years. The data used were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin 2015 and World Bank Development Indicators document (various issues). The study will employ Ordinary Least Squares Regression Analysis and Error Correction Mechanism (ECM).

The study used data on Real Gross Domestic Product (RGDP), Life Expectancy Rate (LER), Health Expenditure (HEX) and Mortality Rate (MOR) to test the hypothesis, but most of the studies reviewed ignored the Mortality Rate.

Model Specification

For this Paper, the functional relationship between the variables is stated thus:

RGDP= f (LER, HEX, MOR)..... 1

The functional model will be converted to a stochastic relationship as:

$RGDP= \beta_o + \beta_1 LER + \beta_2 HEX + \beta_3 MOR + \mu$ 2

Where:

RGDP= Real Gross Domestic Product

LER= Life Expectancy Rate

HEX= Health Expenditure

MOR= Mortality Rate

μ= Error Term

β_o = Intercept of the regression

β_1, β_2 and β_3= parameters coefficient of the respective explanatory variables

Apriori Expectation

On estimation, the intercept β_o and the slope coefficients β_1, and β_2 are expected to have a positive sign and a negative for β_3. That is, positive economic growth is expected at zero value of LER, HEX, and MOR.

The Ordinary Least Square estimation technique is used to estimate the relationships; however, due to the dynamic nature of the relationships, the Error Correction Mechanism ECM is employed in the estimation of the model. This is important to reconcile the short-run dynamics with the long-run equilibrium. Thus, the specification of the model is:

$\Delta RGDP= \beta_o + \beta_1 \Delta LER + \beta_2 \Delta HEX + \beta_3 \Delta MOR + \alpha ECM\ (-1)$ 3

Where β_o is the constant and α is the error correction term which is expected to be negative and lie between zero and one.

A preliminary test to ascertain the time-series properties of the variables in the model was conducted using Augmented Dickey-Fuller Test (ADF). This was followed by a Co-integration test to determine if the variables in the Real Gross Domestic Product are moving together with time. The Johansen co-integration method was used for this analysis because the study involves the use of multivariate estimations to ascertain the direction of the relationship between Real Gross Domestic Product, Life Expectancy Rate, Mortality Rate, and Health Expenditure.

Unit root test

This paper applied unit root test to determine if the data is stationary before any

analysis can be conducted. The unit root test is conducted to validate the data for analysis and was tested using Augmented Dickey-Fuller test at 5% level of significance. The justification for the application of Augmented Dickey-Fuller test was the enhancement of stationary series and for the avoidance of spurious parameters. Also, the choice of lag length was lag (0), which was used uniformly for all variables. The result is shown in table 1.

Table 1: Summary of the Augmented Dickey-Fuller Test

Variables	ADF Statistic	5%Critical value	Order of Integration	Remark
LOGMORT	6.249664	-2.951125	1(0)	Stationary
At First Difference				
LOGRGDP	-3.378660	-2.95402	1(1)	Stationary
LOGHEX	-8.511785	-2.95401	1(1)	Stationary
LOGLER	-5.273072	-2.954021	1(1)	Stationary

Source: Authors' computation from Eviews 7.1

Following Pesaran and Pesaran (1997) procedure, ADF unit root test for this study confirmed that only one of the variables in the research model is stationary at 1(0) and the remaining three are stationary at first difference1(1).

The result in table 1 above indicates that when the variables are tested at levels, only Mortality Rate is stationary. Moving forward, we difference the respective variables and perform the unit root test on each of the resultant time series. The rationale behind this procedure is as Box and Jenkins (1976) have argued that differencing non-stationary time series will make it attain stationarity. The result of the unit root test on these variables' first difference showed that Real Gross Domestic Product, Life Expectancy Rate, and Health Expenditure are all stationary. With these results, these variables are adjudged to be stationary at 5% critical value. This implies that the variables are integrated of order one 1(0) and 1(1). The findings indicated that the null hypothesis couldn't be rejected for some variables but after differencing the data, the absolute ADF statistics are significant (above 5% critical values) for all the variables. Given the unit root properties of the variables, we proceed to test the long run relationship between them using Johansen co-integration test.

Co-integrating Test Result

Co-integrating test was carried out to determine the long run relationship between the dependent variable (LOGRGDP) and the independent variables (LOGHEX, LOGLER, and LGMORT). The Johansen test result is presented in tables 2 and 3

Table 2: The co-integration test Result

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.768330	92.81729	47.85613	0.0000
At most 1 *	**0.640866**	**44.55678**	**29.79707**	**0.0005**
At most 2	0.275556	10.76277	15.49471	0.2265
At most 3	0.003786	0.125182	3.841466	0.7235

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 3: Maximum Eigenvalue

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.768330	48.26051	27.58434	0.0000
At most 1 *	**0.640866**	**33.79401**	**21.13162**	**0.0005**
At most 2	0.275556	10.63758	14.26460	0.1733
At most 3	0.003786	0.125182	3.841466	0.7235

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: Authors' computation

The Maximum Eigenvalue co-integration test result showed that the null hypothesis of no co-integrating relationship among the variables is rejected at 5% level of significance. This is because the test indicates two co-integrating equations among the variables of the model. The two tests confirm the presence of a co-integrating equation. Therefore, it means that there exists a long run relationship between economic growth and health expenditure in Nigeria. The Trace statistic and the maximum Eigen Statistics are all greater than the critical values at 0.05. Hence, long-run relationships exist between the variables and to reconcile it the Error Correction Mechanism (ECM) was employed.

Error Correction Mechanism (ECM) Result

The error correction specification restricts the long-run behaviour of the endogenous variables to their co-integrating relationships while allowing a wide range of short-run dynamics. The error correction term depicts the speed of adjustment of the dynamic short-run to the long-run equation. The purpose of ECM is to capture the short-run deviation that might have occurred in estimating the long-run co-integration equation. The error correction was estimated with respect to the dependent variable, RGDP using the Ordinary Least Square (OLS).

Table 4: Error Correction Result

	Coefficient	Std. Error	t-Statistic	Prob.
ECM (-1)	-0.242544	0.111094	-2.183220	0.0400
DLOGHEX	-0.029456	0.015219	-1.935499	0.0659
DLOGLER	-0.975091	1.481102	-0.658355	0.5171
DLOGMORT	-9.889540	3.919960	-2.522867	0.0194
C	0.052609	0.014113	3.727680	0.0012

R-squared	0.511393	Mean dependent var	0.050193
Adjusted R-squared	0.311509	S.D. dependent var	0.035573
S.E. of regression	0.029517	Akaike info criterion	-3.957401
Sum squared resid	0.019167	Schwarz criterion	-3.499359
Log-likelihood	73.31842	Hannan-Quinn criter.	-3.805573
F-statistic	2.558443	Durbin-Watson stat	2.140042
Prob(F-statistic)	0.034898		

SOURCE: Authors' computation using Eviews 7

The ECM parameter is negative and significant at 5% level as expected. The ECM is an error correction term in the model to restore equilibrium and validate that there exists a long-run equilibrium relationship between the variables. The value of the ECM is -24.25%, meaning that the system corrects (or adjusts to) equilibrium in the following year at speed of -24.25%. This implies that the adjustment process to equilibrium is slow because of the lower ECM value. Based on this result, the regression shows that a negative and insignificant relationship existed between economic growth and Life Expectancy Rate (LER) in Nigeria at 5%. It shows that a unit rise in LER will lead to a reduction in economic growth by 97.5%. This could be as a result of poor finance of the health sector by government. The money that is expected to improve the health sector, as well as the health status of Nigerians, is diverted to some individual pockets with attendant negative consequences on the growth of the health sector as well as the growth of the economy at large. It is, therefore, important to come up with measures that will increase the LER of Nigerians. Following Bloom and Canning (2003), higher LER will increase both marginal productivity and life time-saving thereby improving economic growth. The result is consistent with Ilori and Ajiboye (2015) who found a negative relationship between economic growth and LER, but a positive relationship between economic growth and Health Expenditure. The result further shows that there exists a negative relationship between Health Expenditure and economic growth; a unit change in Health Expenditure will reduce the RGDP by 2.9% and the Health Expenditure is statistically nonsignificant at the 5% level of significance. This shows that though

Nigeria's public expenditure on health has the tendency of stimulating economic growth, factors such as gross mismanagement of funds have hindered its stimulating influence. On the other hand, the result showed that there exists a negative relationship between Mortality Rate and Real GDP; a unit increase in Mortality Rate will lead to a reduction in RGDP by 988.95% in the economy. Hence, the government needs to put in more resources in the health sector to reduce the mortality rate. The regression result showed that there exists a positive and a significant relationship between health expenditure and economic growth in Nigeria. This is indicated by the goodness of fit of 51% growth in real GDP, which is as a result of a change in the independent variables while the remaining 49% is by the disturbance variables. The overall significance is measured by the value of the probability F-statistic which is 0.03 and is less than 0.05 significance level, indicating a significant relationship. This paper, therefore, rejects the null hypothesis and concludes that there is a significant impact of public health expenditure on economic growth in Nigeria. The result shows that the growth in Real Gross Domestic Product can be measured as a result of an increase in public expenditure as Keynes put it and that would be accompanied by monitoring of the funds invested in the health sector for a positive and a significant result.

Normality Test

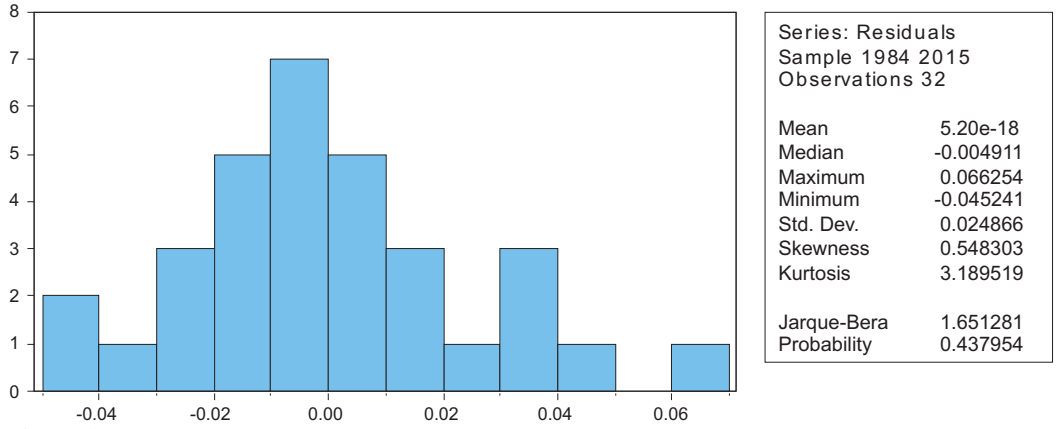

Figure 1: Jarque-Bera Test
Source: Authors' computation

Testing at 5 percent level of significance, the Jarque Bera of 1.65 is greater than 0.44. This implies that the residuals are normally distributed, which is a desirable result. The result of the stability test is presented in figure 2.

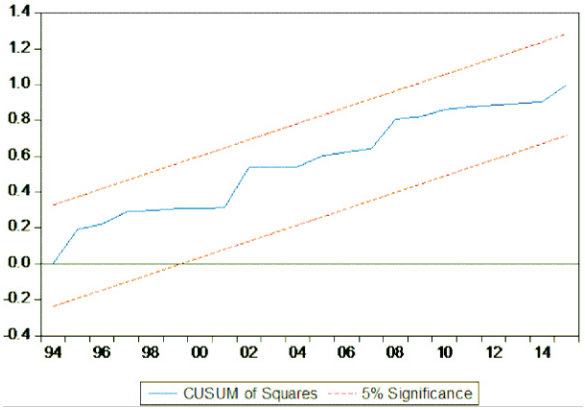

Figure 2: Stability Test
Source: Author's computation

For stability, it is important that the residuals and the cumulative sum of the squares remain within the 5 percent critical bound (represented by two straight lines). The residual in the model remained within the two lines from 1994 to 2014, which parameters are adjudged to be stable within the years indicated by the graph.

CONCLUSION AND RECOMMENDATIONS

The role of health in economic growth cannot be underestimated since it is only with a healthy populace that the economy can translate into higher productivity, thereby, transforming the Nigerian economy. The result of the research showed that not much attention has been given to the health sector (based on the coefficient of health expenditure and that of the life expectancy rate) which largely explains why it is impacting negatively on the economy. Furthermore, life expectancy and health expenditure do not impact positively on economic growth.

More resources should be invested in the health sector, which would help in providing all the health consumables needed in Nigerian hospitals and, hence, reduce the cost of treatment to patients, thereby, reducing the out of pocket expenditure by the patients. This will encourage the common man to have access to the hospital and take care of his/her health, thereby, improving life expectancy rate and reduce the death rate. Specifically, government should increase its budgetary allocation to the health sector up to the 15% as recommended by the Abuja Declaration.

Proper monitoring of the allocation to the health sector should be done to reduce corruption and mismanagement of the funds allocated to the health sector that will help the health sector to impact positively on the economy. This could be done by any of the anti-graft agencies.

The government should provide free anti-natal and post-natal care, and provide free vaccines and drugs for women and children. This will go a long way in improving the Life Expectancy Rate in the country and reduce Mortality Rate.

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EFFECTS OF PUBLIC EXPENDITURE ON UNEMPLOYMENT, INFLATION, EXCHANGE RATE AND ECONOMIC GROWTHIN NIGERIA

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ABSTRACT

This paper examined the effects of public expenditure on unemployment, inflation, exchange rate and economic growth in Nigeria for the period 1986-2017. The period (1986-2017) is significant because the implementation of structural adjustment programme (SAP) in 1986 brought about a major shift in the structure of public expenditure to encourage domestic output growth and employment. The study used the Vector Error Correction Mechanism (VECM) to measure the speed of adjustment in unemployment. Inflation, exchange and economic growth rates and public expenditure grew over the period. The results indicated that past increase in capital expenditure contributed positively to current (2017) inflation, unemployment, exchange and economic growth rates in Nigeria. The implication is that as public expenditure increased both in the past period and current period, inflation rose, unemployment rate increased, the Naira exchange rate depreciated against the Dollar with marginal increase in economic growth rate during the period 1986-2017. On the other hand, increase in recurrent expenditure also contributed positively to inflation, unemployment and exchange rates; but negatively related to economic growth rate. In other words, as recurrent expenditure increased during the period, inflation, unemployment and exchange rates all rose, while economic growth rate fell. This study recommends; first, public expenditure should target real physical and human capital development sectors with the highest growth potentials such as infrastructure, education and health. Second, strict implementation and compliance stance should be maintained to keep track of expenditure performance and targets in order to keep expenditure levels within the monetary absorptive capacity of the economy to mitigate inflationary pressure. Third, public expenditure should be designed to focus on export-oriented production and consumption pattern in order to create needed incentives for domestic output expansion that would lead to employment creation.

Key Words: Public Expenditure, Unemployment, Inflation, Exchange rate, Economic growth JEL CODE: E62

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INTRODUCTION

Public expenditure is strategic to economic growth and development especially in developing economies; and it is considered an important instrument as far as public sector policy is concerned. Generally, public spending is incurred and essentially directed at stimulating and sustaining economic activities that have potentials for sustained income streams, employment creation, and consumption stimulation that would enhance growth. However, arguments exist that suggest that public expenditures are undertaken in different economies with diverse targets and objectives. The target objective of public expenditure may be economic, social and political in nature depending on the prevailing circumstances that informed the spending. Differences in the focus of public spending may essentially be determined by the stage and level of economic, social and political development of the spending country. The existence of economic factors such as low level of personal saving, low per capita income and low saving-Gross Domestic Product (GDP) ratio in developing economies such as Nigeria lend credence to the argument that supports the use of public expenditure as a useful tool for leveraging steady growth. Sequel to this gap is the fact that infrastructural development and growth in capital accumulation is indispensable to the growth of industries and manufacturing, which essentially constitutes the bedrock for sustainable economic growth.

In Nigeria public expenditure is a major instrument for macroeconomic stability, as such there has been consistent debates and modifications to public expenditure policy since the attainment of independence in 1960. Such modifications have led to persistent and astronomical rise in Nigeria's public expenditure. The general view is that public expenditure, either recurrent or capital expenditure, which is geared towards infrastructure development has potentials for economic growth and social well-being. Therefore, the size and structure of public expenditure are expected to determine the pattern and form of growth of the economy. Theoretically, public expenditure is argued to have potentials to boost aggregate demand, raise output and create jobs thereby lowering unemployment in the Keynesian sense (Jhingan, 2010) with limited possibilities for a stable exchange rate and moderate inflation. Furthermore, with sustained public expenditure and consumption patterns, output is theoretically expected to rise, thereby leading to employment creation in the economy (Bhatia, 2002). Thus, the problem of this study is that the theoretical expectation of growth in employment and a rise in economic growth as public expenditure grows has not been met in Nigeria as unemployment rate has remained in double digits from 1999 (17.5%) to 2017 (14.2%) as indicated in table 1.

The above expectations have provided the basis for persistent increases in public expenditure in Nigeria (Maji, 2014). Available statistics on Nigeria show that total government expenditure rose continuously in the last three decades. For instance, as indicated in table 1, total public expenditure increased from N16,223.7 million in 1986 to N701,059.40 million in 2000, N4,194,576.51 billion in 2010 and

N4,605,319.72 billion in 2012 as indicated by Central Bank of Nigeria (CBN, 2012). In the same manner, composition of government expenditure showed that both capital and recurrent expenditure have increased during these years (1986 – 2017), with recurrent expenditure taking the larger proportion of total expenditure than capital expenditure. Figures from Central Bank of Nigeria (CBN) for the period 1986 – 2012 indicated that total government recurrent expenditure increased from N7, 696.90million in 1986 to N124, 491.30 million in 1996, N1, 290, 201.90 million in 2006 and then N3, 325, 156.25million in 2012. During the same period capital expenditure increased sharply from N8, 526.80million in 1986 to N212, 926.30million in 1996, then to N552, 385.80million in 2006 and further increased to N874, 762.27million in 2012. In 2012 recurrent expenditure accounted for about 71.5% of total expenditure against 28.5% expended on capital expenditure (CBN, 2012). There was a gradual increase in total expenditure from N2, 471,690.47 billion in 2013 to N7, 482, 851.40 in 2015 before falling sharply to N638, 968.60 million in 2016 (CBN, 2016); while as at the end of 2017 total expenditure stood at N4.814 trillion (NBS, 2017). The statistics above generally shows a declining quality of public expenditure, in view of the diminishing proportion of capital expenditure and the significant growth in recurrent expenditure.

Given that there was an average increase in public expenditure in Nigeria over the period 1986-2017, it is theoretically expected that basic macroeconomic variables such as unemployment would fall and economic growth would improve. For instance, available data for unemployment in table 1 indicate that unemployment fluctuated between 5.3% in 1986 and 3.5% in 1998; but rose sharply to 17.5% in 1999 before falling to14.9% in 2008 (CBN, 2009). Again, it rose sharply to 19.7% in 2009 and stood at 23.9% in 2012 before falling to 14.5% and 14.2% in 2016 and 2017, respectively (CBN, 2016; NBS, 2017). This trend is also observable for economic growth rate, exchange rate and inflation which have posted worsening trend over the same period (1986-2017) as indicated in table 1.

The question that arises from such rising public expenditure is; what are the effects of increasing public expenditure on unemployment, inflation, exchange rate, and economic growth in Nigeriafl Thus, the objective of this study is to measure the speed of adjustment in unemployment, inflation, exchange rate, and economic growth to increase in public expenditure in Nigeria. The rest of the study proceeds in four sections; section 2 provides theoretical and empirical literature review, section 3 focuses on methodology of the study; while analysis and discussion of results are presented in section 4. Finally, conclusion and recommendations are provided in section 5.

LITERATURE REVIEW

Conceptual Classification

The dominant nature of public expenditure as a major instrument for

macroeconomic stability particularly in developing economies like Nigeria makes a clear understanding of the theoretical and contextual basis for its use imperative for public policy purposes. In Anyanwu's (1997) view public expenditure is the expense that government incurs for its own maintenance, for the benefit of the society, the economy, external bodies and other countries. In simplistic terms, Anyanwu (1993) sums up public expenditure as government spending from revenues derived from taxes and other sources. However, Central Bank of Nigeria (2003) conceived public expenditure to be an outflow of resources from government to other sectors of the economy. Also, CBN (2003) classified government spending into recurrent and capital expenditures. While it defined capital expenditure as payment for non-financial assets used in production for more than one year; recurrent expenditures was defined are payments for non-repayable transactions within a year.

According to Lindauer and Valenchik (1992) cited in Ijaiya, et al (2003) government spending is used to meet rapid population and economic growth and subsequent demographic transitions, increase in income and taste of the people of the country that leads to increase in demand for government goods and services, increase in technological requirements for industrialization, increase in urbanization, increase in inflation over time, balance in productivity growth between public and private sector, and the need to address natural disasters among other things.

Theoretical Review

There are three basic theories around which arguments for public expenditures are largely justified. These are Wagner's (1835-1917; cited in Anyanwu, 1993) law of increasing state activities; Peacock and Wiseman (1961) theory; and the Keynesian proposition of government intervention (1936). According to Wagner (1835-1917, cited in Anyanwu, 1993) increasing state activity is precursor to an increased level of economic development and such increase in state activities is a causative factor for the growth of public expenditure. In Wagner's view, this relationship between increasing state activities and economic development that has consequences for increasing state expenditure operates as a matter of law (Jibril, 2014). This law is the result of empirical observation in progressive countries in Western Europe.

Wagner observed that an increase regularly takes place in the activities of both the central and local governments of economically progressing countries. Such increases are both extensive and intensive: the central and local governments constantly undertake new functions, while they perform both old and new functions more efficiently and completely (Taiwo and Abayomi, 2011). In other words, there is a functional relationship between the growth of an economy and the growth of government activities such that the government sector grows faster than the economy. Thus, all kinds of government irrespective of their levels, intensions (peaceful or warlike) and sizes indicate the same tendency of increasing public expenditure (Anyanwu, 1993; Jibril, 2014). Wagner furthered his argument by stating that social progress has implications for increasing state activities, which, in

turn, implies more public expenditure. Thus, Wagner's argument of increasing state activities and consequently public expenditure can be viewed from two major perspectives such as: expenditure for internal and external security, that is, law and order; and culture and welfare which involves participation in the material production of economic goods, including the provision of social products such as educational services, money/banking arrangements in the face of market failure.

Wagner pointed out that government corporations are expected as a matter of policy to produce certain economic goods requiring large fixed investment, since private companies cannot undertake such investment on a profitable basis, with consequences for public expenditures. Thus, beside the traditional state function of expanding state activities, other forces behind the tendency of increasing public expenditures are rising population, urbanization and, hence, pressure on civic amenities, higher prices, the need to provide increasingly qualitative services, provision of welfare and social security measures, rising cost of servicing debt and debt repayments, and accepted ideals of planning and economic growth (Maji, 2014). It is worthy to note that Musgrave (1969) speculated that Wagner's propositions must be interpreted as a postulation for rising share of the public sector or ratio of expenditure to the gross national product (GNP) within the context of the development of a country to higher per capita income. This is largely interpreted to mean justification for increasing public expenditure as a prescription for influencing economic progress towards higher output and income (Jibril, 2014). Musgrave's (1969) interpretation of Wagner's law as confirmed in Jibril (2014) assumed a functional relationship of the form; $\frac{E}{GNP} = f\ \frac{GNP}{P}$ and it appears that the validity of the law is established whenever the elasticity of public expenditure as a share of gross national product with respect to gross national product per capital $\left[\frac{e_E}{GNP}.\frac{GNP}{P}\right]$ is more than unity. Where E is defined as public expenditure, GNP is gross national product, P is the population, and e_E is the elasticity of public expenditure. Thus, implying the ratio of expenditure to GNP should be equal to the ratio of GNP to the population otherwise known as the per capita income. The validity of Wagner's law is intended to show that when the elasticity of public expenditure as a share of gross national product with respect to gross national product per capita is greater than 1, then public expenditure targets in respect of output growth and employment creation as indicators of development could be potentially met.

Peacock and Wiseman (1961) essentially focused on the analyses of the time pattern of public expenditures. Peacock and Wiseman's (1961) analysis was based on the political theory of public determination that claimed governments like to spend more money and that citizens are averse to tax payment, and that governments need to pay definite attention to the wishes and aspirations of their citizens.

Peacock and Wiseman (1961) used the public expenditure of the U.K for the period 1890-1955 to show that public expenditure does not always increase in a smooth and continuous manner, but in jerks or step like fashion. In other words, government

fiscal activities rise step by step to successive new plateaus, sometimes, some social or other disturbance takes place creating a need for increased public expenditure which the existing public revenue cannot meet (Anyanwu, 1993; Nwezeaku, 2010; Maji, 2014). Peacock and Wiseman (1961) considered the role of emergency, such as war, in raising the level of public expenditure. In normal times, size of public expenditure is limited broadly by the level of taxation which the general public is prepared to tolerate. This tolerable level cannot be high. But major disturbance like war, changes the tolerance limit. At some times, catastrophic occurrences such as wars, famine, and large scale social disturbances take place to induce the need for increased public expenditure over and above what the people had earlier regarded as acceptable level and are willing to accept a rise in taxes. During the period of crises or conflict, they get so used to these new tax burdens that even if taxes are reduced in the immediate post-crises periods, the tax rates do not fall back to the pre-crisis levels. Hence the growth trend of revenue and expenditures is moved upward permanently. The result is a new higher level of government revenue and expenditure which displaces the old one (Nwezeaku, 2010). This movement has been termed as the 'displacement effect'.

Overall, Peacock and Wiseman's (1961) theory postulates that in the absence of major disturbances like war government outlay would increase only gradually (Anyanwu, 1993). The implication is that the movement from the older level of expenditure and taxation by major economic disturbances to a new and higher level is the 'Displacement Effect' with spill-over effects for economic growth.

Furthermore, Peacock and Wiseman (1961) showed that insufficiency of the revenue as compared with the required public expenditure creates an 'inspection effect' that is, war and other social disturbances force people and the government to seek solutions to important problems which previously had been neglected. In addition, since each major disturbance causes government to assume larger proportion of national economic activities, the net result is the 'concentration effect' or 'scale effect'. This refers to the apparent tendency for national government economic activities to grow faster than that of the state and the local governments when a society is experiencing economic growth. The concentration effects hold that the change in the division of responsibilities between layers of government, brought about by these major social disturbances, is always in favour of the higher organs of government.

