DEFENCE SPENDING AND ECONOMIC GROWTH IN NIGERIA: AN EMPIRICAL INVESTIGATION

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Abstract

This paper examined defence spending and economic growth nexus in Nigeria using annual data for the period, (1981-2018). A modified and extended aggregate production function framework (APF) model was adopted and the econometric techniques of unit root test, co-integration analysis, error correction model (ECM) and Ordinary Least Square (OLS) technique were employed to establish the relationship between real gross domestic product (RGDP)(proxy for economic growth) and defence spending (DF) together with other control variables such as exchange rate (EXR), gross fixed capital formation (GFCF), labour force (LF), government capital expenditure (GCE) and trade openness (TO). The unit root test results indicated that all the variables (RGDP, DF, EXR, GFCF, LF, GCE, and TO) were stationary at first difference 1(1) at 5% level of significance. The study finds that defence spending has significant negative effect on real aggregate output (RGDP) and consequently economic growth in the short-run and significant positive impact in the long-run. The co-integration test result shows that the variables were co-integrated at 5% level of significance and consequently, there existed a long run relationship between the variables employed in the model. The error correction model (ECM) result shows the coefficient of defence expenditure (LDF) had significant negative sign which implies an increase in defence spending significantly deters economic growth in the short run. The Ordinary Least Square (OLS) result indicates that defence expenditure has significant positive impact on the real aggregate output (RGDP) in the long-run and consequently on economic growth. To improve security in Nigeria and enhance positive impact of defence expenditure on the economic growth, there should be proper funding of Research and Development (R&D) activities of the armed forces, police force and other national security outfits in order to improve their skills, enlarge their capacities and especially, indigenize their technology. The development of security information communication technology (ICT) tools and its robust utilization in Nigeria should be given more attention. For proper domestic surveillance to be carried out, the security forces in Nigeria especially the police force should be restructured with state, local government and community policing incorporated, and traditional institutions should be involved and their constitutional roles in this regard well defined.

Keywords: Defence spending, economic growth, Nigeria, empirical investigation.

Introduction

Enduring economic growth and development is a major macroeconomic goal which every nation, especially developing nation like Nigeria, strives to attain. According to Awaworiyi and Yew (2014), economic development is often accompanied by a rise in government spending on security. This is evidenced by the fact that no meaningful development can take place in a nation beleaguered by violence, threat, war or any form of insecurity. Insecurity disrupts economic activities, discourages investment and obstructs economic growth and development in a nation. Hence, the provision of security to ensure peace in a nation becomes an important ingredient for survival, economic growth and development. In acknowledgement of security as quintessential variable for survival and development of a nation, the classicalists, though refuted government intervention in the market economy, stressed that the state should confine itself to the provision of services and facilities that create conducive environment for private people to undertake investment that keep the economy functioning. Consequently, included among the roles of the state advocated by the classicalists are maintenance of law and order to ensure peace and security in the country and administration of justice by which the rights to property ownership are defined, protected and enforced as well as regulation of transfer of ownership rights and titles. These involves the provision of legal and judicial devices, police services and other security forces as well as the protection of the territorial integrity of the nation against external aggression through retention of an effective standing army. It is against this background that in many nations of the world, the government expends huge national resources to set up security department in order to handle insecurity issues.

In recent times, there have been increased waves of terrorist activities, external incursion, internal conflict and resistance, violence, threats, and diverse forms of criminality and these had resulted in tremendous increase in security spending by international organizations and government of many nations of the world. For example, in 1989 developing countries categorized by United Nation Development Programme (UNDP) as "high human development" countries allocated 3.1 per cent of their gross domestic product to military expenditure, the "medium human development" countries excluding China allocated 4.5 per cent and the "low human development" countries excluding India allocated 4.8 per cent (Griffin and McKinley, 1992). Carnahan et al (2006) maintained that the United Nations spends about US$5billion yearly on peacekeeping all over the world. About US$7.84 billion which represented about 0.5 per cent of global military spending was budgeted by United Nations for peacekeeping for the period from July, 2011 to 30 June, 2012 (UN Peacekeeping Factsheet, 2011).