The Keynesian proposition for government intervention in economic activities to leverage growth represents Keynes (1936) theory on the expansion of government expenditure to accelerate economic growth. Keynes (1936) assumed the aggregate supply function to be stable, and, therefore, focused his attention on the aggregate demand function to tackle economic depression. In Keynes' view, lingering economic depression is the result of failure on the part of the government to control the economy through appropriate economic policies. Consequently, Keynes proposed the concept of government intervention in the economy through increase in

public spending (Torres, 2010). According to Keynesian economics, imbalance is consequent upon certain and serious shocks that have occurred in the economy. As far as Keynes was concerned, only the government can act in the best interest of the public; as private consumption and investment may fall far below the required amount to spur aggregate demand necessary to cause economic growth at such a time. Thus, the government can act to restore equilibrium by raising its spending in order to increase aggregate demand. Since the influx of government spending drives businesses to hire and consumers to spend, its impact is multiplied (Mankiw, 2010). Thus, the Keynesian proposition generally postulates that increase in government expenditure leads to increase in economic activities and higher economic growth. The Keynesian theory asserts that government expenditure, especially deficit financing, could provide short-term stimulus to help halt a recession or depression. In simplistic terms, this analysis concludes that public spending measures have a direct impact on aggregate demand, which, inturn, stimulates economic growth.

Empirical Literature

Some studies have empirically verified the response of some macroeconomic variables to changes in public expenditures in Nigeria. First, Okpara and Nwaoha (2010) examined the relationship between government expenditure, prices and output in Nigeria using a reduced form growth model estimated with two stage least squares method. The results indicated that public expenditure had significant implications for increases in money supply and consequently prices. Also, the results showed that public expenditure and money supply tend to move in the same direction and that inflation and output growth are positive functions of growth in public expenditure. However, the study noted that such growth had insignificant impact on employment. Loto (2011) investigated the effect of government sectoral expenditure on economic growth in Nigeria during the period 1980-2008. The selected sectors are security, health, education, transportation and communication, and agriculture. The study employed error correction model (ECM) to evaluate the interactions between government spending on these sectors and economic growth. The results indicated that in the short-run, expenditure on the agricultural sector was negatively related to economic growth. The impact of education, though also negative was not significant. However, expenditure on the health sector was positively related to economic growth. Though expenditures on national security, and transportation and communication were positively related to economic growth, the impacts were not statistically significant at the 5% significance level.

Again, Banuso and Odior (2012) studied the impact of macroeconomic volatility on Government Consumption Expenditure (GCE) as well as the burdens and challenges it imposes on public welfare. The study hypothesized that government consumption expenditure (GCE) depended on changes in indicators of macroeconomic performance such as inflation, real exchange rate, and unemployment rate between 1980 and 2008. The study used Structural Vector Auto-regression (SVAR) to capture

the dynamic interactions among the variables and to describe the contemporaneous relationship between the variables. The results revealed that government consumption expenditure (GCE) response to structural one innovation appears to be greater in inflation than other endogenous and exogenous variables; that is, an economic shock to inflation effect is stronger on government consumption expenditure (GCE) at a longer horizon. Also, inflation innovations played a larger role in explaining government consumption expenditure forecast error variance in the short run than in the long run and this generates negative net effects on public welfare manifesting in unemployment, depreciation in exchange rate and fall in output growth in the short run. Olabisi and Oloni (2012) analyzed the relationship between the compositions of public expenditure and economic growth in Nigeria from 1960 to 2008. The study postulated that government expenditure was intended as a matter of policy to be a means of reducing the negative impacts of market failure on the economy. They used Vector Auto-regressive (VAR) Models to estimate the relationship between government expenditure compositions and economic growth and found that expenditure on education had failed to enhance economic growth due to high rate of rent-seeking and the growing rate of unemployment. Also, expenditure on health and agriculture were found to be positively related to economic growth but not significant at 5% significance level, while expenditure on water and education was found to be negatively related with economic growth.

Momodu and Ogbole (2014) examined the relationship between public expenditure and selected macroeconomic variables (GDP, unemployment, inflation, and balance of payment) in Nigeria for the period 1970-2010 using multiple regression analysis and Granger causality test. The study's results showed that public expenditure marginally stimulated growth in GDP, significantly reduced unemployment and enhanced balance of payment position and price stability between 1970 and 1985 (period of economic regulation), while during the period 1986-2010 public expenditure did not significantly improve GDP, unemployment, balance of payment position and inflation.

Lawong and Onah (2017) investigated the trend and relationship between government expenditure and inclusive growth in Nigeria for the period 1970-2014 using trend analysis and ordinary least square (OLS) regression technique. The trend analysis results show that government expenditure has been on the increase over the study period with recurrent expenditure higher than capital expenditure and that inclusive growth did not trend well with both expenditure components (recurrent and capital) for the study period. The OLS results showed that capital expenditure has a negative and nonsignificant impact on inclusive growth; while recurrent expenditure was positively related to inclusive growth but not significant at the 5% level. The study concluded that irrespective of the fact that government expenditure had been on the increase during the study period; such increase had little or no impact on

inclusive growth. Sabo-Adamu and Umar (2017) examined the impact of agricultural expenditure on economic growth in Nigeria for the period 1981-2013 using the Auto-Regressive Distributed Lag (ARDL) model. The results indicated that while recurrent expenditure on agriculture impacted positively on economic growth, capital expenditure on agriculture indicated a negative impact on economic growth.

From the empirical studies above, it is clear that public expenditure has clear implications for macroeconomic variables in Nigeria. However, most of the results indicated negative relationship between public expenditure and economic growth, employment and exchange rate, while it has positive relationship with inflation. Generally, this does not conform to theoretical expectations. However, it should be noted that Bhatia (2002) and Bloom, Canning and Sevilla (2001) had earlier posited that public expenditure can either promote or retard economic growth through its impact on decisions regarding investment in physical and human capital. When such decisions are based on appropriate investment assessment and evaluation, the growth process can be enhanced. If otherwise, the growth process would be retarded.

Trends in Capital and Recurrent Expenditure, Unemployment, GDP growth rate, Inflation and Exchange Rate in Nigeria (1986-2012)

The introduction of Structural Adjustment Programme (SAP) in 1986 had serious implications for macroeconomic variables such as capital and recurrent expenditures, unemployment, GDP, inflation and exchange rate in Nigeria. Theoretically, changes (increase or decrease) in public expenditure have clear implications for the macroeconomic variables above. Thus, changes in the basic components of public expenditure – recurrent and capital, had serious impact on unemployment, GDP (economic) growth, inflation and exchange rate.

Available evidence from CBN (2013) and National Bureau of Statistics (NBS, 2013) indicates that unemployment rate declined from 7% in 1987 to 3.5% in 1998 and rose to 17.5% in 1999 (table 1). The rate of unemployment in Nigeria fell from 7.0% in 1987 to 1.90% in 1995 and thereafter grew steadily to 17.5% in 1999 before falling gradually to 12.70% in 2007 as indicated on table 1. It rose steadily to 23.9% in 2012. As indicated in table 1, inflation rate was 13.67% in 1986. The highest rate recorded throughout the period (1986-2017) was 61.21%, 61.26%, 76.76% and 51.59% in 1988, 1993, 1994 and 1995, respectively. This was attributed to factors such as initial substantial depreciation of the naira exchange rate and the lagged effects of upward adjustments in the prices of petroleum products in 1994. Inflation fell to 6.56% in 2007 before rising to 12.0% in 2012. The Naira exchange rate stood at N2.02/US$ in 1986 before depreciating to N22.05 in 1993. It further depreciated to N120.98in 2002 and stood at N155.76, N185.25, N199.10, N292.30, N305.20 and N310.10 in 2012, 2013, 2014, 2015, 2016 and 2017, respectively, as indicated in table 1. During the period 1988 to 1997, which constitutes the period of structural adjustment and economic liberalization, the GDP responded to economic adjustment policies and

grew at a positive rate, with the highest growth of 11.36% in 1990 and the lowest of 0.01% in 1991 (see table 1). From 2005, Nigeria's GDP growth rate averaged 6.0%, reaching 7.98% in 2010, 6.60% in 2014, -1.15% in 2016 and -0.83% in 2017 as indicated in table 1.

Recurrent expenditure component witnessed a relative rise between 1986 and 2012, while capital expenditure which stood at N8, 526.80million in 1986 grew steadily to a peak of N498, 027.60million in 1999 before falling to N241, 688.30 in 2003. It went to its highest peak of N1, 152,796.50 billion in 2009 but declined to N874, 762.24million in 2012 before rising toN1, 110, 800.39 billion, N2, 681, 100.10 billion, N3, 282, 438.20 billion, and N2.174 trillion in 2013, 2014, 2015 and 2017, respectively, as indicated in table 1.

Table 1: Trends in Capital and Recurrent Expenditure, Unemployment Rate, GDP Growth Rate, Inflation and Exchange Rate in Nigeria (1986-2012)

Year	Capital Expenditure (₦B)	Recurrent Expenditure(₦B)	Unemployment rate(%)	GDP Growth rate (%)	Inflation rate (%)	Exchange rate
1986	8,526.80	7,696.90	5.30	1.89	13.67	2.02
1987	6,372.50	15,646.20	7.00	-0.69	9.69	4.02
1988	8,340.10	19,409.40	5.10	7.58	61.21	4.54
1989	15,034.10	25,994.20	4.50	7.15	44.67	7.39
1990	24,048.60	36,219.60	3.50	11.36	3.61	8.04
1991	28,340.90	38,243.50	3.10	0.01	22.96	9.91
1992	39,763.30	53,034.10	3.50	2.63	48.8	17.3
1993	54,501.80	136,727.10	3.40	1.56	61.26	22.05
1994	70,918.30	89,974.90	3.20	0.78	76.76	21.89
1995	121,138.30	127,629.80	1.90	2.15	51.59	21.89
1996	212,926.30	124,491.30	2.80	4.13	14.31	21.89
1997	269,651.70	158,563.50	3.40	2.89	10.21	21.89
1998	309,015.60	178,097.80	3.50	2.82	11.91	21.89
1999	498,027.60	449,662.40	17.50	1.19	0.22	92.34
2000	239,450.90	461,600.00	13.10	4.89	14.53	100.80
2001	438,696.50	579,300.00	13.60	4.72	16.49	112.03
2002	321,378.10	696,800.00	12.60	4.63	12.17	120.98
2003	241,688.30	984,300.00	14.80	9.57	23.81	129.43
2004	351,300.00	1,032,700.00	13.40	6.58	10.01	133.50
2005	519,500.00	1,223,700.00	11.90	6.51	11.57	131.64
2006	552,385.80	1,290,201.90	12.30	6.03	8.55	127.38
2007	759,323.00	1,589,270.00	12.70	6.45	6.56	124.61
2008	960,900.00	2,117,400.00	14.90	5.98	15.06	117.69
2009	1,152,796.50	2,127,971.50	19.70	6.96	13.93	147.40
2010	883,874.50	3,109,378.51	21.40	7.98	11.8	148.81
2011	918,548.90	3,314,513.33	23.90	7.43	10.3	152.33
2012	874,762.27	3,325,156.25	23.90	6.58	12.0	155.76
2013	1,110,800.39*	1,360,890.08*	12.60*	6.10*	5.87*	185.25*
2014	2,681,100.10*	2,899,354.00*	13.52*	6.60*	4.66*	199.10*
2015	3,282,438.20*	4,200,413.20*	17.20*	6.00*	7.60*	292.30*
2016	634,790.0	4,178.60	14.5	-1.15	18.5	305.20
2017	2.174**	2.640**	14.2	-0.83	16.5	310.10

Source: CBN Statistical Bulletin (2013& 2016), N.B.S Annual Reports (2013, 2017), World Bank Indicators (2015)

Note: * figures may not be reliable, **figures are in Trillion

METHODOLOGY

The main objective of this paper is to measure empirically the effects of public expenditure on unemployment rate, inflation, exchange rate and economic growth rate (GDP) in Nigeria during the period 1986-2017. Consequently, this paper assumes that changes in unemployment rate, inflation, exchange rate and economic growth rate (GDP) are conceptually a function of changes in public expenditure (recurrent expenditure and capital expenditure). Therefore, a combination of deductive and inductive analytical framework was chosen to achieve the objective of this study. The inductive method is necessary to provide a foundation for the empirical analysis of the effects of public expenditure on the selected macroeconomic variables in Nigeria. Also, theories about the relationship between public expenditure and the selected variables developed deductively provided a framework for deriving the interpretations that gave a clear guide to the required inductive analysis carried out in this paper. The study used the Vector Auto-regressive (VAR) Model to measure the magnitude of the effects of changes in public expenditure on the selected variables in Nigeria.

Model Specification

TheVAR technique used in this paper is intended as a diagnostic tool because of its dynamic ability to measure the magnitude of the relationship among the variables. Note that VAR is a simultaneous equation modelling in which we consider several endogenous variables together. But each endogenous variable is explained by its lagged or past values and the lagged values of all endogenous variables in the model. There were more than one co-integrating equations in the model. The data used for this study were found to be I(1) indicating that long-run or equilibrium relationship exists among the variables (table 2); therefore, Vector Error Correction Mechanism (VECM) was used. VECM is a system of equations that enable the estimation of interdependence amongst variables without necessarily holding the effect of any of the variables constant. It incorporates both the long-run dynamics of a variable and the short-run effects simultaneously. That is, the method also captures the contemporaneous and lagged responses of the variables simultaneously.

Unit Root Test

Test for stationarity of data used in this study was carried out using the Augmented Dickey-Fuller (ADF) test by estimating the equation:

$$\Delta Y_t = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \sum_{i=1}^{n} \alpha_i \ \Delta Y_{t-1} + \mu_t \text{---------- (1)}$$

Where,

μ_t is pure white noise error; n is the maximum lag length on dependent variable to ensure that μ_t is the stationary random error.

Note; that the number of lagged difference terms to be included is determined

$\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$

empirically, the idea is to include enough terms so that the error term is serially uncorrelated. The ADF unit root test null hypothesis $\delta = 0$ is rejected if the t – statistics associated with the estimated coefficient exceeds the critical values of the test at 5% level of significance.

Co-integration Test

The Johansen co-integration test that proposes the use of two likelihood ratio tests: the trace test and the maximum Eigen-values test were used. The trace statistic for the null hypothesis of co-integrating relations is computed as follows:

$$\Gamma_{trace}(r\backslash k) = -T\sum_{i=r+1}^{m} \log(1-\lambda_t) \text{ ---------- (2)}$$

Where k is the number of endogenous variables, for r = 0, 1, . . . , k - 1.

Maximum Eigen-value static tests the null hypothesis of r co-integrating relation against r + 1 co-integrating relations and is computed as follows:

$\Gamma max(r|r+1) = -T\log(1-\lambda r+1)$ ---------- (3)

$= \Gamma trace(r|k) - \Gamma trace(r+1|k)$ ---------- (4)

for r = 0, 1, . . . , k - 1.

The Error Correction Mechanism (ECM) from the co-integrating equations is obtained by including the lagged error-correction term obtained from the residual of the long run static model. This process helps to capture the long-run information that might have been probably lost during the differencing. For the results to be consistent with theory, the coefficient of the error term should be negative and range between zero and one in absolute term. The error-correction term estimated represents the short-run to long-run adjustment equilibrium trends. It is a measure of the speed of adjustment of the short run relation to unexpected shocks. It is measured as the effects of residual from the long run model.

The Vector Auto-Regressive Model

The Vector Auto-regressive (VAR) Model used in this study is of the form;

U (UR, IR, GR, ER,) = fl(KE, RE) ---------- (5)

Where: IR= Inflation Rate,UR = Unemployment Rate,GR = GDP growth rate,ER = Exchange Rate,KE = Capital Expenditure, RE = Recurrent Expenditure. It is assumed that the economy is described by a system of equations where:

(UR, IR, GR, ER,) = fl(KE, RE) ---------- (6)

UR, IR, GR, ER = the endogenous variables

KE, RE = the exogenous variables

Yt = (KE, RE)

The explicit expression of the VAR model as used in this study is:

$$Y_{1t} = m + A_1 Y_{t-1} + A_2 Y_{t-2} + A_3 Y_{t-3} + \ldots + A_j Y_{t-j} + \varepsilon_{1t} \text{ ----------(7)}$$

Where:
m is a k x 1 vector of constants,
Yt = vector of endogenous variables at time t,
Ai' = (i = 1 … j) are k x k matrices of coefficients of vectors (Yt – j),
Yt – j is the corresponding lag term for each of the exogenous variables,
j = Number of lag length,
εt's is a vector white noise process,
E (εt) = 0 for all t and
E (εtεs') = Variance.

Sources of Data

The sources of data for this study are essentially secondary which include CBN Statistical Bulletins and Annual Reports and Statement of Accounts, World Bank Development indicators and National Bureau of Statistics. Also, published Journal Articles and unpublished Theses and Dissertations constituted other secondary sources for this study.

RESULTS AND DISCUSSION

The results of the unit root test using ADF and Phillips-Perron (PP) methods are summarized in table 2. The results showed that economic growth rate (GR) is stationary at levels; while exchange rate (ER) achieved stationarity at second difference. However, all the other variables (capital expenditure: KE, recurrent expenditure: RE, inflation: IR,and unemployment rate: UR)achieved stationarity at first difference.

Table 2: Summary of Unit Root Test (ADF) and (PP)

	ADF				PPT			
Variables*	**Level with trend and intercept**	**First diff. intercept with no trend**	**Order**	**Remark**	**Level with Trend and intercept**	**First diff. Intercept With no trend**	**Order**	**Remark**
KE	-0.673721	-10.61500	I(1)	Stationary	-0.780514	-10.82130	I(1)	Stationary
RE	-1.437020	-8.976619	I(1)	Stationary	-2.596735	-10.97038	I(1)	Stationary
IR	-2.547501	-6.130579	I(1)	Stationary	-3.132203	-6.415080	I(1)	Stationary
ER	-1.267788	-5.346799	I(2)	Stationary	-1.267788	-5.347929	I(2)	Stationary
UR	-2.587857	-6.050592	I(1)	Stationary	-2.623449	-6.123140	I(1)	Stationary
GR	-3.088326	-8.175787	I(0)	Stationary	-3.129119	-8.337429	I(0)	Stationary
Critical values: 1%	-4.204681	-4.150193			-4.309824	-4.579011		
5%	-2.887934	-3.317820			-3.258702	-4.268940		
10%	-3.158107	-3.162702			-3.221728	-3.680570		

Source: Results obtained using Eviews: 8

The results of the co-integration test using the Johansen test are presented on table 3. The Trace statistics and Max-Eigen value probability values indicate that the null hypothesis of no co-integration is rejected in favor of the alternative hypothesis at 5% level of significance in all the sections. For instance, in section A the Trace statistics show that the null hypothesis of at most one co-integrating equation and at most two co-integrating equations among the variables are rejected at 5% level of significance. This shows that, there exists long run relationship between the variables (LUR,LKE and LRE). The Trace test indicates three co-integrating equations while the Max-Eigen test indicates one co-integrating equation. This study used the Trace test for interpretation and analysis.

From the results in section B in table 3, the Trace statistics indicate that the null hypothesis of at most one co-integrating equation among the variables is rejected at 5% level of significance. This indicates a long run relationship among the variables. In other words, there is co-integration in at least two equations. The results in section C show that only the trace tests statistics have values greater than the critical values at 5% level of significance. There is at least one co-integrating equation. This shows that there is a long run equilibrium relationship among the three variables (LGR, LKE and LRE). The results in section D of table 3 show the Trace test statistics of the variables (LER, LKE and LRE) indicate that there is at most one co-integrating equation among the variables. This confirms that there exists a long run relationship among the variables.

Table 3: Summary of Co-integration Test Results

A Series: LU_R LK_E LR_E							
Hypothesized No. of CE(s)	Eigen-value	Trace Statistics	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.791564	85.99950*	69.81889	0.0015	47.04364*	33.87687	0.0008
At most 1	0.506150	38.95585*	47.85613	0.0260	21.16572	27.58434	0.2663
At most 2	0.303306	17.79013*	29.79707	0.03816	10.84227*	21.13162	0.0030
B Series: LI_R LK_E LR_E							
Hypothesized No. of CE(s)	Eigen-value	Trace Statistics	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.52162	30.26893*	19.56912	0.0025	17.30143	22.30312	0.2330
At most 1	0.31100	13.13286	14.19754	0.1002	10.52430	14.35740	0.3120
At most 2	0.14270	3.201327*	3.653201	0.0602	5.207812*	2.575370	0.0010
C Series: LG_R LK_E LR_E							
Hypothesized No. of CE(s)	Eigen-value	Trace Statistics	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.486320	44.98601*	30.67436	0.0017	14.01885	23.03573	0.2035
At most 1	0.365892	15.80743*	18.25783	0.0104	13.88211*	14.40521	0.0413
At most 2	0.324128	5.158720	3.312780	0.0736	3.473890	2.64676	0.0642
D Series: LE_R LK_E LR_E							
Hypothesized No. of CE(s)	Eigen-value	Trace Statistics	0.05 Critical Value	Prob.**	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.907671	49.25345*	32.92140	0.0017	35.32420*	21.61240	0.0014
At most 1	0.683455	15.54720	23.27031	0.2583	7.346725	15.53209	0.3450
At most 2	0.356224	8.270134	9.364062	0.2015	5.345768	9.457632	0.0973

Source: Results obtained using Eviews: 8

The VECM Results

This study notes that because there was at least one co-integrating equation which confirms the existence of a unique long-run relationship among the variables; the Vector Error Correction Mechanism (VECM) was considered more appropriate for use in this paper than the VAR model. The VECM incorporates both the long run dynamics of variables (Feasel et. al., 2001) and the short run effects simultaneously. This is made possible by the inclusion of Error Correction Model (ECM)

The estimates in table 4 suggest that the speed of adjustment (error correction mechanism) to the long run is high at50%. This implies that about 50% of the disequilibrium error, which occurred in the previous year is corrected in the current year. The result shows that past changes in capital expenditure (KE) is negatively related to current changes in inflation rate (IR) and economic growth rate (GR), and positively related to current unemployment rate (UR) and exchange rate (ER) all with coefficients that are not statistically significant at the 5% level. On the other hand, recurrent expenditure (RE) is positively related to IR (significant at 5% level), UR and, ER, but negatively related to GR with coefficients that are not statistically significant at 5%.

Table 4: Summary of VECM Results

Independent Variables	Dependent variables			
	$D(logI_R)$	$D(logU_R)$	$D(logE_R)$	$D(logG_R)$
Constant	-7.715461 (4.29047)	0.361967 (1.52229)	6.802645 (7.42809)	0.977594 (1.01362)
$D(LogK_E(-1))$	-7.13180 (-1.70440)	1.207890 (2.15280)	9.914901 (2.26380)	-0.364204 (2.76516)
$D(LogR_E(-1))$	17.11618 (15.1698)	1.508816 (2.38236)	3.26350 (0.23025)	-3.235924 (3.58387)
ECM(-1)	-0.502810 (-1.30697)	-0.134031 (0.18253)	-0.031079 (-0.26550)	-0.318241 (-0.12235)
R^2	0.527090	0.404122	0.3552990.646502	
R^{-2}	0.323443	0.265613	-0.0618600.457768	
F-Statistics	1.0611051.920641		0.8517126.876746	

Source: Results obtained using Eviews: 8

In the short run, increase in recurrent expenditure in the previous period was followed by an increase in inflation rate in the current period. This is theoretically expected; because when recurrent expenditure exceeds the absorptive capacity of an economy in terms of production, inflationary pressure would result. In other words, inability to meet rising aggregate demand due to increase in recurrent expenditure with increase in production of goods and services led to increase in the inflation rate. In fiscal context, mismanagement of recurrent expenditure (inability to accurately judge the absorptive capacity of an economy) leads to increase in volume of money supply in the current period, thus creating inflationary pressure. The negative relationship between capital expenditure and inflation rate is an indication that,

capital expenditure may not have been used for executing capital projects and for further production of goods and services. The lagged coefficients of the components of public expenditure showed a positive relationship with unemployment rate.

Also, the results in table 4 show that the R-squared values of 0.517 and 0.646 implies that about 52% and 65% variations in IR and GR are explained by changes in capital and recurrent expenditures respectively. Also 35% and 40% R^2 values for ER and UR, respectively, implies that the predictive power of the model is low. In view of the low predictive power of the model, this study considered it imperative to estimate the impulse response function (IRF). This is because impulse response function (IRF) sums up all the dynamics.

Impulse Response Function

Most of the coefficient estimates from the VECM were statistically non significant at the 5% level; therefore the impulse response function was carried out as a more robust way of analyzing the contribution of capital and recurrent expenditure to inflation rate, unemployment rate, exchange rate and economic growth rate in Nigeria for the period under review.

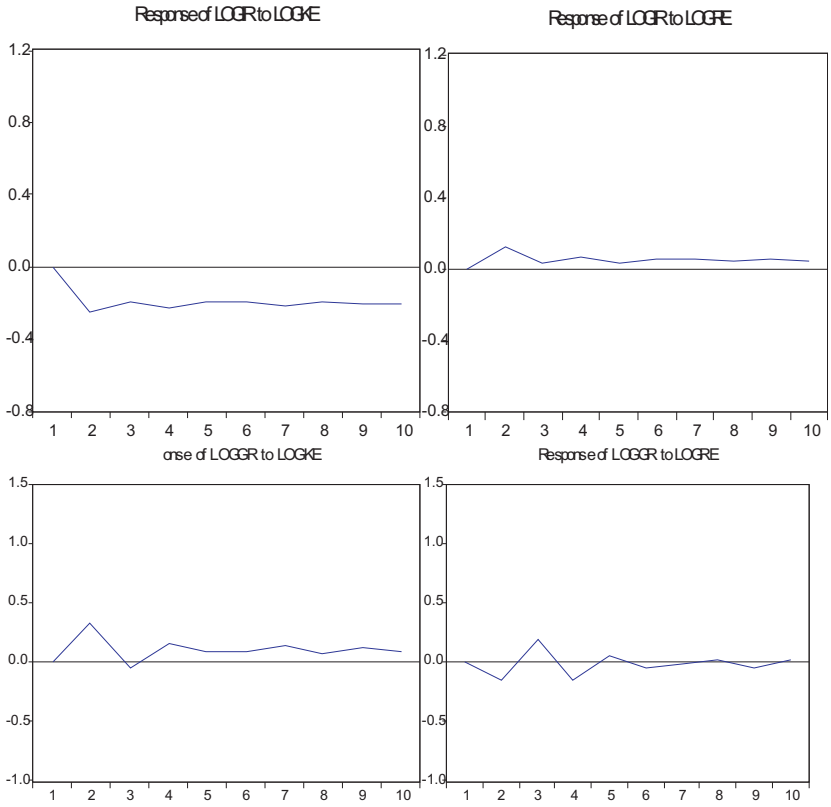

Figure 1: Impulse Response to One-S.D Innovations

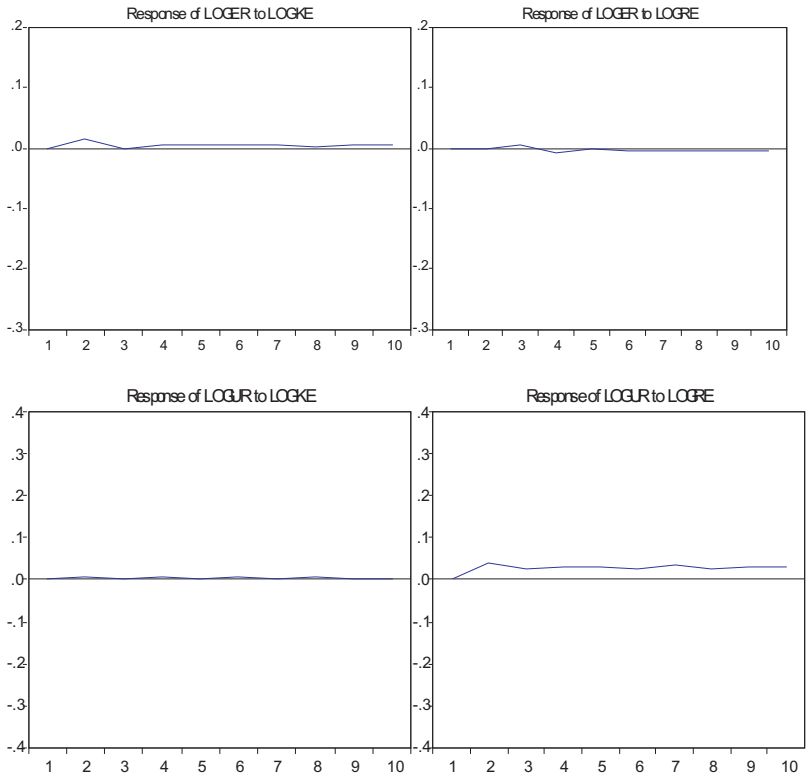

Figure 1(continued): Impulse Response to One-S.D Innovations

The impulse response function as indicated in figure 1 shows that a structural one standard deviation on capital expenditure (KE) had a negative effect on inflation rate (IR). The impact was relatively high; and it lasted up to the third period before stabilizing. On the other hand, recurrent expenditure(RE) had a positive impact on (IR). This positive impact fluctuated but stabilized after the fifth period. The reason for this relationship is related to mismanagement of both capital and recurrent expenditure in the previous period which leads to increase in money supply in the current period. Also, a structural one standard deviation on KE and RE showed both negative and positive impact on economic growth rate (GR) at various periods. The impact of KE was stable and remained positive after the fourth period, while RE was stable and negative after the fifth period. Figure1 further showed that KE had a low positive impact on exchange rate (ER) up to period three, suggesting that capital expenditure on imported capital goods have small impact on exchange rate, while RE impact on ER was negative in all periods. The result also suggests that KE and RE had a small positive impact on unemployment rate (UR). However, RE had more impact on UR than KE. This suggests that the capital projects executed with KE are few and, therefore, have very small impact on unemployment rate in Nigeria.

CONCLUSION

This study concludes that past increase in capital expenditure contributed positively to current inflation rate as at the end of 2017 and positively to current unemployment rate, exchange rate and economic growth rate in Nigeria. The implication is that as public expenditure increased both in the past period (1986-2016) and current period (2017) inflation and unemployment rose, the Naira exchange rate depreciated against the Dollar with marginal increase in economic growth rate during the period 1986-2017. On the other hand, changes in recurrent expenditure also contributed positively to inflation, unemployment rate and exchange rate; but negatively related to economic growth rate. In other words, as recurrent expenditure increased during the period, inflation, unemployment rate and exchange rate all rose, while economic growth rate fell.

According to Bloom et al. (2001) public expenditure can either promote or retard economic growth through its impact on decisions regarding investment in physical and human capital. In particular, increased spending on education, health, infrastructure, and research and development can boost long-term growth. The education, health, infrastructure, and research and development components of capital expenditure in Nigeria have consistently fallen as from 1999 to 2015 (Maji, 2014). In many instances, allocations to infrastructural development in Nigeria are hardly implemented fully in a budgetary year leading to a fall in real growth rate of the economy. Thus, the results of this study are consistent with Bloom et al (2001) and, Lawong and Onah (2017).

Also, this study is consistent with Usman (2012), which indicated that recurrent expenditure in Nigeria was characterized by focus on wages and salaries of unproductive employees; and on rent-seeking incentives that reduce growth by diverting higher human capital away from productive activities with adverse impact on the index of aggregate demand and as a result lowers economic performance compared to what would have been obtained if the resources had been effectively deployed. Consequently, the employment generating capacity of higher consumer spending was misdirected. Again, public expenditure outlay were essentially in favor of import-oriented production and consumption patterns during the period 1999-2015 in Nigeria, thereby creating employment abroad while unemployment grew in the domestic economy.

RECOMMENDATIONS

Without prejudice to theoretical expectations of the relationship between public expenditure and the selected variables in this study, it is clear that the results and conclusions disagree with apriori expectations underlying public expenditure in Nigeria, especially with respect to employment and economic growth. It is for this reason that this study recommends that; first, public expenditure in Nigeria should

target real physical and human capital development sectors with the highest growth potentials such as infrastructure (electricity, railway, and road), education, and health. Second, it is of utmost importance that strict implementation and compliance stance must be maintained to keep track of expenditure performance and targets. Third, recurrent expenditure should be directed towards productive employees and maintain zero tolerance for rent-seeking activities in order to avoid the diversion of financial resources for higher human capital away from productive activities. Fourth, public expenditure should be designed to focus on export-oriented production and consumption pattern in order to create needed incentives for domestic output expansion that would lead to employment creation. Finally, to address the phenomenon of rising inflation, fiscal policy management should be reconciled with monetary policy as both determine money in circulation with consequences for inflation.

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THE IMPACT OF AGRICULTURAL FOREIGN AID ON ECONOMIC GROWTH IN NIGERIA

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&

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ABSTRACT

There are unresolved issues with respect to the effect of foreign aid on the growth of the domestic economy. Some studies found a positive and significant effect; others reported a negative effect, while some found an insignificant influence. Therefore, this study investigates the impact of foreign aid to agriculture on economic growth in Nigeria spanning the period 1992-2014. The study used secondary data sourced from the World Bank World Development Indicators on variables like Gross National Income per capita, Inflation and Foreign aid. It employed Autoregressive Distributed Lag (ARDL) approach in the analysis of the data. The findings indicate that foreign aid to agriculture has a significant and positive impact on economic development. Emphasis on policies aimed at providing conducive environment should be intensified by the government for aid to be effectively utilized.

Keywords: Agriculture, Economic growth, Foreign aid
JEL Classifications: O43; Q14; Q17

INTRODUCTION

The importance of agriculture in any economy cannot be overemphasized. It is no gainsaying that agriculture plays an important role in the growth and development of any country in terms of its many relevance, which include output contribution, factor contribution, foreign exchange contribution and employment generation. The agricultural sector has a multiplier effect on any nation's socio-economy and industry because of the multifunctional nature of agriculture (Ogen, 2007; Obansa, 2013). Agriculture is a driver of development and, from historical perspective, it has been shown that agriculture is responsive to incentives, hence, the justification for foreign aid to agriculture. Foreign aid is the transfer of public funds such as loans or grants from a resource abundant country to another country in need of aid either directly or indirectly through multilateral assistance agencies such as the World Bank. It is, therefore, any flow of capital to a low-income country, which

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objective is not profit oriented from the donor perspective and is characterized by concessional terms; whereby the cost of renting capital and the duration of repayment are less stringent than commercial terms (Todaro and Smith, 2012).

The amount of Official Development Assistance (ODA), which comprises bilateral grants, concessional loans, and technical assistance as well as multilateral flows, has risen from an annual rate of under $5 billion in 1960 to $50 billion in 2000 and to over $128 billion in 2008. However, the proportion of low-income country gross national income allocated to official development assistance declined from 0.51% in 1960 to 0.23% in 2002 before improving to 0.33% by 2005 and to 0.45% in 2008 in an effort to raise assistance in the face of continuous lag in human development in sub-Saharan Africa (Todaro and Smith, 2012). Nigeria has not been left out in terms of foreign aid and agriculture has also benefited as foreign aid has been a major source of external finance in the country. Odusanya et al (2011) stated that foreign aid can have positive effect on economic growth via public expenditure if it is properly utilized in the productive sectors of the economy. Kalibata (2010) opined that foreign aid channelled to agriculture is productive. She opined that foreign aid can cater to the needs of Africa's farmers in terms of improved inputs; seedlings and soils, good road networks, agro credit and private sector investments, storage facilities to reduce post-harvest losses, and training and technology. She suggested that all these factors are pertinent in enhancing agricultural productivity and, in return, this will lead to economic growth and development.

There have been large inflows of foreign aid to the country with a remarkable share channelled to agriculture. According to the Food and Agriculture Organisation of the United Nations, for 2014, it was estimated that Agriculture received a whooping sum of $13 billion in development assistance. In 2014 donors provided $267 billion dollars in total development assistance of which $13 billion, or 5%, was given to projects in the Agriculture, Forestry and Fishing (AFF) sector which was 9% lower than the share provided to the AFF sector in the mid-1990s. While total development assistance increased over time, the share to agriculture fell, with a slight rise following the food price crisis of 2007-2008. In more recent years, development flows to agriculture (DFA) increased in absolute terms, while its share of the total remains lower than in the 1990s.

Development assistance remains an important source of investment financing towards attaining the 17 Sustainable Development Goals (SDGs). As such, several SDG indicators are based on development assistance, also known as foreign aid. Below is a graphical illustration showing the flow of foreign aid to agriculture from 1995 to 2014. According to the reports, between 1995 and 2014, Africa, Asia and the Pacific received 70 to 80% of foreign aid. Until 2007, Asia and the Pacific received the largest global share, at over 40%, while from 2008, Africa has received the largest share, at over 36% (see Figure 1).

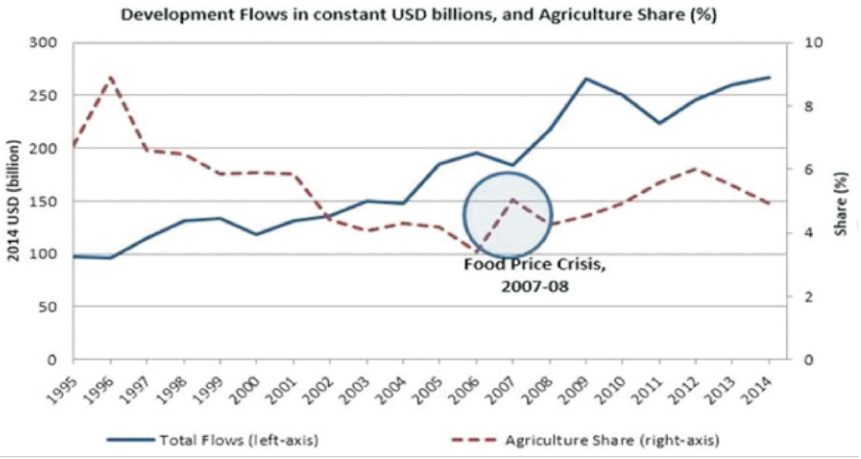


Figure 1: Development Flows and the Agricultural Share, 1995-2014

The value of net official development assistance received, in current US dollars, in Nigeria fluctuated between US$118.1million in 1988 and US$2.1billion in 2010 according to Development Assistance Committee (DAC) of the Organization of Economic Cooperation and Development (OECD). However, the figure increased rapidly to US$6.4billion and US$11.4billion in 2005 and 2006, respectively, with US$66.25million and US$ 106.14milllion channelled to agriculture, respectively. This may have been as a result of the debt forgiveness by the Paris Club. Indeed, wide variations have remained a regular feature in the trend of ODA to Nigeria especially during the period 2002-2010. Figure 2 presents a graphical representation of foreign aid to agriculture spanning from 1992 to 2010. Furthermore, there is a growing assistance to Agriculture in the country (see Figure 3).

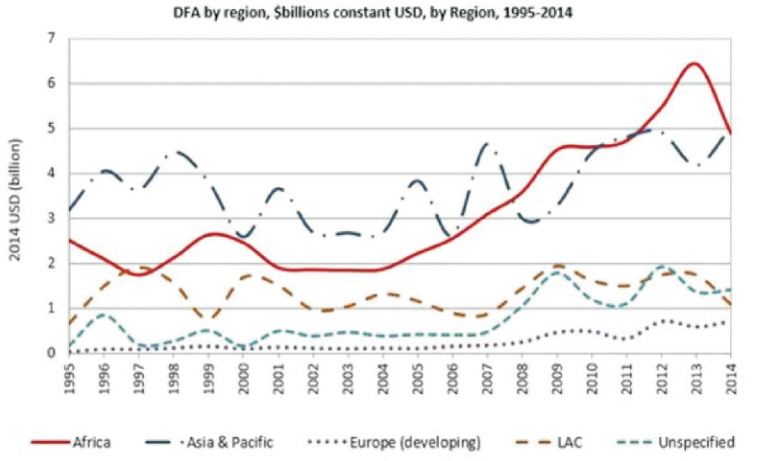
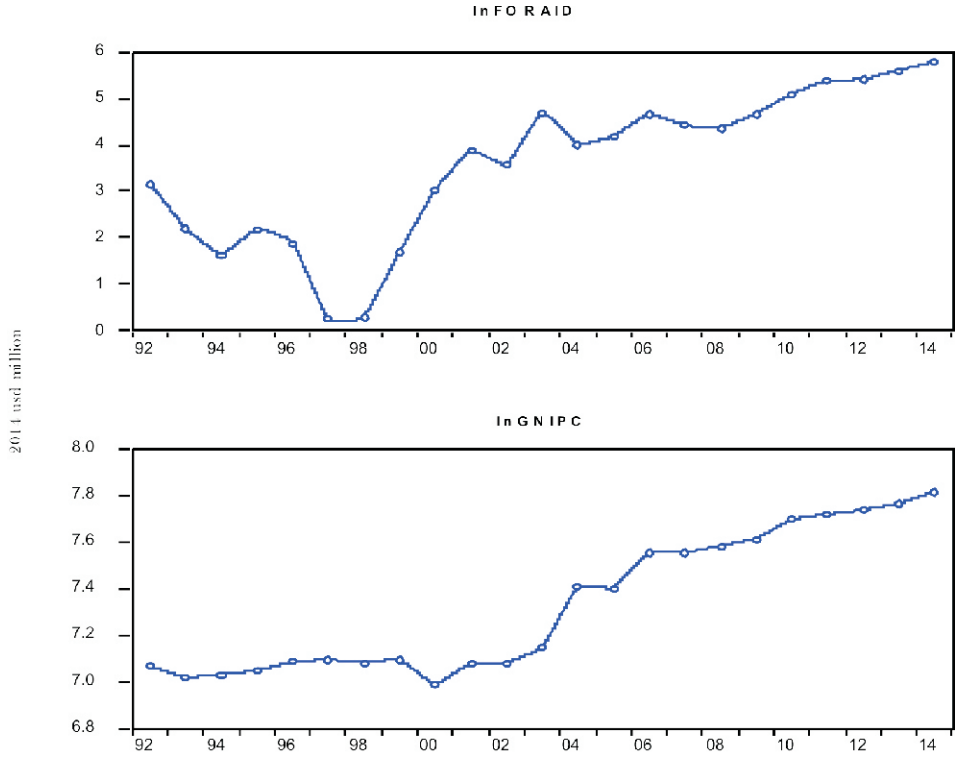


Figure 2: Development flows to agriculture by region in 1995-2014, $billions constant 2014 prices



Figrure 3 Official Development Assistance to Agriculture in million USD in 2014 prices for Nigeria and Gross National Income per capita.

Also, it has been shown from historical perspective that agriculture is responsive to incentives such as financial support, technical assistance and food aid. The efficacy of aid in the growth of developing countries like Nigeria has its theoretical underpinnings in the two-gap model (Chenery and Strout, 1966). The growth of Less Developed Countries is hampered by low savings, inadequate domestic capital and poor foreign earnings (Bacha, 1990; Taylor, 1994). In order to bridge the gap, there is a need for aid inflows. Similarly, the relationship between channels of assistance and development outcomes in low income countries are based on the notion of high level of poverty in Africa and on the capability of foreign aid in propelling economic development (Asongu and Nwachukwu, 2017). Thus, with the growing incentive to agriculture in terms of foreign aid, it is imperative to ascertain if the increasing assistance to agriculture has translated to economic development in the country. Likewise, looking critically at the graphs for foreign aid to agriculture and GNI per capita, it can be seen that there exists a kind of similarity in the lines of the two graphs. Therefore, this study examines the relationship between foreign aid to agriculture and economic growth in Nigeria. To achieve this broad objective, the effects of foreign aid to agriculture on the GNI per capita are estimated.

The rest of the paper is structured as follows: section two is on the review of literature, section three presents the methodology of the study, and section four gives the results and discussion. Conclusions and policy implications are presented in section five.

REVIEW OF LITERATURE

Theoretically, there are political, strategic and economic motives for donor-country governments to provide financial assistance. Some developed economies might have moral or humanitarian, or both reasons to support the poor or less developed countries through the provision of relief materials and medical care. However, there is no empirical finding to imply developed countries give financial assistance without prior knowledge of what they stand to gain in the long run in terms of political, economic and security/defence influence in return. However, this study mainly reviews studies that dwell on financial assistance incentives of donors, which are political and economic motivations.

Most aid programmes to developing countries can be for political reasons in terms of purchasing their security and propping up their sometimes shaky regimes than promoting long-term social and economic development. Foreign aid can be used as a political lever to prop up or underpin friendly political regimes in developing countries, regimes whose continued existence they perceive as being in their own national security interests. Also foreign aid can also be given when there is an outbreak of a deadly disease in order to ensure that such diseases do not spread and affect their country (Lancaster, 2007).

The major theoretical underpinning of this study is the two-gap model. The model posits that developing economies face two gaps in their economy, which they have to fill. The first gap is that between savings and investments in the economy and the second is that of foreign exchange. A developing country starts off with very low savings, but it has to engage in a big push by investing heavily. In what ways would countries fill this gap between savings and investmentsfl There was a lot of debate among economists here. Some argued that developing countries require aid from developed countries. Others argued that these countries need to trade in order to gain trade surpluses, which could then be used to fill the gap. This leads us to the second gap which is that between exports and imports. A developing country by definition produces only primary goods, whereas it would require large imports of consumer and capital goods. There is obviously a cost differential here, because of which, developing countries would necessarily face currentaccount deficits. How can a country fill that gap between exports and importsfl Thus, the reasons countries should get assistance from donor countries (Todaro and Smith, 2012; Kolawole, 2013).

However, there are two schools of thought with respect to the influence of foreign assistance on economic growth. The first school of thought opines that financial assistance has a positive impact on economic growth of countries with established trade policies and good economic structure. They (Tarp, 2009; Askarov and Doucouliagos, 2015; Donaubauer, Birgit and Peter, 2016) argue that foreign financial assistance has contributed immensely to the growth of gross domestic product and economic structure of most developing countries.

On the other hand, the second school of thought argues that foreign assistance encourages corruption, brings about rent-seeking attitude, and dampens administrative policy (Svensson, 2000). Studies (Gomanee, Girma and Morrissey,2005; Gebhard et al, 2008; Wilson, 2011; Gui-Diby and Renard, 2015) that oppose foreign aid argue that rather than increasing the growth rate of the economy, it impedes economic growth by discouraging domestic saving, hence dampening domestic investment and worsening the balance of payments deficits as well as a country's terms of trade. It also increases a country's debt burden and the conditional aid to donor-country exports (Mcmillan, 2011; Todaro and Smith, 2012).

Furthermore, foreign aid been criticised on the ground that it widens the gap between the rich and the poor in developing countries by growing the modern sector, thereby worsening the living conditions of the poor households and income inequalities: therefore, an anti-economic development. Instead of improving the economic status and bridging gaps, foreign aid increases the prevailing savings and foreign-exchange resource problems and sometimes generates more and new troubles for the economy (Ekanayake and Chatrna (2010); Mcmillan (2011); Tadesse (2011), Burnside and Dollar (2000); Waheed, 2014; Odokonyero et al., 2017).

Finally, foreign aid has not been successful because it has been largely advocated for by corrupt administrators, constrained innovation, and generally propagated a welfare notion on the part of recipient nations. Both Friedman (1958) and Bauer (1972) argued that foreign aid to the government is not safe because it leads to a rise in the power of the elites and this will lead to corruption in the country. These varying opinions have led to study on the influence of foreign aid to agriculture on economic growth.

Studies on foreign aid and growth were carried out at micro and macro levels with mixed findings. While some of the studies established a direct positive relationship, others established an inverse relationship. Veiderpass and Andersson (2007) carried out a study which covered the performance of 60 countries, including Nigeria, between 1995 and 2000 on foreign aid, economic growth and efficiency development. However, based on their findings, they established that the relationship between aid and efficiency are inconclusive. Doucouliagos and Paldam (2008) and Ssozi, Asongu and Amavilah (2017) carried out a survey on aid effectiveness of growth, inferred that aid has not, on average, achieved its aims of development, rather, it has displaced foreign direct investment, resulted in larger

governments and increased political instability. Hadjimichael et al. (1995), making use of regression, explored the impact of macroeconomic policies, growth reforms and investment on the effectiveness of aid concluded that aid has a positive impact on growth. Durbarry, Norman and David (1998), using data from 58 developing countries spanning from 1970-1993 with the use of mixed estimation procedures on the effectiveness of aid, emphasized a robust proof of positive foreign impact on economic growth. Lensink and White (2001), using non-lineaar growth models, came up with the aid laffer curve and found out that foreign aid, though having a positive impact on economic growth, is subject to diminishing returns and that returns to foreign aid become negative after a while. Mosley (1987), in investigating the relationship between foreign aid and economic growth, found out that there exists a positive effect of aid at the micro level but not at the macro, a situation coined as micro-macro paradox. In addition, studies such as Levy (1988), Murty et al. (1994) and Gounder (2001), in testing for the impacts of foreign aid, established a positive relationship.

In Nigeria, most studies on aid and agricultural growth such as the works of Bakare (2011), Akpan et al (2013), Binuomote, Odeniyi and Olawuyi (2015) and Akpokodje and Omojimite (2015) reported a mixed relationship between foreign aid and economic development. Also, Alabi's (2012) analysis of the impacts of foreign aid on different sectors failed to establish a clear opinion on the impact of aid on agriculture. On the contrary, in a similar study in 2014 on the impact of aid on agricultural development in Sub-Saharan Africa, foreign agricultural aid was found to have a positive and significant impact on agricultural productivity.

Interestingly, review of literature has shown different opinions by researchers as to the impact of foreign aid on economic growth. While some found a positive relationship, others found a negative relationship and some gave inconclusive findings. Also, in the course of the study, given that behaviourally, it has been established that agriculture is responsive to incentives, no paper was found on foreign aid to agriculture and economic development. Therefore, this study examined the impact of foreign aid to agriculture on economic growth in Nigeria.

METHODOLOGY

Model specification

While observing the trend of the study variables, it is not sufficient to causally observe data trend and conclude that there is a long run relationship between the variables. This could lead to a spurious regression. Thus, to test for stationarity the Augmented Dickey-Fuller test is applied.

Given that the series are of different order of integration, the appropriate test for this study is the Bounds co-integration test proposed by Pesaran, Shin and Smith, 2001. This test is carried out in order to examine the long run relationship among the variables, if any exists. The specification is given as:

$$\Delta lnGNIPC_t = \beta + \beta T + \gamma_1 \ln GNIPC_{t-1} + \gamma_2 lnFORAID_{t-1} + \gamma_3 INF_{t-1} + \sum_{i=1}^{k} \lambda_i \Delta lnGNIPC_{t-i}$$

$$+ \sum_{j=0}^{M} \omega_j \Delta lnFORAID_{t-j} + \sum_{r=0}^{N} \vartheta_r \Delta INF_{t-r} + \varepsilon_t \ldots\ldots..(1)$$

Where, GNIPC is Gross National Income per capita, FORAID is foreign aid to agriculture and INFL is inflation. Equation (1) is the equation for the Bounds co-integration test. To express the long run components in error term, equation (1) reduces to;

$$\Delta lnGNIPC_t = \eta v_{t-1} + \sum_{i=1}^{k} \lambda_i \Delta lnGNIPC_{t-i} + \sum_{j=0}^{M} \omega_j \Delta lnFORAID_{t-j} + \sum_{r=0}^{N} \vartheta_r \Delta INF_{t-r} + \varepsilon_t \ldots\ldots..(2)$$

Where V_{t-1} is the error correction term; $\eta < 0; k and M, N$ are lag length on dependent and independent variables respectively.

Data and Data Source

The data for this study are sourced from the database of the World Bank (World Development Indicators) 2017 spanning from 1992-2014. This study uses data on foreign aid to agriculture (FORAID) and Gross National Income per capita (GNIPC) and inflation (INFL). Specifically, foreign aid to agriculture was gotten from Food and Agriculture Organisation (FAO). The Development Flow Assistance data published in the Statistics of FAO has its source from the Organization for Economic Cooperation and Development (OECD), which includes total official flows, the sum of official development assistance and other official flows as well as grants from private charities and foundations. The data for foreign aid, GNI per capita are expressed in their natural log forms.

RESULTS AND DISCUSSION

Preliminary Analysis

The results of the summary of descriptive statistics of foreign aid to agriculture (lnforaid), gross national income per capita (lngnipc) and inflation (inf) are presented in table 1.

Table 1: Descriptive Statistics

	LNGNIPC	LNFORAID	INFL
Mean	7.333813	3.573632	20.07216
Median	7.14793	4.020305	12.21701
Maximum	7.816461	5.787847	72.8355
Minimum	6.987372	0.254642	5.382224
Std. Dev.	0.300297	1.64954	18.93423
Skewness	0.318818	-0.570329	1.67778
Kurtosis	1.399932	2.2692	4.474408
Jarque-Bera	2.84318	1.758703	12.87392
Probability	0.24133	0.415052	0.001601
Sum	168.6777	82.19353	461.6597
Sum Sq. Dev.	1.983925	59.8616	7887.109

Source: Authors' computation: underlying annual data from World Development Indicators

An observation of the table shows that given the acceptance/rejection criteria, LNGNIPC and LNFORAID are normally distributed since the probability values computed for Jacque Bera is greater than the conventional levels of statistical significance of 5% and 10%. Skewness, which measures the direction and degree of symmetry shows that lngnipc and inf are positively skewed while lnforaid is negatively skewed. The statistics reveal further that LNGNIPC and LNGNIPC are flat (platykurtic) relative to the normal, while INFL distribution is peak (leptokurtic) relative to the normal. The standard deviation, which indicates the most volatile variable, shows that inf has the highest standard deviation and hence the most volatile of all the variables.