In Nigeria, internal resistance by Boko Haram insurgence and ethnic militia like the Bakassi Boys struggling for actualization of People Republic of Biafra, the Niger Delta militants struggling for resource control, the Arewa Youth and Oduduwa Youth struggling for sovereignty of their ethnic groups, among others, has posed serious threat on the national security and unity. In order to increase security labour force, improve their skills and equip them so as to put the internal resistances under check as well as ensure that the armed forces as well as other security agencies are combat ready at all times to defend the territorial integrity of the country, the Nigerian government has spent huge national resource on security (internal and external) over the years. For example, the defence expenditure of Nigeria which was ₦6.60 billion in 1995 rose to ₦43.40 billion in the year, 2000. It rose to ₦71.67 billion and ₦198.71

billion in 2005 and 2010 respectively. In the year 2014 and 2015, the defence expenditure was ₦274.53 billion and ₦330.59 billion respectively. The defence expenditure was ₦380.17 billion and ₦361.92 billion in 2016 and 2017 respectively (CBN, 2018). It has been observed that government spending on security has been rising faster than government spending on human capital development (education and health) that helped to produce sound and healthy labourforce for the economy, agriculture through which food security is guaranteed for the populace, raw materials are produced for agro-industries and employment are generated for the masses, and sciences and technology through which technological capabilities of the nation can be enhanced.

Defence spending, by ensuring the provision of security and maintenance of public order in a nation, is necessary to create a safe and healthy environment for individual activities and investment purposes (Diamond, 1990). As much as defence spending has security benefit, it also has opportunity cost. Consequently, it can enhance economic growth as well as deters it. Awaworyi and Yew (2014) asserted that defence spending facilitates growth through development of new technology that spill over to private sector, creates socio-economic structure through spin-off effects, provides public infrastructure and protection against threats, and increase aggregate demand and employment through the Keynesian multiplier effect. On the other hand, defence spending can hinder growth through its opportunity costs. It has been observed that defence spending can crowds out investment (both private and public) in the economy by distorting resource allocation (Deger, 1986; Shieh et al, 2002) as well as diverts scarce national resources away from other sectors of the economy like health, education, agriculture, industry, etc and productive activities like physical and human capital development to defence purposes. It is on this premise that this study is conducted to examine defence spending - economic growth nexus in Nigeria.

2 Review of Related Literature

2.1 Conceptual Issues

Defence spending is government expenditure expended on security purposes to curb external threats and internal conflicts. It is public expenditures on the defence of a country against external attack as well as maintaining internal security. Internal security involves protection of the domestic territory, properties and citizen by security agencies like the armed forces (the army, navy, air-force), the police force, intelligence services and secret police, paramilitary units like the civil defense, legal vigilante and prison warden. The United State of America Department of Defence (2005) refers internal security expenditure to expenditure for maintaining law and order within a nation. Internal security is carried out by upholding the national law and defending a nation against internal security threats. Oriavwote and Eshenake (2013) describes internal security expenditure as the total amount of expenditure expended on protection of the domestic territory and citizens by security agencies.

Defence spending encompasses all recurrent and capital expenditures on the armed forces including peace keeping forces, defence ministries and other government agencies engaged in defence projects, the police forces, paramilitary forces, training and equipment for security operations and military space activities. It includes expenditures on salaries and allowances of current defence personnels (security and civil), retirement pensions and social services for retired personnels and their famililies, expenditure on training, procurement, operations and maintenance of security equipment, military research and development (R&D), military construction

and military aid (Brasoveanu, 2010). Alexander (2011) cited some basic definitions of defence expenditure provided by International Monetary Fund (IMF) and North Atlantic Treaty Organization (NATO).

According to IMF, defence expenditure covers all expenditures, whether by defence or other departments, for maintenance of military forces, including the purchase of military supplies and equipment (including the stockpiling of finished items but not the industrial raw materials required for production), military construction, recruiting, training, equipping, moving, feeding, clothing and housing members of the armed forces, and providing remuneration, medical care and other services for them. Also included are capital expenditure for provision of quarters to families of military personnel, outlays on military schools, and research and development (R&D) serving clearly and foremost the purpose of defence. Military force also include paramilitary organizations such as gendarmerie, constabulary, security forces at the border and custom guards, and others trained, equipped and available for use as military personnel. Also categorized as defence expenditure are expenditures for the purposes of strengthening the public services to meet wartime emergencies, training of civil defence personnel, and acquiring materials and equipment for these purposes. Included also are expenditures for foreign military organizations and alliances. This category excludes expenditure for non-military purposes, though incurred by a ministry or department of defence, and payments or services provided to war veterans and retired military personnel.