Unit root tests

The results of the unit root test are presented and it shows a mixed order of integration. The results reveal LNGNIPC and LNFORAID became stationary after being differenced once (Table 2). This means that the two series are integrated of order one, that is, I(1). The exception is INFL that is stationary at level for the Augmented Dickey-Fuller test.

Table 2: Unit Root Test

Variables	Level	First difference	I(d)
LNGNIPC	—	-5.1085***[c] [0]	I(1)
LNFORAID		-3.8833***[c] [0]	I(1)
INFL	-5.1015***[a] [0	—	I(0)

Source: Authors' computation: underlying annual data from World Development Indicators (WDI)

Note: I (d) imply order of integration
a implies test equation with intercept and trend
b implies test equation without intercept and trend
c implies test equation with intercept
***, **, * implies 1%, 5% and 10% level of significance, respectively

Co-integration Test
The series contains a mixture of I(0) and I(1) order of integration, which makes the ARDL (Bounds co-integration test) approach most suitable for testing the co-integration among the variables, and the result is presented in table 3.

Table 3: ARDL Bounds tests

Test Statistic	Value	K
F-statistic	13.77971	2
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.50%	4.41	5.52
1%	5.15	6.36

Source: Authors' computation: underlying annual data from World Development Indicators (WDI)

From table 3, it is seen that the calculated F-statistic is greater than the Critical Value Bounds for the upper bound I (1), thus we conclude that there is co-integration.That is, there is long-run relationship between foreign aid to agriculture and economic growth in Nigeria.

Empirical Results and Discussions
To show the relationship between foreign aid to agriculture and economic development, the results of the estimation of both short and long run dynamics are presented in Table 4.

Table 4: short and long run dynamics

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNFORAID)	-0.01123	0.015983	-0.70246	0.5002
D(LNFORAID(-1))	0.117278	0.022866	5.128917	0.0006
D(LNFORAID(-2))	-0.13634	0.019318	-7.05768	0.0001
D(LNFORAID(-3))	0.035726	0.017462	2.045973	0.0711
D(INFL)	0.011267	0.002656	4.241711	0.0022
D(INFL(-1))	-0.00317	0.001144	-2.77027	0.0217
CointEq(-1)	-0.21658	0.095738	-2.26226	0.05
Cointeq = LNGNIPC - (0.2576*LNFORAID + 0.0389*INFL + 6.1907)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFORAID	0.257602	0.046223	5.572989	0.0003
INFL	0.038858	0.024848	1.563831	0.1523
C	6.19066	0.391472	15.81379	0

Source: Authors' computation: underlying annual data from World Development Indicators (WDI)

Table 4 reveals that, the error correction term ERT (-1) is -0.21658 with its probability value of 0.05, indicating its significance at 5%. This corresponds to a priori expectations of the error term being negative and less than 1 in absolute term. Thus, there exists a long run relationship between foreign aid to agriculture and economic development.

The foreign aid to agriculture in Nigeria shows a positive and significant relationship in its first lag, that is, movement in the same direction; in its second lag, it shows a negative and significant relationship; and in its third lag, it shows a significant positive relationship. This implies that foreign aid to agriculture leads to increase in economic development in Nigeria. However, in its second lag, it is noticed that increase in agricultural aid has a negative relationship with economic development; this may be as a result of the non-effective utilisation of the aid by the Nigerian government. However, in its third lag, it shows a significant positive relationship; that is, foreign aid to agriculture enhances economic development. In the long run, the coefficient shows a positive and significant relationship. That is, foreign aid to

agriculture accounts for about 26% of the Nigeria's development. This implies that foreign aid to agriculture enhances economic development. According to the World Bank report (2008), world poverty is overwhelmingly rural and as such agricultural development in Nigeria is synonymous to the development of rural area in Nigeria.

Inflation in its constant form shows that there exists a positive and significant relationship with economic development and then as it progresses, it becomes detrimental to Nigeria's development. This supports the school of thought that inflation may not necessarily be detrimental to the performance of an economy but that the level of inflation should not exceed a certain limit as the more it rises beyond the specified limit, it becomes detrimental in the economy. However, in the long run, inflation is nonsignificant to economic development and this is in line with the neutrality of money in the long run.

The ARDL is a linear regression model and, therefore, the underlying assumptions of CLRM have to be verified. These assumptions include linearity, serial correlation and normality among others. Diagnostic test results to verify the underlying assumptions are in Table 5.

The result shows that, using the Breusch-Godfrey Serial Correlation LM Test, there is no serial correlation among the residuals, while, using the Breusch-Pagan-Godfrey Heteroscedasticity Test, there is no heteroscedasticity and the model is linear and the residuals are normally distributed.

Table 5: Diagnostic test

Test	F-statistic	Prob. Value	Obs*R-squared	Prob. Value
Linearity	0.99488	0.1955		
Breusch-Godfrey Serial Correlation LM Test	0.572671	0.5884 (Prob. F(2,7)	2.6716	0.2629 Chi-Square
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.6646	0.7237	7.58613	0.5763
Normality (Jarque Bera) 0.3880		0.89188		

Source: Author's computation: underlying annual data from World Development Indicators (WDI)

CONCLUSIONS AND POLICY IMPLICATIONS

In examining the relationship between foreign aid to agriculture and economic development in Nigeria, the results show that there exists a positive and significant relationship between Gross National Income per capita and foreign aid to agriculture in Nigeria. This study supports the economic traditionalists, who argue that aid has indeed promoted growth and structural transformation in many developing countries.

In view of policy analysis, the findings imply development assistance to agriculture aids economic development and as such, governments should ensure that foreign aid to agriculture is properly utilised to improve the lives of the rural community. This will lead to an increase in the quality of life in the country. Also, the Government should ensure that policies are put in place to provide the enabling environment for aid to thrive and ensure strict adherence to the reason why the assistance was given so that it can be beneficial to the Nigerian economy.

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EFFECTS OF CAPITAL FLIGHT ON ECONOMIC GROWTH IN NIGERIA: 1986-2015

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&

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ABSTRACT

This paper empirically examined the effect of capital flight on economic growth in the Nigerian economy within the period 1986 to 2015. The effects of capital flight on economic growth and development in Nigeria is crucial to the growth and development of Nigeria as well as other developing economies because of the negative effects of capital flight in the economic growth of any economy. This is because most developing countries have lost enormous resources through capital flight than through payment of principal and interest owed on existing debt. Using the Autoregressive Distributed Lag (ARDL) methodology for the analysis of the time series data with the Augmented Dickey-Fuller (ADF) Unit Root Test for the preliminary test, the study found that a negative relationship exists between capital fight and economic growth in Nigeria with a coefficient of -0.406664 and p-value at 0.5795. The paper revealed that capital flight has a dampening effect on Nigeria's economic growth by -40.67 per cent, which is detrimental to the Nigerian economy and further impoverishes the masses, thereby, slowing down economic growth. The R2 of 0.8742 (87%) indicates that GDP can be explained by changes in the explanatory variable (capital flight). Based on the findings, the study recommends amongst others that government should intensify efforts to repatriate stolen funds back home and invest them in the real sector of the economy. This will help reduce poverty and improve the standard of living of Nigerians. Agencies such as the Economic and Financial Crimes Commission (EFCC), Independent Corrupt Practices Commission (ICPC), etc., should be given powers to convict offenders, which will help curb the menace of the flight of capital in the economy; and domestic and foreign firms should be encouraged to make use of local skills, manpower, technology and raw materials available in the domestic economy, rather than importing them. This will save foreign exchange, improve technical skills of the Nigerian citizens and limit the flight of capital from the economy.

Keywords: Capital flight, economic growth

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INTRODUCTION

This paper on the effects of capital flight on economic growth and development in Nigeria is important to Nigeria as well as other developing countries because of the negative effects of capital flight in the economic growth of any economy (Khan, 1989). According to Ndikumana and Boyce (2002), most developing countries have lost resources through capital flight than through payment of principal and interest owed on existing debt. In addition, Lessard and Williamson (1987), as cited in Francis and Chukwuemeka (2014), asserted that large capital outflow constitutes a serious problem to domestic resources meant for developmental purposes in African countries. They observed that there have been some arguments amongst analysts and scholars concerning the use of the term 'capital flight'. Some analysts perceive capital flight as a manifestation of a disordered society, while others view capital flight as reasons why so many poor, developing countries are unable to find their footing and bearing as far as growth and development is concerned.

Capital flight from developing countries, such as Nigeria, leads to insufficient resources meant for development and also results in a decline in economic growth. The relationship between capital flight and economic growth is inverse and is expressed as:

> "The fundamental economic concern about capital flight, which reduces welfare in the sense that it leads to a net loss in the total real resources available to an economy for investment and growth. That is, capital flight is viewed as a diversion of domestic savings away from financing domestic real investment and in favour of foreign financial investment. As a result, the pace of growth and development of the economy is retarded from what it otherwise would have been" (Deppler and Williamson, 1987:52).

There are various reasons responsible for capital flight in Nigeria and the causes of capital flight are both economic and political in nature. These causes are the result of economic instability, poor infrastructural facilities, political crises and corruption by government officials who take advantage of their offices to siphon funds to foreign countries (Ajayi, 1995).

Nigeria is regarded as one of the developing countries with high level of poverty and debt burden that is so large that the country cannot take additional debt to finance its future projects due to the large outflow of capital meant for development in the country. However, little attention has been paid on the causes and consequences of capital flight with focus on its effect on the economy. It is to this end that this paper empirically investigated how capital flight affects economic growth in Nigeria.

This paper is structured into five sections. Section one is the introduction, which discussed the background and objectives of the study; section two, which is literature review, dealt with conceptual, theoretical and empirical literature among others; Section three addressed the methodology of the paper, section four discussed the findings; and section five is the conclusion and recommendations of the study.

Objectives of the Study

Capital flight is a threat to attaining economic growth in developing countries, as is the case in Nigeria. Therefore, the major objective of this study is to examine the effects of capital flight on economic growth in the Nigerian economy. The specific objectives are to:

1. Analyse the factors responsible for capital flight
2. Identify the major consequences of capital flight on the domestic economy
3. Examine the relationship between capital flight and the Nigerian economy.
4. Proffer measures to curb capital flight in the Nigerian economy.

LITERATURE REVIEW

Conceptual framework

Pastor (1990) defined capital flight as the abnormal and unexpected movement of capital from countries whose capital is small as compared to other countries, such as those in the developing countries, to countries with relatively high level of economic growth, such as developed countries. In a similar view, Bakare (2011) defined capital flight as the flow of capital from one country to another. He further asserted that capital flight involved the movement of capital from countries with insufficient capital such as the poor and non-industrialised countries, to higher wage advanced countries. Ndikumana (2016), referred to capital flight as any statistical differences in the balance of payments accounting. This, according to him, includes any inaccuracies in the collection of data. These inaccuracies in the process of collection of data are referred to as net errors and omissions in the balance of payment statistics.

Jhinghan (2006) defined economic growth as an increase in an economy's real level of output over a period of time. He further opined that, it is an absolute increase in economic variables such as the Gross Domestic Product (GDP), Gross National Product (GNP), Per Capita Income (PCI), etc. Lending credence to Jhinghan, Dwivedi (2001) asserted that economic growth is a sustained increase in per capita national output or national product over a long period of time. It therefore, implies that the rate of increase in total output is greater than the rate of population growth.

According to the World Bank (1993), economic growth is described as a more rapid output and productivity growth in agriculture and manufactured exports supported by high rates of domestic savings and expansion in both physical and human capital. This implies that economic growth involves the accumulation of productive assets,

which is fundamental for rapid economic growth through creating jobs, increase in real wages, and raising the rate of return on labour force and increasing the demand for technology and knowledge.

This study, adopted the concept of economic growth as defined by World Bank (1993). The study viewed that political and economic instability contribute to slow economic growth in developing countries as a result of corrupt government officials who take advantage of their positions and offices to siphon capital meant for economic growth and development outside the shores of the economy, which leads to slow economic growth.

Theoretical Framework

Theory of Capital Flight

The investment diversion theory states that funds are diverted as a result of the unpredictable macroeconomic and political conditions in developing countries and at the same time the presence of better investment opportunities in developed countries. Such scholars as Ajilore (2005), Collier, Hoeffler and Patillo (2004), Deppler and Williamson (1987), supported the unrestricted free flow of funds between countries. According to them, stringent controls of capital prevent economic agents from achieving an efficient use of their assets. As a result, economic agents prefer to move their funds outside the shores of their domestic economy rather than invest in the domestic economy. In addition, as a result of a favourable economic climate in developed countries, some corrupt leaders and government officials in developing countries siphon the insufficient capital resources from their countries to developed countries. These funds meant to develop the domestic economy become unavailable for investment in the economy, thereby, resulting in slow economic growth.

The debt driven capital flight theory is also referred to as the debt overhang thesis. One of the proponents of debt driven thesis is Helpman (1989) who proposed a framework where private investment is negatively influenced by expectations in high rate of taxation, which in turn depends on future debt service obligations. Hence, when government debt service obligations are high, the income of the private sector are heavily taxed, which leads to low investment and consequently, low economic growth.

Linear Stages of Growth Model

The most prominent of the linear stage models are Rostow's Stages of Growth Model and the Harrod-Domar Growth Model. These models are reviewed thus.

The Rostow's Stages of Growth Model was propounded by American Economist,

Rostow (1963). He argued in his model that the processes of change into development occur in sequential stages. Each stage can only be achieved through the completion of the former stage. He was of the view that all developed countries have passed through these stages and developing countries are in one of these stages or another. These four stages Rostow asserted are:The Traditional Society, Preparatory Stage, Drive to Maturity Stage and Stage of Mass Consumption.

The Harrod-Domar theory of economic growth is an expansion of Keynesian analysis and relates to an economic situation in which all labour resources and income are used efficiently. This model was developed by Harrod (1939) and Domar (1946). Their model was used in development economics to explain an economy's growth rate in terms of the level of savings and productivity of capital (Todaro and Smith, 2009). Both Harrod and Domar opined that investment plays a key role in the process of economic growth. Basically, their theory placed special importance on the twofold character of investment. To them, the first characteristic of investment is that it creates income and secondly, it augments the productive capacity of the economy by increasing its capital stock. Hence, total investment in an economy leads to an increase in real income and output. Harrod and Domar argued that both real output and income should increase at the same rate at which the productive capacity of the capital stock is increasing in order to maintain a full employment equilibrium level of income annually. They further attested that any difference between real income/output and capital stock will lead to excess or unemployed resources, thus, making entrepreneurs to reduce their investment expenditures. Consequently, this will affect the economy by decreasing income and employment in succeeding periods, hence, resulting in a state of disequilibrium in the economy (Jhinghan, 2009).

The Harrod-Domar theory comprises of some fundamental assumptions, one of which is the constant capital output, which is based on linear function and referred to as the AK model, which is referred to as the constant capital output ratio, thus:

$$Y = AK,$$

where: Y = Income or Output
K = Capital stock
A = Output capital ratio
$\Delta Y = A\Delta K$, but ΔK = Net Investment (I)
Therefore, $\Delta Y = AI$.

International Dependence Revolution

International-Dependence models view third world countries as characterised by rigid institutional, political and economic conditions. These developing countries are involved in a dependence and dominance relationship with developed countries. According to Rewman and Littlefield (2002), international-dependence growth models received great attention amongst scholars in developing countries during the 1970s, as a result of the limitations associated with the linear stages and structural

change models. Todaro and Smith (2006) highlighted the three major schools of thought based on this approach, which are: the colonial dependence approach, the false paradigm model, dualistic development thesis and the neoclassical free-market counterrevolution.

The neo-colonial dependence model is an implied outcome of Marxist ideas. The theory attributes the existence and continuation of underdevelopment basically to the historical development of an extremely uneven relationship within the international economic system based on private ownership of developed countries and the poor developing countries. This uneven relationship possibly exists because the rich and industrial nations of developed countries intentionally take advantage of developing countries. The interdependence between rich and poor nations in an international system dominated by such unequal authoritarian relationship between the developed countries (the centre) and the developing countries (periphery) allows poor and developing nations to make attempts on being self-sufficient and independent, which becomes difficult and sometimes unattainable. Here, underdevelopment is thus seen as an externally induced phenomenon compared to the linear stages and structural-change theories, which emphasize internal constraints such as insufficient savings, investment and lack of education and skills.

The false paradigm model is the second and less extreme international-dependence approach to development. This model ascribes underdevelopment to defective and inappropriate advice given by well-meaning but often unenlightened, partial and discriminating foreign experts from developed countries and multinational-donor agencies. These experts offer complex concepts, refined theoretical structures and complicated econometric models of development that often result in improper policies. In line with this argument, prominent university intellectuals, trade unionists, high-level government economists, and other civil servants in developing countries all get their training from institutions in developed countries where they are thought wrong doctrines of foreign concepts and inapplicable theoretical models. Hence, when these elites in developing countries are faced with real economic problems, they are incapable of proffering appropriate solutions to their development problems.

The third International-Dependence approach is the Dualistic-Development Thesis. The term dualism represents the existence and persistence of increasing differences between the rich and poor nations, and the rich and poor people at various levels. According to this approach, there exists different kinds of conditions of which some are superior (developed countries), and others are inferior (developing countries), and the interrelationship between the superior and inferior elements are such that the existence of the superior element does little or nothing to improve the inferior element. In effect, the superior element may further suppress the inferior element's underdevelopment.

The main argument of the neoclassical counter-revolution theory is that underdevelopment is caused by inadequate allocation of resources as a result of inadequate pricing policies and excessive government intervention measures by excessively active government of developing countries. The first writers of the counter-revolution school of thought include: Peter (1984), Deepak (1985) and Ian (1982). They argued that government intervention in economic activities slows down the pace of economic growth. They further opined that a desirable level of economic growth can be attained by allowing competitive free market to thrive, privatization of state-owned enterprises, promoting free flow of capital across countries, creating a conducive environment for foreign investors, elimination of excessive government control and price distortions in factors, products and financial markets. In contrast to the claims of the dependence theorists, the neo-classicalist counter-revolutionists argued that third-world countries are underdeveloped not because of the exploitative activities of advanced countries and the international agencies they control, but because of the excessive government regulation in economic activities, corruption, inefficiency and lack of business incentives which pervades the economies of developing countries.

This paper adopts the neoclassical counter-revolution theory which posits that underdevelopment is caused by inadequate allocation of resources as a result of inadequate pricing policies and excessive government intervention measures which slow down the pace of economic growth.

Review of Empirical Literature

The consequences of capital flight have been of great debate amongst scholars of economics in the world. As a result, the issue of capital flight has received great attention by both scholars in developed and developing countries. Hence, an appreciable number of researches have been done on the effects of capital flight to the economy. Specifically, this paper is on capital flight and economic growth of the Nigerian economy.

Ajayi (1995) estimated the magnitude of capital flight using different alternative methods. Using the Ordinary Least Square technique, the study found that the cumulative sum for the period of 1972-89 was US$ 2280.1, while the cumulative sum of the change in debt for the same period was US$ 32181. For the years 1977, 1980, 1985 and 1986, capital outflows exceeded foreign debt accumulation indicating the depletion of domestic resources. He also found that when capital flight to change in debt ratio was 69%, 36%, 352 %, and 122.5%, growth rates were negative at 6%, 4%, 4% and 48% respectively. Ajayi opined that though domestic policy distortions can lead to capital flight, the role of access to political offices and perquisites of the office cannot be ignored. In a related study, Saheed, Zakaree and Ayodeji (2012) examined the relationship between capital flight, exchange rate and economic growth in Nigeria. According to them, capital flight encouraged increased demand for foreign currency, which exerted pressure on exchange rate, thereby

increasing the rate. The study adopted the segregation approach to examine the impact of capital flight on exchange rate and economic growth (GDP). They found a positive effect of capital flight on economic growth. They, therefore, suggested that parts of the capital outflow were used for importation of industrial or capital goods, which are then used domestically in the process of production. They also found that capital flight has a positive and statistically significant impact on exchange rate.

Adaramola and Alamu (2013) in their study titled "Does capital flight have a force to bear on Nigerian economic growthff" presented a critical examination of the impact of capital flight on Nigeria's economic growth over a period of 30 years (1981-2010). Capital flight estimates were computed using the residual approach. Using the Ordinary Least Squares regression analysis, the study employed the Johansen co-integration test to investigate the dynamic relationship between capital flight and economic growth. They found that there is a long run co-integration among the variables. They further established that change in external debt, foreign investment and current account balance relate positively with GDP, while external reserves and capital flight relate negatively with GDP.

Causes of Capital Flight in Nigeria

Studies of Cuddington (1986), Lessard and Williamson (1987), Pastor (1990), Baker (1999),Walter (1986) and Ojo (2007) identified the causes and routes of capital flight in Nigeria as: corruption by political leaders, economic instability, political crisis and poor infrastructural facilities. These causes are discussed in this section.

The unconstrained access to government funds by political leaders has led to unhealthy transfer of funds from Nigeria to overseas for the main purpose of escaping sanctions and seizures of their looted funds by succeeding governments. It is in this light that Ogboru (2014) described corruption as a tripartite function (i.e. consisting of three parts), which can be classified into: petty, grand and political corruption. According to him, petty corruption includes misappropriating funds on a small-scale and committing minor crime of giving preferential treatment to an individual or a group of persons, while grand corruption involves the misuse of public office at higher levels within the state, which includes the act of wrongfully appropriating funds that have been entrusted into the care of public officers who have the aim of stealing such monies. He further asserted that renowned politicians and bureaucrats conspire secretly with some private individuals to enable them divert public funds for their personal use. The third classification of corruption is corruption found in government establishments, which in his words includes:

> Gross abuse of the country's mechanisms of restraint; legislative and judicial processes, as well as auditory, investigatory and oversight powers; subversion of electoral power through vote-buying and bribery of accountable officials; large-scale assignment of public

> property to privileged interests; political motivated loans by banks and financial institutions; large contributions from public coffers to private causes and large political donations and bribes to parties and party officials (Ogboru, 2014:5-6).

Baker (1999) established a strong link between capital flight and corruption in which he divided capital flight into two: legal and illegal. According to him, the legal aspect of capital flight entails the movement of capital out of the economy which is properly documented, while the illegal component is undocumented. All stolen monies by Nigerian political officeholders fall into this latter category and this has drastically reduced the domestic investible funds.

Most developing countries, Nigeria inclusive, are unable to meet their financial obligations due to high rate of inflation, lack of confidence in the domestic economy, high unemployment rates and rising prices of goods and services in the economy. This is as a result of instability in the economy which affects businesses' ability to thrive. As a result, investors take advantage of the opportunities available outside the country, where interest rates are attractive and there are various financial instruments in which their wealth can be held. Additionally, Walter (1986) unequivocally posited that some countries encourage secret accounts, and have, therefore, encouraged illegal transactions and tax evasion.

Nigeria has had to experience frequent crises in various parts of the country in the form of internal religious uprisings such as insurgencies of Islamic sects in the North-east, threats of civil wars and agitations for independence by the Biafrans in the South-East, and the kidnappings and oil bunkering by Niger-Delta militants in the Southern part of the country. These crises tend to divert the attention of government from developmental projects to the maintenance of law, order and security, leading to increased expenditure on them. Also, foreign and indigenous entrepreneurs are discouraged from investing in productive ventures since the safety and profitability of their investments are not guaranteed during periods of political instability. This however, has led to investors moving their resources to 'safe havens' where their investment will yield much profit.

The Nigerian economy is presently faced with infrastructural deficit that has impeded the development of the country and its transformation into an industrial economy. As a result, the economy has constantly lost its resources to capital flights over the years. For example, Dunlop Plc left the country to Ghana due to epileptic nature of power supply in Nigeria. Many other investments have been lost as a result of inadequate infrastructure which has impeded on economic growth.

Effects of Capital Flight on Economic Growth in Nigeria

Capital flight is considered an observable occurrence that should be avoided because of its negative consequences on the Nigerian economy. From the examination of the effects of capital flight in the Nigerian economy, this paper identified the following as the negative consequences of capital flight: reduction in economic growth potentials, decline in exchange rate, and rise in unemployment rate.

Any amount of money siphoned to a foreign country cannot contribute to domestic investment; this implies that capital flight is a diversion of domestic savings away from domestic real investment. Ajayi (2007), stated that when these resources are kept away from the economy, they become unavailable for the importation of equipment and materials that are necessary for the growth of the domestic industry and the economy, which impedes economic growth. In addition, political officials who hold public offices take advantage of their positions to siphon money abroad, which further depletes the investible funds in the domestic economy. Hence, money supply becomes inadequate and unstable. As a result, the level of productivity and profitability of business enterprises reduces. Therefore, capital flight leads to a net loss in the resources of a country meant for investment, leading to slow economic growth.

Capital flight prevents capital accumulation, which limits exchange rate mechanisms of Less Developed Countries (LDCs). The decline in exchange rate mechanism comes as a result of the urgency by the wealthy in developing countries to invest capital abroad in the form of cash. These capital, which are sent overseas are in both local and foreign currencies; usually in U.S. dollars. Hence, these accumulated capital, which are in local currency must first be converted into the currency of the developed country. Thus, a large number of those seeking to invest abroad in such manner demand for less of the domestic currency, and more of foreign currencies. This results to further loss of confidence in the local currency and in the domestic economy at large.

Most developing countries are unable to mobilize sufficient domestic investment capital to ensure sustainable economic growth. This is because capital flight takes place by conveying a part of domestic private savings from developing economies to foreign countries. The continuous outflow of these private savings, which could have otherwise been used as capital to fund developmental projects that create employment is taken abroad. In addition, corrupt political officials divert public funds meant for curbing unemployment in the economy into their private accounts overseas, thereby undermining the efforts of government in achieving increased employment rate in the economy. This, Ogboru (2006) asserted, worsens capital shortage problems in the economy by making less money available for developmental purposes, as these monies are in most cases, kept in foreign banks for safe-keeping.

RESEARCH METHODOLOGY

The paper employed the econometric diagnostic test i.e the autoregressive distributed lag (ARDL) and the Augmented Dickey-Fuller (ADF) unit root test model in estimating the equation. This is due to stationarity experienced at first difference of the data in utilizing the Ordinary Least Squares.

The paper utilized secondary data collected from Central Bank of Nigeria (CBN) Statistical Bulletin (various issues), CBN Annual Reports and Statements of Accounts (various issues), Global Financial Report of the World Bank (2015), World Bank International Debt Statistics (various years), International Monetary Fund (IMF, 2016) and Index Mundi (internet database) website. The indices used in measuring the effects of capital flight on economic growth are economic growth (proxied by Gross Domestic Product), capital flight, change in external debt stock, current account balance and unemployment rate. The empirical measurement covered the period 1986 to 2015.

Model Specification

The econometric data used for the estimation of the model's parameter is the Econometric-views (E-views9) computer software. However, a basic econometric diagnostic test such as the Augmented Dickey Fuller (ADF) unit root test carried out before running the ordinary least squares analysis. The test was also carried out to avoid spurious regression results. In order to achieve the stated objective, the model is, hereby, specified in line with the hypothesis that:

H_o: Capital flight has no significant impact on GDP in Nigeria.

H_1: Capital flight has significant impact on GDP in Nigeria.

The model for this study is of the form:

$GDP_t = f(CAB_t, CAPF_t, EXR_t\ EDS_t, NFDI_t)$..... (1)

Econometrically, equation (1) can be written as:

$GDPt = \alpha_0 + \alpha_1 CAB_t - \alpha_2$ flCAPF$_t + \alpha_3 EXR_t + \alpha_4 EDS_t + \alpha_5 NFDI + U_t$ ..... (2)

with a priori expectations of $\alpha_1 > 0, \alpha_2 < 0, \alpha_3 > 0, \alpha_4 < 0, \alpha_5 > 0$.

Where:

GDP_t = Gross Domestic Product (Proxied by Economic Growth) in period t,

CAB_t = Current Account Balance in period t, $CAPF_t$ = Capital Flight in period t,

EXR_t = Exchange Rate in period t,

EDS_t = External Debt Stock in period t,

$NFDI_t$ = Net Foreign Direct Investment

U_t = error terms that capture the other variables not included in equation (2),

t = time trends, and α_1, α_2, α_3, α_4 and α_5 are the parameters.

In equation (2), α_0 is a constant while α_1, α_2, α_3, α_4 and α_5 are the parameters of the explanatory variables to be estimated in conformity with the hypothesis that states

that capital flight has no impact on Gross Domestic Product in Nigeria. The a priori expectations (signs) of the variables represented by their respective coefficients are expected to be positive, while others are expected to be negative. This implies that such explanatory variables as: Current Account Balance, Exchange Rate, External Debt Stock and Net Foreign Direct Investment are expected to impact positively on economic growth (GDP), while Capital flight is expected to impact negatively on economic growth. The analysis employed for this model is the autoregressive distributive lag analysis (see table 1).

RESULTS

Unit Root Test Results

This study applied unit root test to determine if the data is stationary before any analysis can be conducted. It is recommended that the unit root test be conducted to validate the data for analysis. The Unit Root Test Results are presented in table 1.

Table 1: Augmented Dickey Fuller (ADF) Unit Root Test Result

Variable	ADF t-statistics	P-value	5% critical value	Order of integration	Conclusion
GDP	-3.4599	0.0174	-2.9763	I(1)	Stationary
CAB	-4.5440	0.0012	-2.9678	I(0)	Stationary
CAPF	-4.4056	0.0017	-2.9678	I(0)	Stationary
EXR	-4.9092	0.0005	-2.9719	I(1)	Stationary
NFDI	-6.6797	0.0000	-2.9719	I(1)	Stationary
EXD	-3.4852	0.0172	-2.9862	I(1)	Stationary

Source: Authors' Computation using Eviews9

Based on the ADF unit root test result presented in Table 1, some of the results were found to be stationary at level of order I(0) , while other variables were found to be stationary at difference level of order I(1) at 5 per cent critical level. The ADF result indicated that CAB and CAPF were found to be stationary at level, at 5 per cent level of significance with t-statistic value of -4.5440 and -4.4056 with a probability value (p-value) of 0.0012 and 0.0017, respectively, while GDP, EXR, NFDI and EXD were not stationary until after first differencing with intercept at 5 per cent critical value, with t-statistic of -3.4599, -4.9092, -6.6797 and -3.4852 with corresponding p-values of 0.0174, 0.0005, 0.0000 and 0.0172, respectively.

A unit root result of this nature, where some variables are stationary at level and others are stationary at first difference warrants the use of autoregressive distributed lag (ARDL) model in estimating the equation (Pesaran and Shin, 1999). Thus, the Auto-regressive distributed lag estimation results presented in table 2

Table 2 : The Auto-regressive distributed lag estimation result.

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDP(-1)	1.020382	0.117041	8.718128	0.0000
CAB	11.08013	5.251924	2.109728	0.0471
CAPF	-0.406664	0.722549	-0.562818	0.5795
EXD	-0.890909	1.261117	-0.706444	0.4877
EXR	33.93334	53.93530	0.629149	0.5360
NFDI	0.053898	8.548435	0.006305	0.9950
C	-265.6052	4349.290	-0.061069	0.9519

R-squared	0.874165	Mean dependent var	11246.66
Adjusted R-squared	0.838213	S.D. dependent var	23735.04
S.E. of regression	9546.898	Akaike info criterion	21.37814
Sum squared resid	1.91E+09	Schwarz criterion	21.71119
Log likelihood	-292.2939	Hannan-Quinn criter.	21.47996
F-statistic	24.31429	Durbin-Watson stat	2.045808
Prob(F-statistic)	0.000000		

Source: Authors' Computation using Eviews9

*Note: p-values and any subsequent tests do not account for model selection.

DISCUSSION OF FINDINGS

Table 2 contains the ARDL estimation result. The result revealed a positive and significant relationship between previous years GDP and current GDP with a coefficient of 1.0204 and p-value of 0.0000.

Considering the study's objective and its corresponding hypothesis, it was found that a negative but nonsignificant relationship existed between CAPF and GDP, with coefficient of -0.406664 and p-value at 0.5795. This means a unit increase in CAPF will lead to 0.5795 unit decrease in GDP. The result is, therefore, in line with our a priori expectation, although the p-value (0.5795) revealed it is not statistically significant, since 0.05 level of significance is less than the p-value, 0.5795. The H_0 is, therefore, accepted and the conclusion drawn by the paper is that it is nonsignificant. However, this negative relationship is consistent with the a priori expectation. This could be attributed to the extent to which capital flows outside the domestic economy through investors that take advantage of investment opportunities in foreign countries and the unrestricted access to government funds by corrupt government officials, thereby, reducing investible funds, which, in turn, impedes economic growth. Hence, CAPF has a dampening effect on the economy, and this result is consistence with Bakare (2011) who found a negative relationship between CAPF and GDP.

The coefficient of the constant or intercept is -265.60 which shows that if the explanatory variables were held constant, the GDP will be -26560, a decrease in

economic growth. In relation to our a priori expectation, it is expected that there should be positive relationship between CAB, EXR, EDS and NFDI in Nigeria. However, the coefficient of EDS did not conform to our a priori expectation. The implication is that a unit increase in EDS will decrease GDP by 0.8909. This is attributed to the fact that capital that enters the country in the form of external borrowing to increase productivity is probably diverted as a result of corruption and subsequently fail to contribute to increase in economic growth. Meanwhile, CAB, EXR and NFDI conformed to our a priori expectation. The implication is that a unit increase in CAB will increase GDP by 11.08. Hence, this positive current account balance indicates that the country is a net lender to the rest of the world. It was also found that EXR had a coefficient of 33.93 with a p-value of 0.5360. This, therefore, implies that a unit increase in EXR will increase GDP by 3393. The implication is that the inflow of capital into the country is used to purchase equipment from abroad, which increases production, and invariably, economic growth.

The study also found that the coefficient of determination (R^2) showed the percentage of variations in the independent variables that can be explained by dependent variables. The R^2 of 0.8742 or 87.4% showed that GDP can be explained by changes in the explanatory variables used in the model while the remaining 12.8% is explained by factors outside the model. This shows the goodness of fit of the model. The Durbin-Watson statistic of 2.0458 showed that the model is free from serial correlation. This means that the value of the random term in any particular period is uncorrelated with its own preceding values, which indicates there is absence of autocorrelation.

The values of Akaike info criterion, Schwarz criterion and Hannan-Quinn criterion were found to be 21.3781, 21.7112 and 21.4799, respectively. This means that the values are low, hence, the model is well specified, and has performed well. Also, the overall model was statistically significant at 5% level of significance based on the empirical values of F-statistic and the probability of the F-statistic (24.31 and 0.00, respectively). We therefore, conclude that capital flight impacts significantly on economic growth, hence, capital flight impedes economic growth, because, a diversion of capital from the nation's economy will result to decrease in economic growth.

CONCLUSION AND RECOMMENDATIONS

The study revealed a negative relationship between capital flight and Gross Domestic Product in Nigeria. In other words, capital flight has a dampening effect on Nigeria's economic growth. Based on the findings, the study established that capital flight is detrimental to the Nigerian economy, and further impoverishes the populace. This, therefore, leads to slow rate of economic progress of the national economy.
The following recommendations are made based on the findings of this study:

i. There should be intensification of efforts by the government to repatriate funds back home and more efforts should be made to ensure the effective use of these funds by way of investing them in the real sector of the economy. This, however, cannot be achieved by the government alone. All hands must be on deck to bring this about. This will help to reduce poverty level and improve the standard of living of Nigerians.

ii. Capital flight is related to being in power and having access to domestic and foreign currencies by government officials. The solution to this problem lies in attitudinal changes towards public wealth. Hence, a positive change in the attitude of our leaders towards public wealth will culminate into better governance as shown in accountability and transparency of other nations in, especially, the developed world.

iii. Domestic and foreign firms should be encouraged to make use of local skills, manpower, technology and raw materials available in the domestic economy, rather than importing them. This will save foreign exchange, improve technical skills of the Nigerian citizens and limit the flight of capital from the economy.

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APPENDIX A

Annual GDP ($m), External Debt Stock ($m), Net Foreign Direct Investment ($m), Exchange Rate (N/$), Current Account Balance ($m) and Capital Flight ($m) for the period 1986-2015.

YEAR	GDP	EDS	NFDI	EXR	CAB	CAPF
1986	257.78	41.5	193	1.75	211	6656
1987	295.09	100.8	611	4.02	-732	1160
1988	256.00	134	379	4.54	-296	-149
1989	275.41	240.4	188	7.36	109	3187
1990	328.61	298.6	588	8.04	499	103
1991	328.64	328.5	712	9.91	120	-3608
1992	337.29	544.3	897	17.30	227	2346
1993	342.54	633.1	135	22.07	-780	3307
1994	345.23	648.8	196	22.00	-213	1405
1995	352.65	716.9	108	21.90	-258	-2576
1996	367.22	617.3	159	21.88	351	-3484
1997	377.83	595.9	154	21.89	552	1496
1998	388.47	633	105	21.89	-424	-524
1990	393.11	2,257.40	100	92.34	506	3337
2000	412.33	3,097.40	114	101.70	743	-2006
2001	431.78	3,176.30	119	111.23	248	-5
2002	451.79	3,932.90	187	120.58	108	5025
2003	459.01	4,478.30	201	129.22	339	3591
2004	527.58	4,890.30	187	132.89	168	-1508
2005	561.93	2,695.10	498	131.27	365	6933
2006	595.82	451.5	485	128.65	365	8285
2007	634.25	438.9	603	125.81	276	1493
2008	672.20	523.3	820	118.55	292	3440
2009	718.98	590.4	855	148.90	139	372
2010	54,612.26	689.8	603	150.30	1311	1285
2011	57,511.04	896.8	884	153.86	107	2059
2012	59,929.89	1,026.90	707	157.50	174	3351
2013	63,218.72	1,387.30	556	157.31	190	5900
2014	67,152.79	1,631.52	466	158.55	126	7065
2015	69,780.69	10,718.43	306	192.44	-119	1678

Source: Central Bank of Nigeria (CBN) Statistical Bulletin (various issues), CBN Annual Reports and Statements of Accounts (various issues), Global Financial Report of the World Bank (2015), World Bank International Debt Statistics (various years), International Monetary Fund (IMF, 2015), Global Financial Report of the World Bank (various years) and Index Mundi (internet database) website and Author's Computation (2016).

Dependent Variable: GDP
Method: ARDL
Date: 09/20/18 Time: 14:03
Sample (adjusted): 1987 2015
Included observations: 28 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic):
Fixed regressors: CAB CAPF EDS EXR NFDI C
Number of models evalulated: 4
Selected Model: ARDL(1)
Note: final equation sample is larger than selection sample

ARDL RESULTS

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDP(-1)	1.020382	0.117041	8.718128	0.0000
CAB	11.08013	5.251924	2.109728	0.0471
CAPF	-0.406664	0.722549	-0.562818	0.5795
EDS	-0.890909	1.261117	-0.706444	0.4877
EXR	33.93334	53.93530	0.629149	0.5360
NFDI	0.053898	8.548435	0.006305	0.9950
C	-265.6052	4349.290	-0.061069	0.9519

R-squared	0.874165	Mean dependent var	11246.66
Adjusted R-squared	0.838213	S.D. dependent var	23735.04
S.E. of regression	9546.898	Akaike info criterion	21.37814
Sum squared resid	1.91E+09	Schwarz criterion	21.71119
Log likelihood	-292.2939	Hannan-Quinn criter.	21.47996
F-statistic	24.31429	Durbin-Watson stat	2.045808
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

THE NEXUS BETWEEN EDUCATION AND POVERTY REDUCTION IN NIGERIA

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ABSTRACT
The study seeks to investigate the role of education in reducing poverty in Nigeria with emphasis on accessibility, affordability, and acquisition of qualitative education. The study used descriptive statistics including line graphs and bar charts to explain the trend of poverty and education in Nigeria focusing on adults' literacy rate and per capita expenditure densities. For the empirical analysis, annual time series data from 1986 to 2016 was employed. Aggregate poverty level (APOV), the endogenous variable was regressed against gross primary school enrolment (PRSE), literacy rate (ALIR), gross secondary school enrolment (SCSE) and government capital expenditure on education (EXED), the exogenous variable using the ordinary least square (OLS) method, Error Correction Model (ECM), Augmented Dickey Fuller test, unit root test and Johansen co-integration test as pre-test and estimation techniques. The coefficient of determination as revealed by R2 indicates that 34% of the variations observed in the dependent variable were explained by variations in the independent variables. This implies that the rate at which poverty changes is determined by variations in the education sector. Also, the impact of SCSE and ALIR on poverty is positive while that of EXED and PRSE is negative. The findings revealed that education in Nigeria had not led to desired poverty reduction as the country is yet to fully harness the immense benefits of education. The study recommended that the government at all levels should increase budgetary allocation to the education sector to meet up with the 26% benchmark of the United Nations. Also, there is the need to ensure adequate and timely monitoring and evaluation of funds allocated to education to prevent misappropriation.

Key Words: Education, Nexus and Poverty Reduction

INTRODUCTION

Poverty which manifests in form of deprivation, low standard of living, and little or no capacity for sustainable survival has remained one of the major problems of development confronting many economies particularly the third world countries, where majority of the people still live below poverty line. Adebayo (2018) noted that about two-thirds of the world's extreme poor are found in Africa and if the current trend persists, Africa will account for nine-tenth (about 90%) of world poverty by 2030 with the situation being worse in Sub-Saharan Africa.

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In addition to being one of the poorest countries in Africa Nigeria has overtaken India to become the country with the largest number of poor people in the world. To buttress this, Adebayo (2018) observed that by the end of May 2018 Nigeria had about 87 million people in extreme poverty, compared with India's 73 million. In support of these assertions, Ige (2018) pointed out that extreme poverty in Nigeria was seen to be growing by six people every minute, while the poverty level in India continues to fall. The 87 million Nigerians which now live in extreme poverty represent nearly 50% of her estimated 180 million population (Adekunle, 2018). This fact cannot be disputed when one carefully looks at Nigeria's poverty index and the rate at which the citizens are continually pushed below the poverty line.

The Nigerian situation can be described as an "epidemic that has defied all medical prescriptions" against the background that poverty level continues to rise in the midst of increasing government efforts to mitigate it. It has therefore become pertinent to intensify efforts in finding solutions to this scourge that has continued to plague our nation particularly as from mid-1980s. In doing so, emphasis on main correlates of poverty such as education, health care, income distribution and employment are crucial. The focus of this paper is on education being one of the correlates.
Recognizing the indispensable role education is capable of playing in poverty reduction, the United Nations in its bid to eradicate poverty in the world has right from 1995 consistently emphasized that education is key towards poverty eradication. In its declaration of the first poverty eradication decade (1997 - 2006), United Nations stressed that investment in human capital (education) is a prerequisite for eradication of poverty (First United Nations Decade for the Eradication of Poverty, 1997). The global body in its second decade stressed that education and training are key critical factors in improving the lives of those living in poverty. Similarly, at the preparation stage of the third decade which commences in 2018, emphasis is on ensuring that in addition to income, access to (and affordable) quality education; clean water and sanitation as well as affordable energy among other basic services are necessities for poverty reduction (Zhenmin, 2018). Available data indicate that secondary education alone is capable of lifting 420million people out of poverty in the world, thereby reducing the number of poor people globally by more than half (Global Partnership for Education, 2017).

From the foregoing, quality education is inevitable in the process of finding solutions to the scourge of poverty. This paper is thus an attempt to provoke discussion on the role of education in reducing poverty in Nigeria with emphasis on accessibility, affordability and acquisition of qualitative education. The paper has been divided into five sections. Section one is introduction followed by literature review and methodology in sections two and three respectively. The forth section is results and discussion while section five provides the conclusion and offers recommendations.

LITERATURE REVIEW

Conceptual Clarification

Education is the bedrock for any meaningful self-improvement and development process as well as necessary and important component of human capital which makes them productive and raises their standard of living. Raji (2014) posited that education is the process by which society deliberately transmits its accumulated knowledge, skills and values from one generation to another. It entails both the acquisition of knowledge and experience as well as the development of skills, habits, and insolences which help a person to lead a full, worthwhile and purposeful life. It is in fact, a process of training the individual through various experiences of life, so as to draw out the best from him/her. It entails a process of proper development of imagination and powers of mind. Aref (2011) described education as both a social and private good. It is an investment that is capable of yielding benefits that have some externalities. In its broad sense, education is any act or experience that has a formative effect on the mind, character or physical ability of an individual.

Within the context of this paper, education is seen as a process of purposeful training and retraining with the aim of transmitting and acquiring of knowledge, skills, habits and attitudes through formal and/or informal settings. It is expected that such education should be of good standard, accessible and affordable to majority of the citizens of Nigeria.

There is no general consensus on the definition of poverty largely because the phenomenon affects many spheres of human condition such as physical, moral and psychological. This has given rise to several definitions of poverty based on perspectives of researchers. Some of the definitions according to Umo (2012) include asset poverty, capability poverty, transitory poverty, knowledge poverty, etc. Irrespective of the perspective from which poverty is defined, it can be generally categorized into three namely; absolute poverty, relative poverty and subjective poverty (Nweze and Ojowu, 2002).

Absolute or subsistence poverty deals with basic human needs measured by resources required to maintain physical efficiency (Haralambos and Heald, 1980; Kuper and Kuper, 1996). Individuals, families or groups are considered to be in absolute poverty when they are unable to afford the resources particularly net income to obtain the types of diets needed to enjoy some fixed minimum standard of living. This minimum standard of living considers some amount of goods and services essential and those who are unable to obtain them are said to be poor. Such goods and services include food, clothing, housing, education, healthcare, water and sanitation. People considered to be in absolute poverty are determined through a yardstick known as poverty line. The poverty line which is based on the level of income or consumption of individuals, households or groups in a given society (Balogun, 1999) provides a threshold whereby those whose income falls below are poor and

those whose income is above are non-poor. The poverty line used by the World Bank for international comparison is one dollar ($1) per person per day (Kankwenda et al, 2000; Ali-Akpajiak and Pyke 2003). Those below the poverty line according to Kankwenda et al (2000) and Balogun (1999) are grouped into two, namely, the poor and core or extremely poor giving rise to two poverty lines (upper poverty line and lower poverty line). While those whose income falls below the upper poverty line but above the lower poverty line are categorized as poor, those whose income falls below the lower poverty line are categorized as the core or extremely poor. In addition to using income as a yardstick, Kuper and Kuper (1996) and World Bank (2004) opined that absolute poverty is a condition of life characterized by insufficient social services such as health, education, safe drinking water, sanitation and public transport, with disease, low life expectancy, squalor as well as physical and mental retardation as consequences.

Relative poverty is a situation where an individual's or a household's income is less than the average income of the population in the society being considered. This means that the individual or household has goods and services which are lower than those of other persons or households in the society (Schiller, 1976; Oladunni, 1999; Kuper and Kuper, 1996). In the words of O'Donnel (1997), those who are in relative poverty have their resources far lower than those possessed by average individuals or households to the extent that, they are, in effect excluded from ordinary living patterns, customs and activities. This definition is dynamic as it must be related to the needs and demands of a changing society.

The concept of subjective poverty which is "expressed in a range of non-material and intangible qualities" (Nweze, et al 2002:2), is based on respondents' perception of their standard of living. This feeling of whether one is poor or not depends on individual societies and is based on a minimum standard of living in a particular society below which one is categorized as poor (Vaidyanathan, 2002; Haralambos and Heald, 1980).

The various concepts of poverty discussed above reveal that absolute poverty deals with those who find it difficult to live a meaningful decent life due to financial constraint. This implies that they are poor because they possess inadequate financial resources needed for them to obtain the basic necessities of life. The point here is that the poor in Nigeria are more concerned with obtaining the basic necessities of life (which is a concern of absolute poverty) than meeting up with the living standards of the non-poor (a concern of relative poverty). Thus, absolute poverty in the context of this paper is described as a situation where an individual or household is faced with limited financial resources and as a result, unable to meet his/her or its basic necessities of life such as food, clothes, shelter, education and health care (including sanitation and safe water).

Theoretical Underpinning

This paper is anchored on two theories namely; the human capital theory and structural/Marxian theory of poverty. The human capital theory postulates that education creates skills which facilitate higher levels of productivity amongst those who possess them in comparison with those who do not. Researchers in this field have found strong, and empirically verifiable, positive relationships across all societies between the wages and salaries people receive at work and the level of education they attain. According to Ukwueze and Nwosu (2014) Human Capital theory presents a link between education and poverty in terms of education as a means of poverty reduction. This link can be drawn both at the macro and micro levels of poverty and on the levels of education. The World Bank (1995), asserted that education especially basic (primary and lower secondary) education helps reduce poverty by increasing the productivity of the poor, by reducing fertility and improving health, and by equipping people with the skills they need to participate fully in economy and society.

The Structural/Marxian theory of poverty is hinged on the fact that capitalism brings about fundamental social problems including severe inequality which leads to poverty. Since wealth is concentrated in the hands of a minority who are bent on pursuing profits through exploitation of labour, the redistribution of resources is more within classes than between classes. Those stricken by poverty are often subjugated by the bourgeoisie so as to glean (collect undeserved) profits and capital via exploitation. This means that poverty is a class rather than an individual or group issue (O'Donnell, 1997; Haralambos and Heald, 1980). It is the macro-structure of a capitalist society that produces inequality and consequently poverty argued Islam (n.d.). Institutions and class exploitation account for poverty as people suffer in the hands of the privileged class and institutional arrangements. The poor are unable to attain higher living standards and thus come out of poverty because the capitalist arrangement is biased against them. The structure of political power in a capitalist society determines the extent and distribution of poverty among the population. It sees poverty as a characteristic feature of a situation in which the few that possess and control the political power organize the economic system to suit their own selfish interests. Hence, poverty results from the fact that, office seekers, realizing that no condition is permanent, endeavour to maximize wealth acquisition at the expense of the majority within the shortest possible time. Here, element of greed is highly exhibited. It is important to stress that the degree of success or otherwise of the exploiting class depends on the consciousness of those oppressed to revolt as well as their organizational capacity to resist exploitation and overthrow the mechanisms of the oppressive property system. The Structural/Marxian theory of poverty provides the basis for analysis in this study because it explains the situation in Nigeria where there is co-existence of low political consciousness due largely to high rates of illiteracy on the part of the masses, and a high degree of centralization of resources which the ruling class exploit.

Poverty Situation in Nigeria

Despite efforts aimed at reducing poverty in Nigeria, the phenomenon has been described in the words of Onibokun and Kumuyi (1996) and National Planning Commission (1995) as not only aggravating but continuous and worsening. According to Federal Office of Statistics (1999), of the 19 states in Nigeria in 1980, no state had more than half of its population categorized as poor but by 1985, eight states (namely Bauchi, Edo/Delta, Borno/Yobe, Kaduna/Katsina, Kano/Jigawa, Niger, Ogun and Plateau) had more than half of their population categorized as poor though the number reduced to three states (Bauchi, Kwara/Kogi and Plateau) in 1992. However, by 1996, only two states (Rivers and Borno) never had more than half of its population as being poor. In 2004, seventeen states had less than fifty per cent (50%) of their population being poor. The 2010 figures show that five states namely Bayelsa, Lagos, Niger, Ondo and Osun had less than fifty per cent (50%) of their population being poor.

The nation's general picture depicts a relatively continuous rise in poverty level. While in 1980 only 27. 2% of the Nigerian population were said to be poor, the proportion increased to 46.3%, 65.6% and 80% in 1985, 1996 and 1998 respectively. The trend according to Ogwumike (2001) and World Fact Book (2004) declined to 70%, 60% and 54.4% in 1999, 2000 and 2004 respectively, before rising to 69.0% in 2010.

Table 1: Trends in poverty level: 1980 -2010 (in %).

Year	1980	1985	1992	1996	1997	1998	1999	2000	2004	2010
Poverty Level	27.2	46.3	42.7	65.6	69.2	80.0	70.0	60.0	54.4	69.0

Source: Compiled from CBN (1998), F.O.S (1999), Ogwumike (2001), World Fact Book(2004), Soludo (2005) and NBS National Poverty Profile (2005 & 2010).

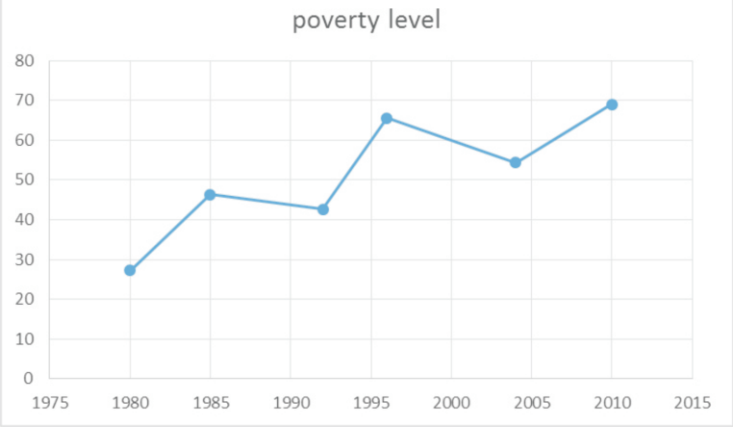

Figure 1: Poverty Level in Nigeria (1980 - 2010)

The poverty trend in Nigeria has been described as a paradox considering the fact that it possesses the greatest natural resources in South Saharan Africa and is said to be growing. The population living below the poverty line increased significantly from 17.68 million in 1980 to 112.47 million in 2010 as shown in table 2.