On the other hand, The NATO defines defence expenditure to include all current and capital expenditure on the armed forces, in the running of defence departments and other government agencies engaged in defence projects as well as space projects, the cost of paramilitary forces and police when judge to be trained and equipped for military operations, military research and development (R&D), tests and evaluation costs, and costs of retirement pensions of service personnel, including pensions of civilian employees. Military aid is included in the expenditure of the donor countries. Excluded are items on civil defence, interest on war debts and veteran's payment. The IMF definition, though explicit and provides a wide coverage of defence expenditure, does not clearly states the status of foreign military aid received. In addition, based on national income account practices, IMF definition excludes military pensions, while both IMF and NATO definition exclude war-related expenditure for veteran's payments and interest on war debt, on the ground that they are transfer payment (Alexander, 2011).

In the literature, there are many categorizations of defence spending such as personnel expenditures, equipment expenditures, infrastructures and other operational expenditures. The United Nation Organization (UNO, 1986) categorized defence expenditure into three major groups namely: operating costs, procurement and construction, and research and development. This categorization shows the structure of defence spending, indicating that it comprises consumption and investment expenditures. The operation cost, which captures military personnel operations and maintenance including civilian payment, is consumption expenditure. The expenditure on procurement and construction together with expenditure on research and development is associated with investment expenditure.

2.2 Theoretical Issues

Defence spending has its root from the classical and neoclassical economics where defence is recognised as a "pure public good" to be exclusively provided by the

state to ensure national security and peace. As a public good, national defence is non-excludable, non-depletable, non- exhaustable, and non-rival in consumption. Once it is provided by the state, peace is maintained and, security is made available to every individual and property and this has spill-over effects on economic activities. Thus, by ensuring the maintenance of security and public order, defence spending is necessary to create a safe and healthy environment for individual activities and investment purposes (Diamond, 1990). Adam Smith (1776) in his popular work, "An Inquiry into the Wealth of Nations" stressed that defence expenditure should be the first duty of any government as it seeks to protect and preserve the society from violence and invasion of other independent societies. He further added that defence expenditure is remarkable one in that, it does not necessarily require considerable opinion by the majority of the citizens as to what level of defence spending that is needed in a particular situation. However, he maintained that defence expenditure does not yield any productive resources.

In addition to the classicalist theoretical foundation, the theoretical root of the relationship between defence expenditure and economic growth is linked to Keynesian economic theory as defence spending is an integral part of government spending. Government spending is a fiscal policy instrument. Keynesian economic theory stresses that fiscal policy has more direct effect on real GDP (Jhingan, 2010), hence can be used to regulate economic activity. Government expenditure, as a fiscal policy instrument, can be used to stimulate or restrain economic activities. In the same vein, defence spending, as a component of government spending, can as well be used to stimulate or restrain economic activities. For instance, it is on record that it was when the USA government began to increase spending for military production in 1939, that total recovery from great depression started; unemployment reduced drastically and the value of the nation's output was twice that of 1929 (Bowden, 1985). Brasoveanu (2010) identifies the channels through which fiscal policy exerts influence on economic growth to include: increase the labour's productivity (state invest in capital and labour only when it complements private sector's activities, situation that is necessary because of the externality or market imperfections), increase the capital's productivity (state may provide social and economic infrastructure that facilitates private sector's activity), increase the quality of labour and capital factors (state might finance the public activities in a way that minimize the possible distortions over the demand or supply of capital and labour). Government spending in general and defence spending in particular can influence economic activity and consequently, economic growth through the channels identified above.