Table 2: Population Living in Poverty: 1980 – 2010 (Million)

Year	Poverty Level (%)	Estimate Population (Million)	Population in Poverty (Million)
1980	27.2	65	17.68
1985	46.3	75	34.7
1992	42.7	91.5	39.1
1996	65.6	102.3	67.1
2004	54.4	126.3	68.7
2010	69.0	163	112.47

Source: National Bureau of Statistics; National Poverty profile, (2010)

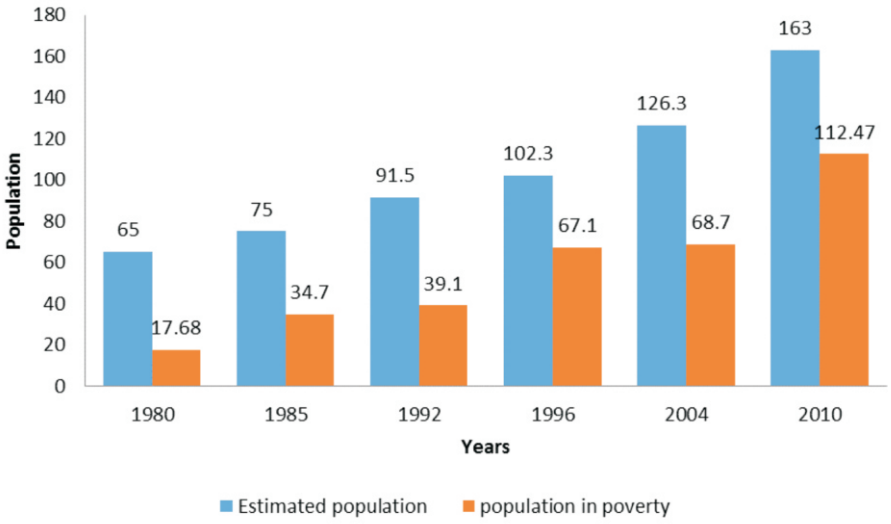

Figure 2: Population in Poverty

Poverty in Nigeria is more pronounced in rural areas than in urban areas. The level of poverty in rural areas rose from 28.3% in 1980 to 73.2% in 2010, while in urban areas, it rose from 17.2% to 61. 8%, during the same period. Table 3 presents the poverty situation in rural and urban areas.

Table 3: Poverty trends by sector (rural and urban): 1980 - 2010

Year	Urban (%)	Rural (%)
1980	17.2	28.3
1985	37.8	51.4
1992	37.5	46.0
1996	58.2	69.8
2004	27.5	36.2
2010	61.8	73.2

Source: National Bureau of Statistics; National Poverty profile, (2004 & 2010)

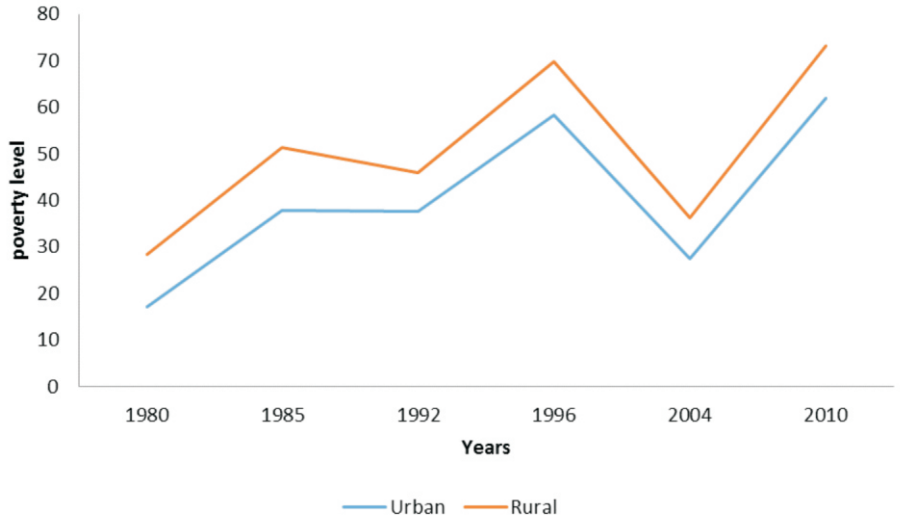

Figure 3: Poverty level by sector (rural and urban, in %).

Table 4: Poverty Incidence by sectors and geo-political zones

Zone	**2004**	**2010**
South South Zone	47.5	51.6
South East Zone	31.2	53.5
South West Zone	40.2	46.9
North Central Zone	58.6	64.2
North East Zone	64.8	74.3
North West Zone	61.2	73.2

Source: National Bureau of Statistics; National Poverty profile, 2010

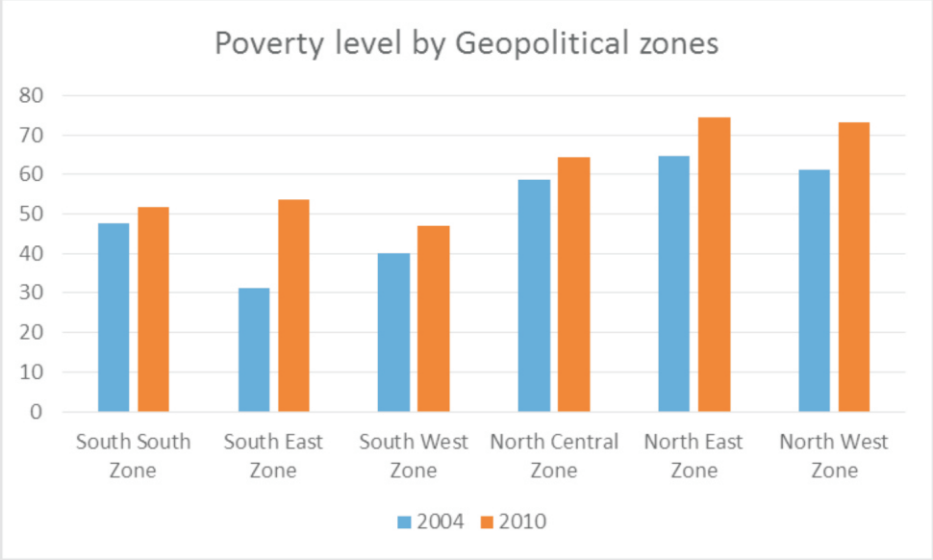

Figure 4: Poverty Level by Geopolitical zones

Nigeria's Education Sector

Prior to the introduction of western education in Nigeria, various communities were engaged in informal educational processes. The African culture consciously engaged in training young men and women in various traditional ways. According to Adiele, Obasi and Ohia (2017) they did this by transferring various skills and knowledge to members of their families even though there were no physical conventional classrooms. After this period, Thomas Birch Freeman came to Southern Nigeria in 1842 and introduced Western education which is generally considered as the formal education (Hauwa, 2012). The British government adopted a new education policy for its British West African colonies in 1926. The policy called for greater investment in education in order to raise the efficiency of Nigerians. The memorandum stated the guidelines for operation in the colonial education system clearly (Osokoya, 2002; Fabunmi, 2005).

After independence, Nigerian government having recognized the importance of education in promoting national unity, economic and social development; came up with policies and programmes to support the education sector. According to Federal Republic of Nigeria (2014), Nigeria's educational system encompasses of three different sectors: basic education for nine years (consisting of six years of elementary and three years of junior secondary education) which aims at achieving equal educational opportunities and eradicating illiteracy; post-basic which is senior secondary education for three years, and tertiary education for four to six years (depending on the programme of study). The purpose of the 2014 National Policy on Education was to make education an aggregate tool of empowerment for the poor

and the socially marginalized groups. According to Daniel (2018) the aim of the policy is to serve as an effective means of developing the full capabilities and potentials of human resources, as well as the development of competent workforce through the acquisition of practical life skills relevant to the labour market as a veritable means of developing sound intelligent learning societies, fit and relevant to the 21st century.

Past administrations have made it a mandate to boost education by coming up with different educational programmes like the Universal Primary Education (UPE) scheme in 1976, which was later revised to Universal Basic Education (UBE) in 1999 and the National Policy on Education in 1977 which was revised and updated in 1981, 1990 and recently 2014 (Presidential Advisory Committee, 1999). These policies have been aimed at ensuring that every Nigerian child has full access to quality education at all levels as well as encourage education for self-reliance.

There has been phenomenal growth in the number of educational institutions at various levels in Nigeria from independence. Universities alone in Nigeria increased from 16 in 1980 to 152 in 2015; that is, 850% rise. However, the quality and level of literacy have remained a mirage as compared to the quantity. The literacy rate has improved marginally from 55.4 % in 1991 to 57.9% in 2010 and 67% in 2016 after suffering decline to 54.8% and 51.1% in 2003 and 2008, respectively.

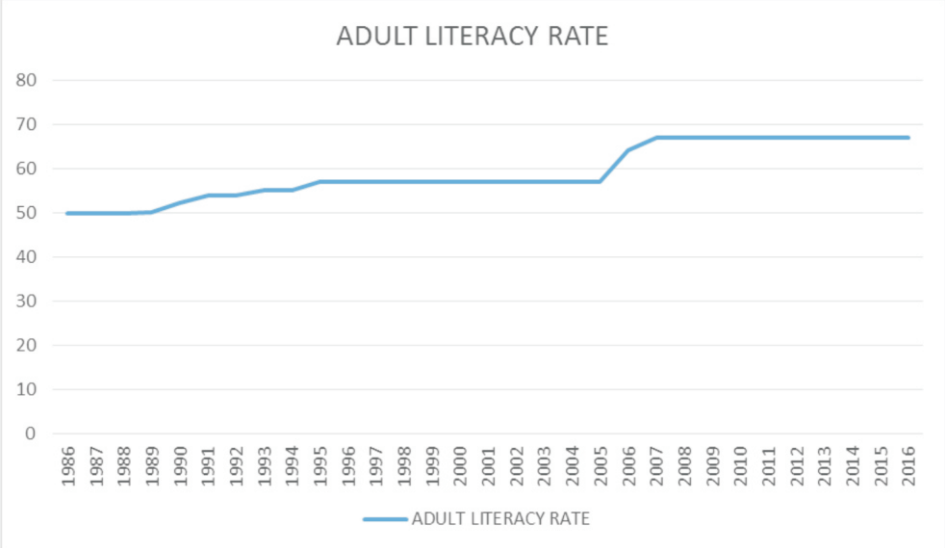

Figure 5: Adult Literacy Rate in Nigeria (1986-2016)

Table 5: Adult Literacy Rate by Geopolitical Zones

Zone	Male	Female	Both Sexes
North Central	65.1	47.3	56.4
North East	49.8	33.4	42.0
North West	39.7	23.2	31.7
South East	80.7	67.5	73.8
South South	81.1	66.7	74.0
South West	75.5	62.6	69.1
National	**65.1**	**50.6**	**57.9**

Source: National Bureau of Statistics; National Literacy Survey, 2010

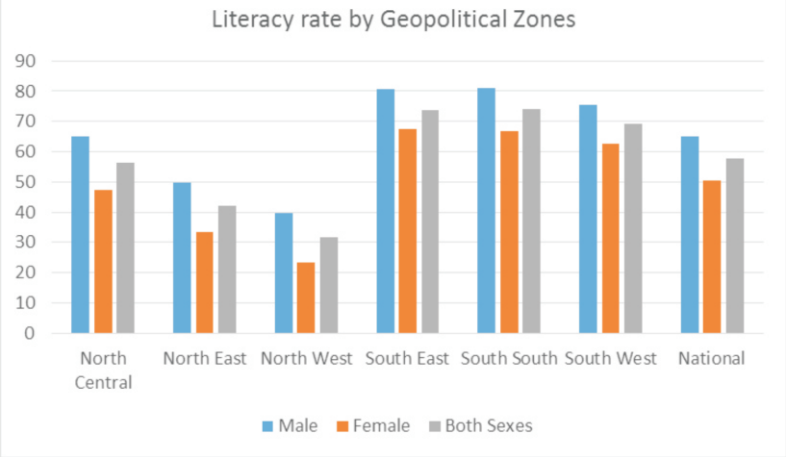

Figure 6: Adult Literacy Rate (male & female) by Geopolitical Zones

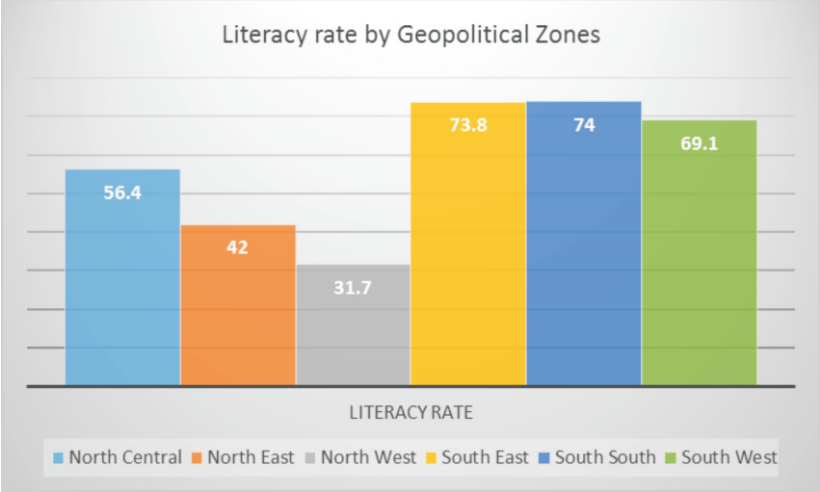

Figure 7: Adult Literacy Rate by Geopolitical Zones

Challenges and Prospects of Education in Nigeria

It is no gainsaying that due to laudable programmes put in place by various governments in Nigeria in improving the quality of Education in the Nigerian society, much has not been achieved in really carving out policies that will suit the entire society and reduce poverty. The challenges faced in the educational sector at all levels are discussed below.

One key challenge is underfunding of the educational sector which has left most educational facilities at a deplorable state. While efforts at increasing capacity by building new universities, secondary and primary schools have generally been positive for access in absolute terms, they have also created issues related to institutional quality. Nigeria's institutions (particularly public institutions) have characteristics of lecture halls being severely overcrowded and skyrocketed teacher to student ratio (World Education Services; WES, 2017). Lab facilities, libraries, dormitories and other facilities at all levels of education are in a state of decay. Over the past decade, strikes have become an almost ritual occurrence causing delayed graduations, loss of income by university staff, and further eroding the already low standard and trust in the education system.

Osipian (2013) posits that Nigeria's education sector is particularly vulnerable to corruption and fraud; he stated that limited access to education in Nigeria has no doubt contributed to the use of bribes to get coveted places at universities. While corruption is a covert activity that is difficult to measure, Nigeria scores low on 'the global perception index' published by the organization Transparency International. World education services (WES, 2017) asserts that the 2016 report places Nigeria at 136th place among 176 countries. Transparency International reported that about 30% of Nigerians surveyed said they had paid a bribe in the education sector. The West African Examination Council has deemed it necessary to start using biometric fingerprint technology when registering students so as to curtail examination malpractice which is high in the country.

Other challenges include limited access to and quality of basic education; limited provision of facilities for science, technology, engineering and mathematics (STEM) education; inadequate facilities at all levels of education especially at tertiary level; and inadequate structured and quality programmes for technical and vocational education and training. There are also constraints such as inadequate financing, insufficient number of skilled teachers and lecturers, and outdated and obsolete educational policies and practices (Federal Republic of Nigeria, 2017). If these challenges are addressed, literacy rate will be enhanced which will eventually lead to innovation and technological advancement thereby creating employment opportunities capable of reducing poverty.

The Nexus between Education and Poverty

The major demand of the poor is not food but various inputs and facilities that can help them generate income on the basis of their skills and proficiencies. According to Uno (2017) the best way to ensure poverty reduction is to improve the level of education of its citizens because effective poverty reduction should begin from ensuring adequate education for everybody irrespective of one's position on the income ladder. He further asserted that the advantages of education in the improvement of man are diverse and its strength in ensuring poverty reduction is sterner. Therefore to ensure human capacity development, Nigerian Government can make education very cheap so that the poor and their children can have access to quality education. Obadan (1992) buttressed the point that education is crucial to the elimination of poverty. He argued that to the extent which education provides skills and abilities, it also allows the poor to secure productive and well-paying jobs.

Education is a major capital programme for the government to expend money and other resources on. Eid (2004) noted that education enables people improve their social, cultural and economic situation which implies that its utility is myriad. According to Gaolathe, (2004) education is a major factor in ensuring that people get out of the vicious circle of poverty. He asserted that poverty is a barrier to accessing education. This is the reality in Nigeria because education of poor children is often sacrificed mainly due to the need for child labour for family survival; thereby creating a vicious circle of poverty. However, Uno (2017) stressed that there is need for the Nigerian Government to redirect poverty eradication programmes by focusing on investing in human beings by making education highly accessible and affordable to the poor. This is because in the words of Abimiku and Bulus (2013) education is a close correlate of poverty which implies that the more educated an individual or society is, the greater his/her chances of escaping from poverty. With the aid of data from the Nigeria Living Standard Survey (NLSS) 2004 and Harmonized Nigeria Living Standard Survey (HNLSS), 2009, they found out that poverty in Nigeria reduces with increasing levels of education as the incidence is lowest among those with some form of tertiary education, and highest among those with no education or just elementary education. Their study observed similar trend across Nigeria as the poverty incidence is higher in Northern parts of the country with less educational access and attainment when compared with the Southern parts.

METHODOLOGY

Data used in this paper which are primary in nature were sourced from National Bureau of Statistics and publications of Central Bank of Nigeria and United Nations. In analyzing the data, both qualitative or descriptive and quantitative methods were used. The qualitative method included percentages, tables, charts and graphs while the ordinary least square (OLS) method was the quantitative method used.

RESULTS AND DISCUSSION

Descriptive Analysis

Data for the descriptive analysis were obtained from the Nigeria Living Standard Survey (NLSS) 2004 and Harmonized Nigeria Living Standard Survey (HNLSS), 2009. Specifically, the variables considered are educational attainment vis-a-vis poverty level in urban and rural areas as well as across geopolitical zones. This has provided a picture of the nexus between education and poverty in Nigeria as depicted in table 6 and figures 8 to 10.

Table 6: Poverty Incidence across level of education

Educational Attainment	**2004**	**2010**
No education	64.2	68.4
Elementary	64.3	70
Primary	46.2	63
Secondary	44.5	51
Tertiary	23.3	34.9

Source: National Bureau of Statistics, Poverty Profile, 2004 & 2010

The expenditure curves in Figure 8 show larger proportions of total area for those with no education and elementary lying to the left of the poverty line, implying higher probabilities of being poor.

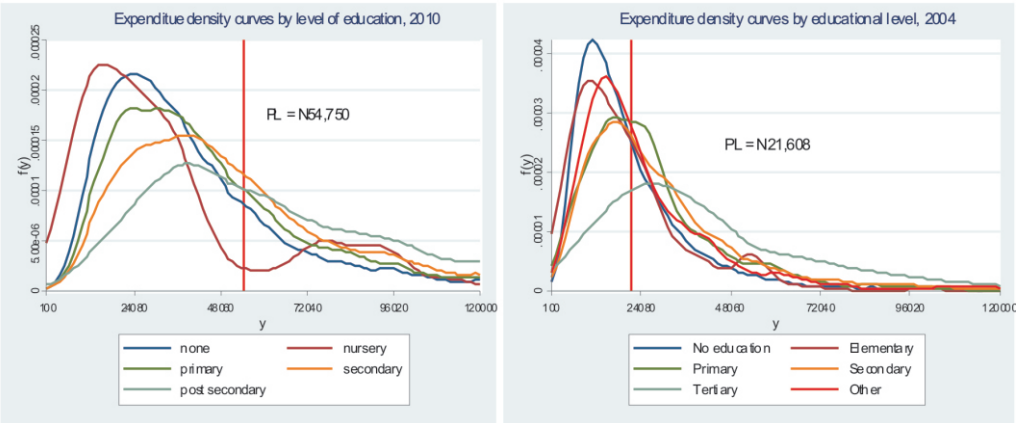

Figure 8: Per capita expenditure densities by educational attainment, 2010 and 2004

Poverty is generally more pervasive in the rural sector with rate of 60.5 per cent on the dollar per day basis compared to the urban rate of 40.1 per cent. The expenditure densities in Figure 9 point to this as well. The probability of being poor measured by the area to the left of the vertical poverty; is higher in both 2004 and 2010 in the rural sector (figure 9).

The intensity of poverty declines generally south-wards. The per capita expenditure density curves in Figure 10 buttress this fact. The topmost three curves are those of the northern zones. In proportionate terms, the areas to the left of the poverty line in both surveys are larger than for the lower curves for the southern zones. In effect, the probability of being poor, or put differently, the probability of an observation falling below (or to the left of) the poverty line is higher in the northern zones.

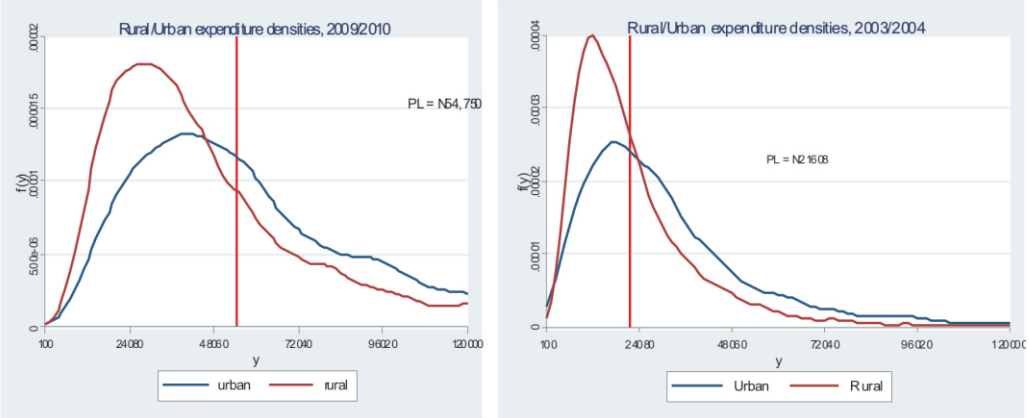

Figure 9: Per capita expenditure densities by sectors, 2010 and 2004

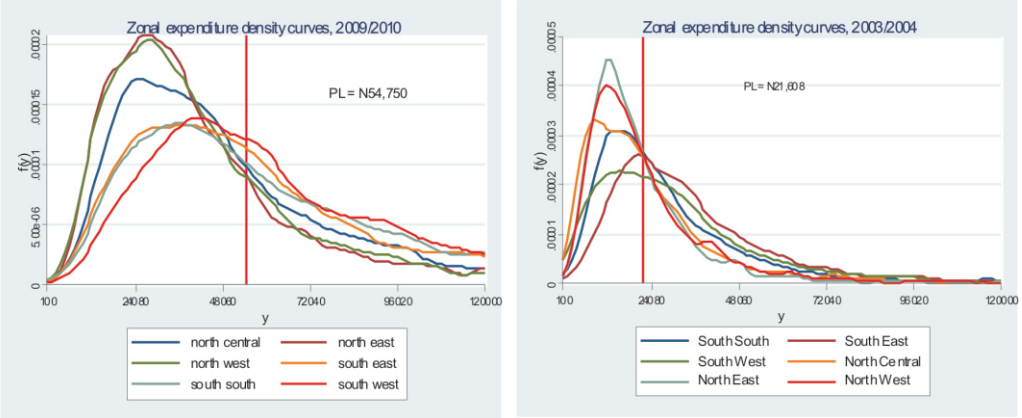

Figure 10: Per capita expenditure densities by geo-political zones, 2010 and 2004

Evidences from countries such as Pakistan, Costa-Rica and Cameroon among others allude to the fact that higher level of attainment of education has the potential of lifting the poor out of poverty and reduce the probability of being poor gradually.

Quantitative Analysis of Education and Poverty in Nigeria

The empirical analysis employed annual time series data covering the period 1986 to 2016. The choice of this scope is anchored on the inception of the structural adjustment program (SAP) in Nigeria which was geared towards poverty reduction in the country through the diversification of the economy by focusing on other sectors of the economy other than the oil sector. One of such sector was education.

The study has the following hypothesis;

H_0: Education has no significant impact on poverty reduction in Nigeria.

H_1: Education has a significant impact on poverty reduction in Nigeria.

The model adopted aggregate poverty level (APOV) as the endogenous variable, while gross primary school enrolment (PRSE) gross secondary school enrolment (SCSE) and government capital expenditure on education (EXED) of Nigeria and adult literacy rate (ALIR) are used as the exogenous variables. The data relied on secondary source obtained from the World Bank, Central Bank of Nigeria (CBN) and UNESCO.

The methods of analysis include Ordinary Least Square (OLS) method, and Error Correction Methodology with Augmented Dickey Fuller (ADF) Unit Root Test and Johansen's Co-integration test as pre-tests and estimation techniques. The functional form of the model is specified as:

APOV= f(ALIR, EXED SCSE, PRSE)……(1)

The linear form of equation (1) becomes;

$\log APOV = \beta_0 + \beta_1 \log ALIR + \beta_2 \log EXED + \beta_3 SCSE + \beta_4 PRSE$ …….. (2)

The error correction model derived from equation (2) becomes

$D(\log APOV) = \beta_0 + \beta_1 D(\log ALIR) + \beta_2 D(\log EXED) + \beta_3 D(\log SCSE) + \beta_4 D(\log PRSE) + \phi ECM(t-1)$ …. (3)

Where;

β_0 = Intercept of the model (constant).

$\beta_1 - \beta_4$ = coefficients of each exogenous variable

ECM= Error Correction Term

The a priori expectation for the coefficients in the model are $\beta_1, \beta_2, \beta_3, \beta_4 < 0$

Unit Root Test Results

Stationarity of the variables was tested using the Augmented Dickey Fuller (ADF) test. Table (7) depicts the results which indicate the rejection of the unit root null hypothesis of the stationarity of APOV, ALIR, EXED and SCSE at the first difference and PRSE at second difference.

Table 7: Augmented Dickey Fuller (ADF) Unit Root Test

Variables	ADF Statistic	5% CV	Prob.*	Order of Integration
APOV	-3.660420	-3.574244	0.0418	I(1)
ALIR	-4.104232	-3.574244	0.0160	I(1)
EXED	-5.347283	-3.580623	0.0009	I(2)
SCSE	-3.947976	-3.875302	0.0452	I(2)
PRSE	-30.32550	-4.008157	0.0001	I(2)

Source: Authors' Computation

Co-Integration Result

The result of the Johansen co-integration test indicate that the model has five and one co integrating equation(s) at 5% significant. This is shown by both the Trace and Max-Eigen Statistic respectively (See appendix). Hence, the variables are co integrated which implies the existence of a long run relationship between the dependent and independent variables of this study.

Error Correction Estimation Result

Given that the variables of the model are co-integrated, the next step was the estimation of the short-run dynamics within the error correction models (ECM) in order to capture the speed of adjustment to equilibrium in the case of any shock to any of the independent variables. An error correction model was estimated and the results are presented in table 8.

Table 8: Error Correction Model Result

Variable	Coefficient	Standard Error	t-statistic	Probability
C	0.012694	0.010078	1.259595	0.2271
D(LOGALIR,1)	0.242357	0.325689	0.744135	0.4683
D(LOGEXED,2)	-0.008464	0.023413	-0.361505	0.7228
D(LOGSCSE,2)	0.052056	0.105075	0.495412	0.6275
D(LOGPRSE,2)	-0.051421	0.163144	-0.315189	0.7570
ECM(-1)	-0.004559	0.001824	-2.499482	0.0245
R-Squared	0.345228		**DW Statistic**	1.225139
Adjusted R^2	0.126971		**Prob(F-Stat)**	0.224959

Source: Authors' Computation Using Eviews Version 9.0

From table 8, the coefficient of determination as revealed by R^2 indicates that 34% of the variations observed in the dependent variable APOV were explained by variations in the independent variables. This implies the rate at which poverty changes is determined by variations in education sector. Also, from the results, the error correction term is -0.004559. The negative sign implies that the Error Correction Model was adjusting with the previous system dis-equilibrium annually. It also means that the ECM term actually corrects dis-equilibrium in the system.

Furthermore, the findings revealed that the impact of EXED and PRSE on APOV are negative which is in line with a priori expectation and implies that a change in these two variables will cause a change in poverty in the opposite direction. However, the impact of ALIR and SCSE on APOV are positive. This is unfortunately not in line with the theoretical a priori expectation implying that education in Nigeria has not led to poverty reduction. Finally the probability of the F- statistic shows that at 0.05 level of significance, the variables are jointly significant.

CONCLUSION AND RECOMMENDATIONS

Improving and widening access to education, especially basic education has been an objective of the education policy in Nigeria. This reflects the broad recognition that education contributes to development. Basic education is often considered a social right which the state has a responsibility to guarantee to its citizens and the benefits of education have been clearly established globally. The evidence is profound that education raises the quality of life, improves health and productivity, increases individual's access to paid employment and often facilitates social and political participation capable of reducing poverty.

However, the findings of this study have revealed that Nigeria is yet to fully harness the good benefits of education. With inadequate allocation of revenue to the education sector, dwindling enrolment rates and literacy rate below international benchmarks; it is no wonder the country has been ranked as the world's poorest country in terms of population. Hence, the following are the recommendations of the paper'

i. The federal government should increase its allocations to the education sector to meet up with the 26% benchmark of the United Nations. Also, there should be enforced monitoring of the allocated funds to prevent misappropriation.

ii. There should be a continuous training and retraining of teachers at all levels of education to ensure that the quality of students produced from the schools are optimal.

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APPENDIX I

YEAR	APOV	EXED	SCSE	PRSE	ALIR
1986	44	0.34	27.08	93.27	50
1987	44	0.45	27.07	89.51	50
1988	44	0.46	24.13	85.17	50
1989	43.9	0.49	24.6	82.83	50.1
1990	43.8	0.54	24.6	86.26	52.2
1991	43	0.56	23.5	85.42	54
1992	42.5	0.91	23.5	89.46	54
1993	48	0.64	23.5	93.56	55
1994	53.9	0.67	23.5	93.35	55
1995	59	0.65	23.5	89.06	57
1996	61	0.58	23.5	78.46	57
1997	66	0.51	23.5		57
1998	68	0.56	23.5		57
1999	69	0.58	23.42	93.81	57
2000	70	0.84	24.46	98.36	57
2001	71	0.88	26.86	96.04	57
2002	72	0.94	29.42	97.64	57
2003	71	1.26		99.08	57
2004	73.4	1.22	34.75	100.26	57
2005	73	0.66	34.7	100.93	57
2006	74	0.68	34.19	101.67	64.2
2007	76	0.65	31.61	92.9	66.9
2008	75.8	0.61	35.1	83.76	66.9
2009	79	0.66	38.9	84.99	66.9
2010	79	0.61	43.84	84.72	66.9
2011	78	0.57	45.15	90.25	66.9
2012	80	0.53	46.76	91.66	66.9
2013	82	0.47	55.7	93.6	67
2014	81	0.36	56	94	67
2015	82.5	0.08	56	94	67
2016	83		56		67

Source: National Bureau of Statistics, Central Bank of Nigeria and the United Nations (2017).

APOV: Aggregate poverty level
EXED: Capital expenditure on education as a percentage of total capital expenditure
SCSE: Secondary school enrolment rate
ALIR: Adult literacy rate

APPENDIX II: UNIT ROOT TESUNITROOT TEST RESULTS

APOV

Null Hypothesis: D(APOV) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.660420	0.0418
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

ALIR

Null Hypothesis: D(ALIR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.104232	0.0160
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

EXED

Null Hypothesis: D(EXED) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.347283	0.0009
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

SCS

Null Hypothesis: D(SCSE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 7 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.947976	0.0452
Test critical values:	1% level	-4.992279	
	5% level	-3.875302	
	10% level	-3.388330	

APPENDIX III: COINTEGRATION RESULTS

Date: 11/06/18 Time: 14:36
Sample (adjusted): 1988 2015
Included observations: 21 after adjustments
Trend assumption: Linear deterministic trend
Series: APOV ALIR EXED SCSE PRSE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.811697	91.11212	69.81889	0.0004
At most 1 *	0.686463	56.04833	47.85613	0.0071
At most 2 *	0.526859	31.69176	29.79707	0.0299
At most 3 *	0.333911	15.97617	15.49471	0.0423
At most 4 *	0.298432	7.443194	3.841466	0.0064

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.811697	35.06379	33.87687	0.0360
At most 1	0.686463	24.35657	27.58434	0.1228
At most 2	0.526859	15.71559	21.13162	0.2419
At most 3	0.333911	8.532979	14.26460	0.3271
At most 4 *	0.298432	7.443194	3.841466	0.0064

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

APPENDIX IV
ECM

Dependent Variable: D(LOGAPROV,1)
Method: Least Squares
Date: 08/19/18 Time: 15:02
Sample (adjusted): 1988 2015
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.012694	0.010078	1.259595	0.2271
D(LOGALIR,1)	0.242357	0.325689	0.744135	0.4683
D(LOGEXED,2)	-0.008464	0.023413	-0.361505	0.7228
D(LOGSCSE,2)	0.052056	0.105075	0.495412	0.6275
D(LOGPRSE,2)	-0.051421	0.163144	-0.315189	0.7570
ECM(-1)	-0.004559	0.001824	-2.499482	0.0245

DOMESTIC ENERGY CONSUMPTION AND POVERTY REDUCTION IN NIGERIA: A DISAGGREGATED ANALYSIS

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Ilemona Adofu [2]

and

Okwori Joseph [3]

ABSTRACT

There is paucity of literature on the nexus between the different sources of energy and poverty reduction in Nigeria. This paper addresses this gap by examining the effects of various energy sources on poverty reduction in Nigeria. The paper employs the impulse response function and variance decomposition in analysing the reaction in poverty level to disaggregated energy sources over the period 1981 to 2014. The results suggest the existence of long run cointegrating relationship among poverty level, PMS, Kerosene, gas, biofuel and charcoal consumption. The impulse response function shows that poverty responds negatively to consumption of electricity, PMS, gas and kerosene. The response of poverty to charcoal and biofuel consumption is positive, suggesting that the consumption of energy from efficient sources reduces poverty than inefficient energy sources. The variance decomposition shows that poverty responded more to shocks from PMS, charcoal and biofuel. The results of this study imply that energy from inefficient sources has significant impact on poverty level in Nigeria. The study suggests a move away from overdependence on inefficient energy sources by ensuring constant supply of efficient energy sources and the stability of energy price.

Key words: Poverty; Energy consumption; Variance Decomposition; Impulse Response Function

JEL Classification: I32, Q43

INTRODUCTION

Access to quality energy is fundamental to growth in the quality of life of citizens of every nation, yet many countries pay little attention to the type of energy consumed and the effect it has on development (Aliyu, Ramli & Saleh, 2013). Understanding the link between access to quality energy and sustainable development is important because energy forms an essential input in the production process and remains central to the speed of economic development of a nation (Spreng, 2011). Recently,

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many literature have tried to establish the link between energy consumption, economic growth and poverty (Karekezi, Mcdade, Boardman & Kimani, 2016). Literature such as Oyedepo (2012), Eleri, Ugwu and Onuvae (2012) stressed availability and cost of energy as vital for sustainable growth. Studies are now trying to link the nature of energy consumed to the level of income and poverty rate of countries: Foster and Tre (2000) for Guatemala; Barnes, Khandker and Samad (2010) for Bangladesh; Murtaza and Faridi (2016) for Pakistan. Besides the fact that the type of energy used reveals the extent of poverty, the type of energy used could accentuate poverty. This is because the output produced per kilowatt and the cost of energy used is determined by the type of energy consumed (Karekezi et al., 2016). In Nigeria for instance, about 60 to 70 percent of the population still use fire wood and charcoal as their main source of energy while majority do not have access to electricity (Sa'ad and Bugaje, 2016). Poor access to efficient energy sources largely explains the reason for low growth and slow pace of economic development in Nigeria (Oseni, 2017).

This paper addresses this issue by examining the relationship between the different types of energy consumed and poverty level in Nigeria. Specifically, the energy consumed is disaggregated into electricity, charcoal, premium motor spirit (PMS), gas, kerosene, and biofuels. This paper argued that understanding the link between specific types of energy source commonly used especially among households is important in understanding how energy can be used for poverty reduction in Nigeria. The sources of energy used for economic and domestic activities are a pointer to the nature of poverty that exists in a nation. Rich nations tend to use more efficient energy like electricity, nuclear, renewable energy that require less amount of energy to produce goods and services. In contrast, poor nations tend to use inefficient energy sources like wood, coal, plant and animal waste that require large amount of energy to produce goods and services (Kaygusuz, 2012; Shahsavari, 2018).

A look at the nature of energy consumption in Nigeria suggests that the economy seems to face both fuel poverty and energy poverty. For instance, Energy commission of Nigeria [ECN] (2014) reports showed that 86 percent of energy consumed by residential are from coal and firewood. Apart from low access to efficient and clean energy in Nigeria, the cost of accessing the available energy sources is not just in monetary terms but also in time. For instance, the money cost of firewood is low, but the time and energy required to fetch such woods is high especially for a poor household in the rural areas. In the case of PMS, adding the time of staying in the queue to cost of acquiring PMS during time of scarcity makes the price of PMS and DPK (kerosene) expensive with many spending more than 30 percent of their income on energy (Eleri, Ugwu and Onuvae, 2012). A nation faced with such situation according to Boardman (1991) is faced with fuel poverty. Fuel poverty occurs when households spend more than 10 percent of its income on fuel

(Boardman, 1991). Recently the definition of energy poverty has gone beyond lack of access to energy to involve affording efficient and clean energy (Baiyegunhi and Hassan, 2014).

This work contributes to existing literature in the following ways. First, previous studies have tried to attribute the determinants of energy use to income (Mesah and Adu, 2015), education (Ogwumike, Ozughalu and Abiona, 2014) and consumers' awareness (Lay, Ondraczek and Stoever, 2012) and willingness to pay (Oseni, 2017) for a particular type of energy. In contrast, the paper establishes the link between energy types and poverty level in Nigeria by disaggregating energy consumed by types and shows the rate at which each energy source affects poverty level. Second, Jiang and O'Neill (2004) explored the patterns of residential energy use and energy transitional in rural China. They argued that although residential energy consumption varies significantly across geographical regions due to disparities of access to different energy sources, prices, climate, level of urbanization, household demographic characteristics (in particular household size); household energy use is primarily a function of net income rather than total expenditure. In line with the position of Jiang and O'Neill (2004) this paper argued that if the use of energy is defined by the level of income or worse still poverty level, then the scarcity of essential energy increases poverty rate in Nigeria. This implies that poor access to modern and efficient energy poses an obstacle to poverty reduction in Nigeria.
This study investigates the causal relationship between poverty and disaggregated energy sources in Nigeria. In doing so, the study has been divided into five sections. Section one is the introduction followed by literature review and methodology in sections two and three respectively. While section four is devoted to results and discussion, the fifth section is focused on conclusion and recommendations of the study.

LITERATURE REVIEW

Theoretical Review

Recent theoretical conjectures have tried to link energy consumption with growth. First of these is the work by Kraft and Kraft (1978) who saw economic growth as a function of energy consumption. Other works by Asafu-Adjaye (2000), Chontanawat, Hunt and Pierse (2008), Apergis and Payne (2010), Ozturk, Ashan and Kalyonau (2010) established the causal link between energy and growth. Studies by Foster and Tre (2000) Barnes, Khandker and Samad (2010) linked energy with poverty. This study however is anchored on the energy ladder hypothesis. The proponents of the energy ladder hypothesis such as Hosier and Dowd (1987) and Leach (1992) linked the nature of energy consumed to income. According to the theory, household energy consumption move from traditional energy sources such as wood, to transitional energy sources such as kerosene and then to clean modern energy sources such as electricity as the income of households' increases. The theory explains that the type of energy consumed by households strongly depends on the

level of household income. Drawing from consumer theory, the hypothesis posits that as income increases, energy consumers tend to transit from traditional or inferior energy to efficient energy due to ease of use and comfort. The theory holds that there is a direct link between level of income and types of energy consumed. High income countries tend to consume more efficient energy source.

Empirical Review

Although many literature exist on poverty and energy consumption, few literature exist that deals with energy types and poverty and yet very few exist that analyzes the relationship between energy types and poverty in Nigeria. The empirical reviews are divided into two strands: works that deal with energy poverty and vulnerability and those that concern energy types and poverty level.

Olatomiwa, Mekhilef, Huda and Ohunakin (2015) evaluated the effect of hybrid energy systems on the quality of life of rural dwellers in six geo-political zones of Nigeria. The study employed the hybrid optimization model to examine the feasibility of transforming solar rays to electricity in six rural communities within the different geo-political zone of the country. They observed that providing electricity to rural areas using renewable energy improves the quality of life of rural dwellers and are cost effective. The electricity power which has been the cleanest energy source can only meet about 40 percent of Nigeria population that are connected to the national grid with less than 60 percent efficiency in production. Over the years, the Nigerian government had tried to improve access to clean energy and such efforts have not yielded the desired results. For instance, Oyedepo (2014) examined the prospect of the use of renewable energy for energy efficiency towards enduring sustainable development in Nigeria. Employing a comparative analysis of the different types of energy sources, the study observed that lack of diversification of energy sources, willingness to accept new technologies and dependence on fossil fuel as the main source of energy generation still continue to plaque the country's drive for a cleaner energy source.

Ogwumike, Ozughalu and Abiona (2014) investigated the determinants of household energy use in Nigeria using the 2004 Nigeria living standard survey data. The authors utilized descriptive statistics and multinomial logit models as methods of analysis. The outcome of the study showed that households in Nigeria do not use environmentally friendly modern energy sources. In addition, the study revealed that most families in Nigeria use firewood and coal to meet their domestic energy needs like cooking, heating and lightening. In regards to consumers' status, the authors observed that a major determinant of the type of energy choice in Nigeria is the level of education, per capita expenditure and household size. A related study by Baiyegunhi and Hassan (2014) explored the effects of household social economic characteristics on choice of cooking fuel in Giwa Local government of Kaduna state, Nigeria. The study used a multinomial logit model to estimate the possible

determinants of energy choice in Giwa. The results show a consistent pattern of fuel wood usage alongside modern fuels. Majority of the households depend on wood as the main source of cooking energy not displaced by modern energy source. Like other studies, they observed that the age of the household head, educational attainment, household size, income, the duration of food cooked and price of fuel wood significantly influence the choice of cooking fuel. Scholars like (Oseni, 2017) pointed out that other factors that tend to determine the choice of the type of energy use in Nigeria is access and reliability of energy type. People tend to purchase more available energy not necessarily for efficiency but for security of supply.

The cost of energy has significant impact on income of energy users. Siddig, Aguiar, Grethe, Minor and Walmsley (2014) studied the impact of subsidy removal on the Nigeria economy. Using an economy-wide model, the study investigated the direct and indirect impact of subsidy removal on poor households in Nigeria. They found that reduction in subsidy increases the GDP of Nigeria but however had detrimental impact on the income of poor households. They recommended that subsidy removal should be accompanied with income transfer aimed at the poor. Apart from the poverty implication of efficient energy source, the upgrading of energy use to more efficient sources is also for mitigating climate change. As posited by Grueniech (2015) energy efficiency should be geared towards overcoming five key challenges; increasing the level of savings, diversify energy efficient sources, measure and ensure the persistence of energy efficient savings, understanding the values of energy efficiency and integrating energy efficiency with carbon reduction framework.

Baland, Bardhan, Das, Mookherjee and Sarkar, (2010) investigated the environmental impact of poverty on firewood collection in rural Nepal with the aim of measuring the relationship between poverty and forest fire wood. Using OLS technique, they found that income level has no significant effects on firewood consumption. Rather, they observed that the level of education and non-farm occupation and fertility rate have significant impact on firewood consumption. High level of education, high number of non-farm occupation and low fertility rate lead to reduction in firewood consumption. The result is not surprising given that in the rural areas there are few alternative sources of energy sources. Sometimes where there are no alternative sources of energy, the available energy becomes a means of livelihood for citizens. For instance, Schure, Levang and Wiersum (2014) analyzed the contribution of commercial wood fuel production to income of the poor in Democratic Republic of Congo. The study found that charcoal constitutes about 75 percent of the income of over 300,000 people in Kinshasa. Despite the low income, charcoal production supports the basic needs of the people that are depending on it, thus, saving them from abject poverty. The findings of Vollmer et al. (2017) however challenged the proposition that the use of charcoal relieves citizens from abject poverty. They posit that in the long run, users of energy sources such as wood fuel are made worse off.

Studies have tried to analyze the determinants of energy choice by households. Frederiks, Stenner and Hobman (2015) argued that generally, the more aware consumers are, the more likely they decide the type of energy source to use. Employing a comparative analysis of factors that affect consumers' behaviour, they pointed out that household energy consumption is not driven primarily by financial incentives; rather, it is determined by patterns of behaviour. Given the irrational behaviour likely exhibited by individuals, they observed that it is difficult to predict energy use among households, though, community behaviour can guide the type of energy provision. According to Pachauri (2004) factors that affect household's demand and types of energy sources include age and literacy of the head of household, size of households and household income.

Mensah and Adu (2013) investigated the determinants of household cooking energy choices in Ghana using the ordered probit model. The study observed that the use of energy from biomass for cooking constitutes 89.2 percent of household source of energy, while only 10 percent of households use gas, electricity or kerosene for cooking. The study observed that apart from social and demographic factors, household income is a major determinant of energy choices in Ghana. The study recommended a reduction in poverty rate so as to boost demand and use of other sources of household energy. Kalaba, Quinn and Dougill (2013) also found that the use of fire wood add to the stress of household especially women. The study examined the use of forest wood as provisional energy source in Miombo woodlands of Zambia. Kalaba, Quinn and Dougill (2013) found that social economic and gender status of households determine choice of energy source especially during period of energy scarcity. Wealthy families and men are less affected by energy shocks and do not suffer from the stress of charcoal.

Middlemiss and Gillard (2015) examined different literature on vulnerability of fuel for poor households in the UK. Using qualitative data, the study employed context analysis to identify six challenges to energy vulnerability for the fuel poor; they include quality of dwelling fabric, energy costs and supply issues, stability of household income, tenancy relations, social relations within the household and outside and ill health. Nkomo (2006) studied the impact of high oil price on southern African countries and observed that energy consumers are constrained by their energy consuming appliances to using oil as source of energy despite hike in the price of oil. The author observed that low income countries and households tend to suffer more from rise in oil price. Day, Walker and Simcock (2016) studied the relationship between energy consumption and wellbeing in concept of energy deprivation. Applying the Amartya Sen and Martha Nussbaum capabilities approach, they posit that the effect of energy on wellbeing is better understood when viewed across region, thus, makes sense when solutions are provided in terms of local context. As such, it makes it easy to address energy poverty in areas that can easily be over looked. Bouzarovski and Petrova (2015) employed an integrated conceptual

framework to examine the implications of domestic energy deprivation in developed and developing countries. They identified some of the consequences of domestic energy vulnerability to include; poor health, gender inequality, decrease in level of education and general impediment to economic development.

Gonzalez-Eguino (2015) studied the different ways of measuring energy poverty and their implications. Employing trend analysis to examine the consequences of energy poverty across different regions of the world, they observed that 1.3 million people die yearly in developing countries from the use of energy sources from firewood and biomass. According to Bouzarovski and Petrova (2015) all forms of energy and fuel poverty in developed and developing countries are caused by the inability to attain a socially and materially level of domestic energy services. Domestic energy shortages are traceable to ineffective operation of socio-technical component that is not tailored to meet households' needs. Access to energy infrastructure is fundamental to cleaner energy use. Legendre and Ricci (2016) investigated the different measurement approaches of fuel poverty on the vulnerability of ordinary poor household in France. Logit model was used to analyze the probability of vulnerable households falling into poverty. Their result showed that the probability of falling into poverty is high for those who are retired living alone, rent their home, use an individual boiler for heater, cook with butane or propane and have poor roof insulation. Nussbaumer, Bazilian and Modi (2012) examined methods and instruments used in measuring energy poverty across different literature with the aim of ascertaining the adequacy and applicability of the methods and instruments to Africa context. The study observed that most of the methodology did not take into consideration the multidimensional energy poverty index. The study argued that taking into cognisance the multidimensional energy consumption is important in capturing both the incidence and intensity of energy poverty in Africa.

The gap in the literature is that, these studies gave little attention to the linkage between poverty and the different energy sources. The study also examines the degree to which the different energy sources affect poverty rate in Nigeria. Literature that discussed poverty as it relates to energy consumption, do not speak to how the different energy sources affect poverty rates in Nigeria. The paper has attempted to fill this gap.

Stylized Facts on Energy Use and extend of poverty

According to the United Nations Environmental Programme (UNEP) (2016), about two billion people in developing countries still have no access to conventional electricity. This situation of low access to quality and constant energy by majority of the population can be attributed to the level of growth and development of a nation. The World Health Organization [WHO] (2006) report demonstrated how the level of development is positively related to the consumption of efficient energy as shown in figure 1.

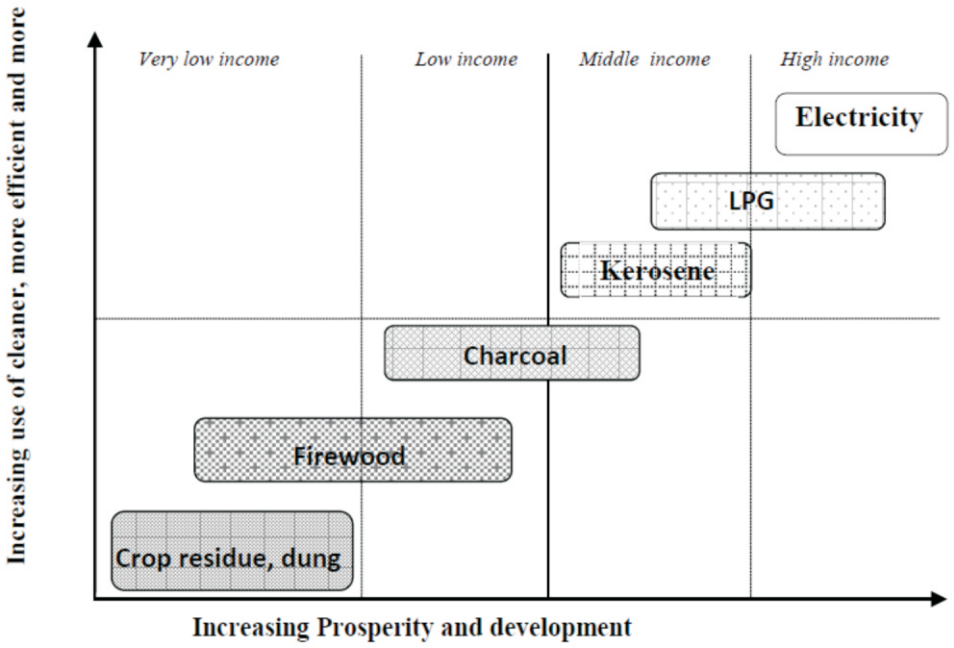

Figure 1: Nation's Prosperity and Type of Energy Consumption
Source: World Health Organisation [WHO] (2006)

The WHO report as shown in figure 1 is in congruent with the energy ladder hypothesis positing that developed and high income countries tend to consume cleaner and efficient energy like electricity and modern renewable energy. Providing clean and efficient energy that will aid the prosperity of citizens has been of great challenge to most nations especially those of developing nations due to the fluctuating price of energy in the international market. Scholars such as Eleri (2012) argued that high prices of modern energy tend to make people climb down the energy ladder from clean and efficient energy like electricity to less efficient energy like fire wood and coal. The implication of towing this pattern of thought is that high prices of energy exacerbate poverty rate. This implies that poor access to modern energy limits developing nations' potentials to reduce poverty and ensure sustainable growth. According to Sovacool (2012) energy deprivations inhibit production and reduce the level of economic activity.

To examine the relationship between poverty and type of energy consumption further, this study compares level of country's income relative to the population's access to clean energy. The countries are grouped into low, middle and high income countries as classified by the World Development Indicator (2017) report as reflected in table 1.

Table 1: Per Capital Income and Access to Clean Energy

Income Status	GDP Per Capita (Current US Dollar)			%age Population Access to Clean Energy		
	2000	2010	2015	2000	2010	2015
Low Income Countries	231.57	502.04	622.34	4.44	5.96	7.01
Middle Income Countries	1219.09	3628.84	4996.69	42.31	52.13	56.36
High Income Countries	25940.63	39870.81	42123.41	99.15	99.43	99.46

Source: World Development Indicator [WDI] (2017)

Table 1 shows the per capita income of low, middle and high income countries in 2000, 2010 and 2015 and access to clean energy. The report shows that as income of countries increases, the percentage of population that access clean energy also increases. In each of the years, the percentage population of high income countries that can access clean energy is higher than those of low and middle income countries. The outcome in table 1 provides interesting insights into the level of poverty and nature of energy consumption. First, it suggests that income continues to be an important factor that determines access to clean and modern energy. Second, it partly explains why poverty persists in developing nations since poor access to energy could cause vicious cycle of poverty; poor people can only afford low efficient energy, as such engage in low income generating activities which will only enable them to buy less efficient energy and the cycle continues.