As much as defence spending has some benefits, it also has opportunity cost. Consequently, it can enhance economic growth as well as distorts it. The argument had been on the context of "butter or guns" versus "butter and guns". Awaworyi and Yew (2014) asserted that defence spending facilitates growth through development of new technology that spill over to private sector, creates socio-economic structure through spin-off effects, provides public infrastructure and protection against threats, and increase aggregate demand and employment through the Keynesian multiplier effect. On the other hand, defend spending can hinder growth through its opportunity costs. Through guns-butter trade-off, increase in defence spending crowds-out investment in the economy by distorting resource allocation (Deger, 1986; Shieh et al, 2002) as well as diverts scarce resources away from other sectors of the economy like health, education, agriculture, industry, etc and productive activities like physical and human capital development to defence purposes.

Gyimah-Brempong (1998) used simultaneous equation models and panel data to show a trade-off between military spending and the expenditure on social services including investment in physical and human capital. Dunne and Mohammed (1995) studies also reveal that military spending in African countries substitute for investment in human and physical capital. Moreover, most of the defence equipment procurement of developing countries, Nigeria inclusive, are imported from advanced economies. This, in addition to diverting the resources of the country, caused a drained on the scarce foreign exchange which could have been used for importation of manufacturing inputs to enhance manufacturing output. Moreover, in view of the fact that defence spending can be financed through taxation or borrowing (internal and external) or money creation, any increase in defence spending comes with either increased tax burden, government debt or inflation which are inimical to growth. Hence, the net effect of defence spending on economic growth, therefore, will depend on its benefits versus the opportunity costs and, could be determined empirically.

2.3 Empirical Literature Review

Many studies had been conducted to investigate the relationship between defence spending and economic growth. Available empirical findings on defence spending – growth nexus are mixed and had remained unsettled. Empirical evidences from some studies show a positive relationship between defence spending and economic growth (that is "guns and butter" argument) (Atesoglu and Mueller, 1990; Bose, Haque and Oborn, 2003; Mueller and Atesoglu, 2007; Ando, 2009; Tiwari and Shahbaz, 2011) and the direction of causation runs from defence spending to economic growth. On the other hand, the empirical results of some other studies provide support for negative relationship between defence spending and economic growth (that is, "guns or butter") (Mintz and Huang, 1990; Ward and Davis, 1992; Yildirim, Sergin and Ocal, 2005; Galvin, 2003, Brasovearu, 2010; Olofin, 2012) and the direction of causation runs from defence spending to economic growth. Yet, there are some studies whose empirical findings conclude that there might be a positive and also a negative relationship between defence spending and economic growth (Chowdury, 1991; Wilkins, 2004). There are also some studies whose empirical findings show that the relationship between defence spending and economic growth is neither positive nor negative relationship; that is, there is no relationship at all (Benoit, 1973; Alexander, 1990; Gerace, 2002; Habibullah, 2008). The relevant factors that are responsible for the heterogeneity in the defence spending – growth relationship studies result in the literature are identified as type of models, econometric specifications and data type employed as well as period of study (Awaworyi and Yew, 2014).

Among the studies whose empirical evidence on the relationship between defence spending and economic growth is positive include: Atesoglu and Mueller (1990) used a two sector Feder-Ram model and US data for the period 1949 to 1989 to study the impact of defence sector on civilian sector. Their findings show a positive effect from the defence sector to the civilian sector. In the same vein, Mueller and Atesoglu (2007) investigated the relationship between defence spending and economic growth of United States of America (USA) by incorporating technological change into a two sector Feder-Ram model and used time series data for the period 1948 to 1990. The result of the study reveals a positive and significant relationship between defence spending and economic growth.

Stewart (1991) employed a Keynesian demand function to examine the impact of defence and non-defence spending on economic growth of a group of Less Developed Countries (LDCs). The finding of the study shows that both defence and non-defence spending have positive effects on growth. However, the effect of non-defence spending was found to be stronger. In a study conducted in India by Tiwari and Shahbaz (2011) to examine the effect of defence spending on economic growth using ARDL bounds testing approach to co-integration in augmented version of Keynesian model, the result shows that there exists a long-run relationship between the variables included in the model and defence spending exerts positive effect on economic growth. The variance decomposition approach result of the study also shows that there is bidirectional causal relationship between defence spending and economic growth.