METHODOLOGY

The data used for this study are obtained from international energy statistics of Nigeria (2017) and World Development Indicator (WDI, 2017). The sample period of the data collected spans from 1981 to 2014 consisting of 33 years. The choice of 1981 as the starting period captures the period of high growth in energy consumption and also to ensure consistency in the data. Apart from poverty level, the rest of the data stopped at 2014. The data sources are presented in table 2.

Table 2: Variable Description

Variable Name	Description	Data Source
LPMS	Log of PMS final consumption measured in kilowatt	International energy statistics for Nigeria
LGAS	Log of final cooking gas and diesel consumption measured in kilowatt.	International energy statistics for Nigeria
LELEC	Log of final electricity consumption measured in kilowatt.	International energy statistics for Nigeria
LKERO	Log of final kerosene consumption measured in kilowatt.	International energy statistics for Nigeria
LCHAR	Log of final charcoal consumption measured in kilowatt.	International energy statistics for Nigeria
LBIO	Log of final biofuels this include firewood, animal waste and other plant measured in kilowatt.	International energy statistics for Nigeria
LPOV	Log of poverty level is the approximated poverty headcount.	World Development Indicator and author's calculation. Poverty rate x estimated population.

Note: Final consumption of the disaggregated energy sources constitutes energy consumption due to residential use, commercial and public services, agriculture and industrial and other non-specific use. The variables are converted to logs so as to harmonize the variables when estimating the model.

Instead of fusing the total energy consumption, this study assesses the response of poverty to the different energy sources that have direct link to citizens. The total energy consumption is disaggregated into six primary sources: electricity, charcoal, premium motor spirit (PMS), gas (this includes cooking gas (LPG) and diesel (AGO)), kerosene (DPK), other biofuels (this includes firewood and other animal wastes). The choice of the primary sources of energy is determined by use for household consumption and other economic activities that have direct impact on the wellbeing of the citizens. The consumption of gas includes cooking gas and diesel. Energy source from hydro and natural gas are not included because they are converted to electricity and have been captured as such. Electricity generated from other renewable energy sources such as wind and solar are not included due to paucity of data as they are still in their elementary stage.

Following the work of Nussbaumer, Bazilian and Modi (2012) the causal functional model of poverty and aggregated energy sources for Nigeria can be presented as:

$$\lambda_{trace}(r) = -T\sum_{i=r+t}^{n}\ln(1-\hat{\lambda}_i) \quad \text{.....(1)}$$

$$\lambda_{Max}(r,r+1) = -T\ln(1-\hat{\lambda}_{r+1}) \quad \text{.....(2)}$$

Where: $\hat{\lambda}_i$ is the estimated eigenvalue of the characteristics roots r, (r ranged from 0, 1, 2,…,t) and T is the number of observations. The null hypothesis of the trace statistics is that the distinct cointegrating vectors is less or equal to r, while the null hypothesis of the maximum eigenvalue assumes the cointegrating vectors less or equal to r + 1. The essence of Johansen cointegration test is to test for the existence of long-run relationship among the variables. To examine the interrelationship between the variables, we first estimate the unrestricted VAR model so as to determine the lag length of restricted VAR. The Akaike Information Criterion (AIC), Schwarz Criterion (SC) and the Hanna-Quinn Criterion (HC) are used to determine the optimal lag length.

Since the existence of cointegration does not tell us of the direction of causality among the variables. The vector error correction model (VECM) is therefore employed to determine the lead and lag variable. The VECM is important because it depicts the role of each of the variables by showing both the short and long run direction of causality. More so, it shows how the system recovers after a simultaneous shock to the entire system. The VEC model is presented as:

$$\Delta Y_t = c + \sum_{i=1}^{k-1}\Gamma_i\Delta Y_{t-i} + \varphi\beta' Y_{t-k} + \varepsilon_t \quad \text{.....(3)}$$

Where: Δ is the first difference notation, Yt is the N x 1 vector of the variables integrated of order one (in this case, poverty level, gas, kerosene, PMS, electricity, charcoal and biofuel consumption), c is N x 1 constant vector, k is the lag structure, Γ_i is N x N matrix that indicates the short run adjustments among the variables, φ represents the speed of adjustment, the speed of adjustment, β is the cointegrating vectors and ε_t is the N x 1 Guassian white noise residual vector. If variables are cointegrated, there will be a long run equilibrium relationship since the linear combination of $\beta' Y_t$ will be stationary although Yt is not stationary. The Error correction term $(\varphi\beta' Y_{t-k})$ indicates how the deviation from the long run equilibrium affects the short run dynamics of the dependent variable in each of the equation of the VECM.

The role of different energy sources on poverty level is examined using the variance decomposition technique. The variance decomposition is used to determine the relative exogeneity and endogeneity of the variables by decomposing the variance of the forecast error of the variables into proportions attributable to innovation in each variable in each system.

To assess the response of the poverty to shocks in the different energy sources in Nigeria, the study employs the impulse response function (IRF) analysis. The IRF is used to explain the economic relationship among the estimated variables in VAR or VEC model. The IRF shows the reaction of a dynamic system in response to some external change. Since it is hard to interpret the coefficients of VAR and VECM model due to the many lags and dynamic nature of the models making it difficult to ascertain the variables one wishes to examine, the IRF is a veritable tool that reveals the response of a given variable to shocks in other variable(s) (Stock & Watson, 2001).

RESULTS AND DISCUSSION

The trend analysis of the data showing the consumption of charcoal, electricity, PMS, kerosene, gas, biofuels and poverty level are shown in figure 2.

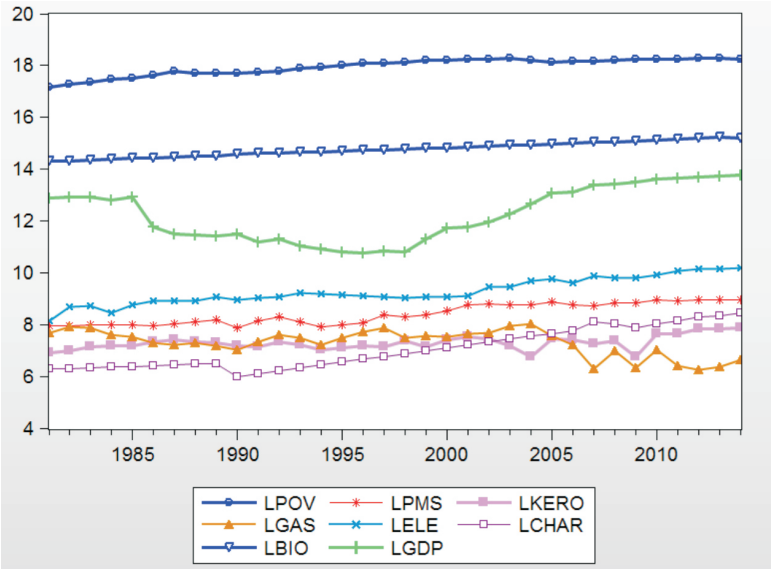

Figure 2: Energy Consumption, GDP and Poverty Level

The combined graphical representation of the variables is shown in figure 2. The graph provides the historical background of the behaviour of the series used in this study. The increase in the consumption for charcoal and biofuel is probably due to the continuous increase in poverty level and population. In addition, the price of charcoal and biofuel are relatively inexpensive and accessible for domestic energy use for cooking lightening and ironing, thus, making it an easy energy option for low income earners. The consumption of PMS continues to rise within the period because it is used for variety of purposes such as transportation, powering of residents and small businesses. Not until recently, the price of PMS has been considerably subsidized by the government making it relatively cheap to purchase. A

7. The unrestricted VAR of intercepts and no trend was used to estimate the Johansen's trace and eigen test.

common characteristic of the series is that they all expressed a gradual growth process with a clear intercept. After ascertaining the nature of the data, all the variables were subjected to stationarity test using Augmented Dickey Fuller test (ADF) with results shown in table 3.

Table 3: ADF Unit Root test

Variable	Statistics		Remark
	level	1st difference	
PMS	-0.35	-6.26***	I(1)
GAS	-1.77	-5.69***	I(1)
ELEC	0.53	-6.80***	I(1)
KERO	-2.13	-8.00***	I(1)
CHAR	2.39	-4.41***	I(1)
BIO	1.06	-2.69*	I(1)
POV	-1.92	-3.89***	I(1)

Critical values of 1%, 5% and 10% are -3.64, -2.95 and -2.61 respectively for intercept and -4.26, -3.55 and -3.21 for intercept and trend. ***, ** and * means significant at 1%, 5% and 10% level of significance respectively.

Table 3 is the ADF unit root test results for the series used in this study. The null hypothesis of the ADF states that a particular time series is not stationary. The outcome of ADF indicates that the variables are all integrated at order one I(1), thus, the need to test for the existence of long run cointegration among the variables. The study employed the Johansen and Juselius (1999) cointegration test for existence of long run cointegration among the variables. The result of Johansen test is shown in table 4.

Table 4: Johansen test for Co-integration

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.765	151.85	125.61	0.000
At most 1 *	0.633	105.38	95.75	0.009
At most 2 *	0.556	73.24	69.81	0.026
At most 3	0.476	47.22	47.85	0.057
At most 4	0.312	26.50	29.79	0.114
At most 5	0.280	14.52	15.49	0.069
At most 6 *	0.117	3.98	3.84	0.045
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.765	46.46	46.23	0.047
At most 1	0.633	32.14	40.07	0.295
At most 2	0.556	26.01	33.87	0.319
At most 3	0.476	20.72	27.58	0.293
At most 4	0.312	11.97	21.13	0.549
At most 5	0.280	10.53	14.26	0.178
At most 6 *	0.117	3.98	3.84	0.045

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level. Max -eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values

Table 4 shows the result of the Johansen and Juselius cointegration test. The null hypothesis of trace and max-eigenvalue is that there is no cointegration among the variables under examination. The trace and Max-eigenvalue statistics show different results; while trace statistics indicate three cointegrating equations, the Max-eigenvalue indicates one cointegrating equation. Based on parsimony principle, we go by the decision of the max-eigenvalue that at least one co-integrating equation exists among the variables at 5 percent level of significance. This implies that it is better to use the vector error correction (VEC) method to estimate the short and long run relationship among the variables. The VEC outcome is therefore used to generate the impulse response function.

In line with the objective of this study which is to examine the effect of the consumption of different energy sources on poverty, the impulse response function is used to identify the response of poverty level to shocks in PMS, kerosene, gas, electricity, charcoal and bio fuels. The graph of the impulse response function is shown in figure 3.

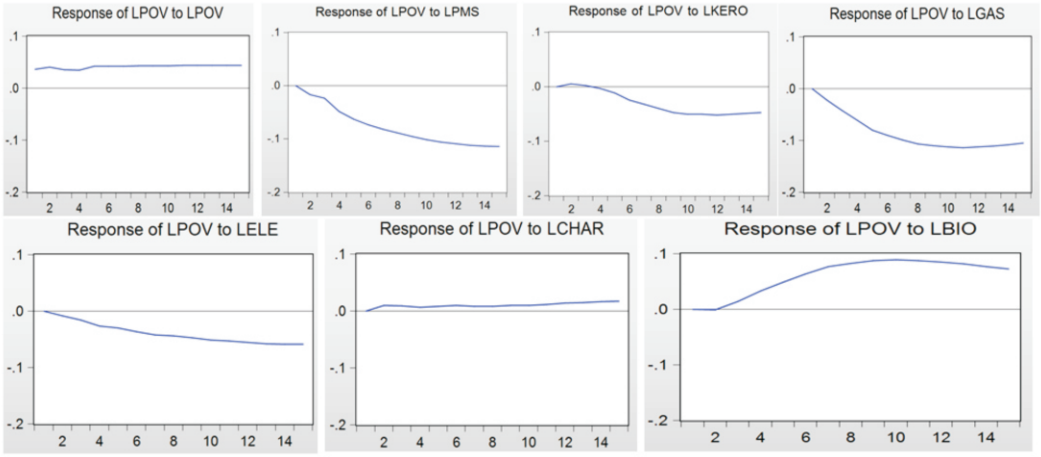

Figure 3: Impulse Response Function of Poverty to Energy Consumption

Figure 3 shows the response of poverty level to consumption of different energy sources in Nigeria. The result depicts that poverty responds negatively to shocks in PMS, kerosene, gas and electricity consumption, while the response of poverty to shocks in the consumption of charcoal and biofuels sources is positive. This implies that the use of less efficient energy sources increases poverty level rather than reduce it. On the other hand the use of efficient energy sources is seen to reduce poverty level. This may explain the vicious cycle of poverty the poor find themselves because the use of such fuel is both time consuming and less efficient energy source for generating income. Besides producing inefficient energy, charcoal and biomass fuel emit high amount of carbon dioxide which causes respiratory problems, blindness and other illnesses (Zhang and Smith, 2007), thus, increasing health expenditures of the poor and reducing their productivity. The result of this study is in line with the energy ladder hypothesis that individuals with high income are more likely to use efficient energy source. Apart from the economic retardation that results from the use of less efficient energy, inefficient energy is inimical to human health, detrimental to the environment and causes climate change problem. Specifically, the findings that charcoal and biofuel consumption increases poverty rate in Nigeria is in line with the findings of other studies in Africa. For instance, Vollmer et al (2017) found that charcoal consumption does not reduce poverty among producers and consumers in southern Mozambique; Schure, Levang and Wiersum (2014) found that the average producer of wood fuel still lives below the poverty line in Democratic Republic of Congo. Kalaba, Quinn and Dougill (2013) in their study of the role of forest services among households in Zambia observed that those who use and engage the sale of charcoal use it as a coping strategy for survival. The likely explanations to this phenomenon is that continouos use of inefficient energy sources exposes the poor to environmental and climate change problems; thus the more damage caused by the

use of less efficient energy, the more their productivity and income are affected in the long run.

The variance decomposition analysis is employed to determine the rate of response of poverty to shocks in the different energy types over a period of 15 years. The outcome of variance decomposition is shown in table 5.

Table 5: Variance Decomposition of Poverty Level

		Variance Decomposition of LPOV:						
Period	S.E.	LPOV	LPMS	LKERO	LGAS	LELE	LCHAR	LBIO
1	0.0319	100.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0487	60.323	14.382	3.0807	1.2406	0.2887	10.714	9.9697
3	0.0838	20.430	25.361	5.0228	1.1659	0.1581	18.994	28.867
5	0.1523	6.6614	58.129	2.4942	3.936	1.3259	11.548	15.902
10	0.2801	3.3060	71.251	2.1009	2.9070	2.7712	9.0174	8.6455
13	0.3256	3.1265	70.413	2.1865	3.0216	2.6853	9.2568	9.3098
14	0.3385	2.9711	71.455	2.1850	2.9016	2.6963	9.0371	8.7536
15	0.3493	2.9239	71.488	2.0697	3.5529	2.9648	8.6358	8.3638

Table 5 depicts the rate at which poverty level changes when there are shocks in the consumption of the different energy sources in Nigeria. The variance decomposition analysis shows that in the long run, PMS is the main cause of changes in poverty level among the various energy sources in Nigeria. When the poverty level is shocked, 60 percent of the variation is self-explained at the beginning of the period, while the rest of the other shocks are mainly caused by PMS, charcoal and biofuels. Apart from PMS, the result also shows that charcoal and biofuels have significant influence on poverty rate especially in the short run, accounting for 18.9 and 28.8 percent change rspectively in the poverty rate in the first three years. The result also shows that the influence of charcoal and biofuel on poverty is diminishing in the long run. Overtime the majority of the variation is traceable to PMS. This is not surprising due to the importance of PMS to Nigerian economy in terms of the variety of its use. In addition, only one out of the four efficient energy sources significantly influence the poverty level in Nigeria. The result shows that poverty level has continued to be high over the years, primarily because low and inefficient energy such as charcoal and fire wood are the predominant sources of energy for cooking in Nigeria. The result in table 5 contradicts the findings of Eleri, Ugwu and Onuvae (2012) who opined that charcoal and biofuels are important sources of energy for the poor. Their position was based on the volume of use of energy source. The outcome in table 4 points to one direction; that although the volume of use is important, the long run effects of such energy in poverty reduction is vital especially in terms of whether to encourage the consumption of such energy or not.

The analysis confirms that not all forms of energy are relevant for poverty reduction. While PMS and gas are the most important energy in poverty reduction, charcoal and firewood consumption accentuate it, suggesting that previous studies paid little attention to the different role played by different energy sources in poverty reduction in Nigeria. Finding the relationship between energy consumption by sources and poverty in Nigeria is significant for two reasons; first, it provides insight to the most important energy sources vital for poverty reduction. Second, it helps policy makers to strategize on the best way to fight climate change and achieve the nation's commitment to climate agreement policies. Nigeria is part of the Paris agreement on energy use and climate change, she must ensure that policies adopted must not inhibit poverty reduction goals. Thus, the focus should be directed aright. What source of energy actually affects the poor and to what extent it affects development and poverty is crucial in directing the focus of policy makers in Nigeria. The findings of this paper are robust and tested using the necessary sensitivity tests. The stability test shows that the VAR model satisfies the stability condition which means the system of equation is efficient and the model is dynamically stable. The test shows that there is no serial correlation. The Jacque-Bera test shows that the residual is normally distributed.

CONCLUSION AND POLICY IMPLICATIONS

This study examined the link between energy consumption from different energy sources and poverty rate in Nigeria. Studies have reported the link between poverty and energy consumption, however, studies that link poverty to energy consumption in Africa are scanty. This study makes its contribution to the extant literature in that it examines the separate effect of different energy sources on poverty rate in Nigeria. The study also tests the response of poverty rate given a shock to the different energy sources. The paper assumes that the different energy sources do not have the same effect on poverty rate in Nigeria.

Tracing the most important energy source that reduces poverty is vital to policy makers so they can focus their attention on ensuring the availability of such energy to the public. As shown from the outcome of this study, given the importance of PMS among the different categories of energy in Nigeria, the scarcity of PMS inhibits government effort towards reducing poverty since the consumption of PMS significantly affects poverty rate. Also, in line with the work of Arinola, Wiskel, Falusi and Huo (2013) who found that charcoal and biomass are chief causes of respiratory problems among women and children in Nigeria, this study shows that charcoal and biomass consumption increase poverty in Nigeria. This study therefore recommends that effort should be geared towards disallowing the use of inefficient energy sources because it has significant effect in increasing poverty level in Nigeria.

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Appendix 1: Variance Decomposition

Variance Decomposition of LPOV:

Period	S.E.	LPOV	LPMS	LKERO	LGAS	LELE	LCHAR	LBIO
1	0.031917	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.048752	60.32308	14.38263	3.080717	1.240663	0.288721	10.71444	9.969747
3	0.083883	20.43064	25.36105	5.022832	1.165928	0.158138	18.99433	28.86707
5	0.152380	6.661442	58.12976	2.494210	3.936687	1.325941	11.54898	15.90297
10	0.280168	3.306028	71.25170	2.100945	2.907098	2.771254	9.017478	8.645501
13	0.325694	3.126527	70.41327	2.186524	3.021603	2.685343	9.256870	9.309864
14	0.338517	2.971101	71.45510	2.185070	2.901683	2.696308	9.037108	8.753633
15	0.349366	2.923935	71.48890	2.069700	3.552932	2.964878	8.635841	8.363814

Variance Decomposition of LPMS:

Period	S.E.	LPOV	LPMS	LKERO	LGAS	LELE	LCHAR	LBIO
1	0.146594	2.411335	97.58866	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.205718	3.844511	82.69076	2.075486	2.596515	0.699815	4.365112	3.727800
3	0.266369	2.492265	63.95585	4.073664	6.140936	1.102271	10.40589	11.82912
5	0.310231	5.215724	61.10916	3.549571	7.556351	0.830893	9.100406	12.63790
10	0.417201	9.611609	42.39825	5.552729	13.81111	2.088544	7.917403	18.62035
13	0.496535	7.471648	35.20858	8.592949	16.32218	2.742217	7.832764	21.82966
14	0.512071	9.855527	35.08676	8.410990	15.87421	2.615506	7.365620	20.79138
15	0.532685	10.93657	32.75919	8.549879	16.65545	2.437262	6.985031	21.67661

Variance D ecomposition of LKERO:

Period	S.E.	LPOV	LPMS	LKERO	LGAS	LELE	LCHAR	LBIO
1	0.243398	5.504584	2.069439	92.42598	0.000000	0.000000	0.000000	0.000000
2	0.338443	6.427615	2.308443	77.35778	8.751894	0.155252	3.319624	1.679390
3	0.380555	11.64418	2.910542	65.38892	7.378396	0.431011	8.598942	3.648012
5	0.443395	14.04571	4.996822	60.67683	8.686122	0.767564	7.109997	3.716961
10	0.600976	17.03939	6.323395	54.37597	8.415483	0.668360	6.717267	6.460133
13	0.672366	15.35042	6.070634	52.67052	8.981370	0.684686	7.766579	8.475791
14	0.708040	17.29043	5.836733	52.04416	8.916589	0.664913	7.024633	8.222539
15	0.728430	18.01759	6.559435	50.34608	9.107100	0.705661	6.643416	8.620720

Variance Decomposition of LGAS:

Period	S.E.	LPOV	LPMS	LKERO	LGAS	LELE	LCHAR	LBIO
1	0.350667	0.001158	11.22481	18.21586	70.55817	0.000000	0.000000	0.000000
2	0.460224	2.846703	8.828906	38.10289	43.52058	0.128163	2.515198	4.057561
3	0.688276	4.402396	5.129074	49.08796	21.60435	0.544142	7.070018	12.16206
5	0.823841	4.091343	4.141732	49.66797	24.71749	0.396630	5.959591	11.02525
10	1.149215	4.072553	3.342175	51.71252	22.96121	1.056298	4.658880	12.19637
13	1.359333	4.436199	3.108630	53.61062	18.40877	1.362051	4.715233	14.35849
14	1.386527	4.527437	2.988521	52.84197	19.90011	1.350813	4.569281	13.82187
15	1.456921	4.323067	3.021395	51.72119	22.40237	1.228673	4.164176	13.13913

Variance Decomposition of LELE:

Period	S.E.	LPOV	LPMS	LKERO	LGAS	LELE	LCHAR	LBIO
1	0.118414	48.17962	0.336014	9.965670	1.827000	39.69170	0.000000	0.000000
2	0.151603	48.23536	5.136236	7.011235	4.175994	32.57785	0.888822	1.974504
3	0.205828	34.79335	19.72723	6.355333	3.399734	24.39978	7.360343	3.964236

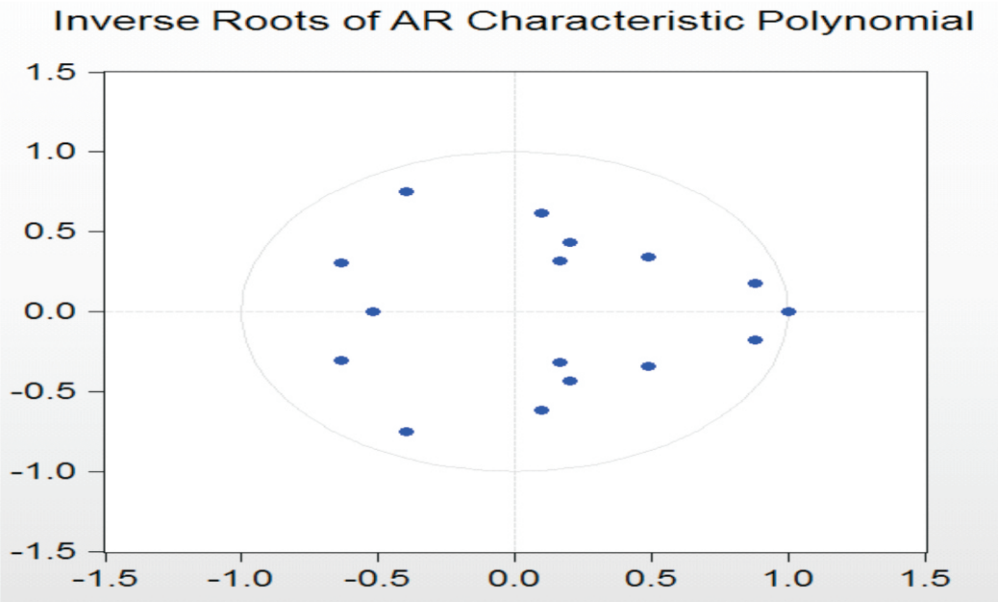
Appendix 2: Test Results

VAR Lag Order Selection Criteria
Endogenous variables: LPOV LPMS LKERO LGAS LELE LCHAR LBIO
Exogenous variables: C
Date: 04/11/18 Time: 12:46
Sample: 1981 2014
Included observations: 32

Lag	LogL	LR	FPE	AIC	SC	HQ
0	66.14822	NA	5.85e-11	-3.696764	-3.376134	-3.590484
1	270.0271	305.8184*	3.95e-15*	-13.37670	-10.81166*	-12.52646*
2	319.3339	52.38846	6.26e-15	-13.39587*	-8.586424	-11.80167

* 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

Stability Test



Serial Correlation

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 04/16/18 Time: 09:24
Sample: 1981 2014
Included observations: 31

Lags	LM-Stat	Prob
1	53.63056	0.3013
2	65.87616	0.0541
3	65.73286	0.0554
4	77.15558	0.0063
5	68.66633	0.0332
6	67.38878	0.0417
7	60.82287	0.1198

Probs from chi-square with 49 df.

Normality Test

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 04/16/18 Time: 09:16
Sample: 1981 2014
Included observations: 31

Component	Skewness	Chi-sq	df	Prob.
1	-0.103947	0.055826	1	0.8132
2	-0.464098	1.112833	1	0.2915
3	0.811362	3.401261	1	0.0651
4	-0.101525	0.053254	1	0.8175
5	0.113876	0.067000	1	0.7958
6	-0.129497	0.086643	1	0.7685
7	0.021595	0.002409	1	0.9609
Joint		4.779227	7	0.6869

Component	Kurtosis	Chi-sq	df	Prob.
1	2.192807	0.841599	1	0.3589
2	4.012047	1.322974	1	0.2501
3	3.472745	0.288671	1	0.5911
4	2.411600	0.447193	1	0.5037
5	4.202030	1.866298	1	0.1719
6	3.633138	0.517782	1	0.4718
7	2.417751	0.437893	1	0.5081
Joint		5.722411	7	0.5725