Bose, Haque and Osborn (2003) used a panel data of the period 1970 to 1990 to investigate the relationship between defence spending and economic growth in thirty developing countries. The findings show a positive and significant relationship between defence spending and economic growth. Ando (2009) studied the impact of defence spending on economic growth using data from 109 countries, including 30 OECD countries for a period of 1995-2003. The result shows that defence spending has a positive effect on the rate of economic growth; as the military sector goes up positively, so does economic growth.

On the other hand, studies whose result show negative relationship between defence spending and economic growth include the following: Scheetz (1991) used pooled cross-section time series data for four Latin American countries over the period 1969 to 1987 to examine the relationship between defence spending and economic growth and found that defence expenditure has a negative effect on investment. Ward and Davis (1992) also examined the effect of defence spending on economic growth of United States of America. The effects of defence spending were decomposed into productivity and externality effects. The findings show that defence spending has a negative effect on economic growth, with a negative productivity effect but a positive externality effect.

Yildirim et al (2005) investigated defence spending – growth nexus for Turkey using time series data that spanned over 47years period (1951-1998). The result of the study shows a negative relationship. The military spending in Turkey decreases as economic growth rate increases in the long-run. Galvin (2003) employed 2SLS and 3SLS methods to estimate the demand-side and supply-side model for 64 Less Developed Countries, using cross-section data. The findings reveal that defence spending have negative effects on both economic growth and the saving-income ratio. For countries with relatively low military spending ratio, Guaresma and Reitschuler (2003) established that the partial correlation between defence spending and economic growth is robust and significantly negative.

Kollas, Manolas and Paleologu (2003) examined the relationship between expenditure and economic growth among the 15 member countries of the European Union (EU) using co-integration and causality test for the period 1961-2010. Although there was no uniformity in the results among the 15 countries, the prevalence direction of causality was from growth to military expenditure. The result indicates that the government of many member country in the European Union make defence spending policy decision based on the state of their economy with concomitant implications for the objective of a Common European Security and Defence Policy (CESDP).

Kentor and Kick (2008) investigated a new dimension of military spending and military expenditures per soldier, which captures the capital intensiveness of the country's military organization using cross-national panel regression and causal analysis of developed and less developed countries over the period 1990 to 2003. The findings reveal that military spending per soldier deters the growth of per capita gross domestic product, with the most pronounced effects in less developed countries. Brasovearu (2010) studied the relationship between defence expenditure and economic growth in Romania with the aim of investigating the existence, direction and intensity of the connection. The methods employed in the study were cluster analysis, quintile analysis, regression technique and granger causality. The results show that in Romania, negative relationship exists between defence expenditure and economic growth.

Olofin (2012) examined the relationship between the components of defence spending and poverty reduction in Nigeria for the period 1990 – 2010 using dynamic Ordinary Least Square (DOLS) method for estimation of the models. The findings show that military expenditure was negatively related to poverty level. In other words, the findings confirm negative relationship between the well-being and capital intensiveness of the military in Nigeria. Similarly, Oriavwote and Eshenake (2013) studied the impact of security expenditure on economic growth in Nigeria using data covering the period, 1980 - 2010 and vector error correction model (VECM), and found that defence expenditure has negative impact on economic growth.

Awaworyi and Yew (2014) used a sample of 243 meta-observations drawn from 42 primary studies to conduct a meta-analysis of the empirical literature that examines the impact of military expenditure on economic growth. The findings from the meta-regression analysis suggest that the effect and size of the estimate is strongly influenced by study variations. It was found that underlying models, econometric specifications, and data type as well as period of study are relevant factors that explained the heterogeneity in the military expenditure – growth literature. Results also show that positive effects of military expenditure on growth are more pronounced for developed countries adopted studies than less developed countries.

Khalid and Mustapha (2014) examined the relationship between military spending and economic growth in China using annual data for the period 1980-2011. The method of analysis employed were autoregressive distributed lag (ARDL) used to test for the long-run and short-run relationship and granger causality techniques to examine the direction of causation. The findings show that there was inverse relationship between economic growth and military spending in the short run but the long run results indicate that the correlation between economic growth and military spending is inconclusive. The granger causality tests revealed a unidirectional relationship running from Gross Domestic Product (GDP) to military spending. Aminu and Bakar (2016) examined the interactional impact of defense expenditure and arms importation on economic growth in Nigeria using data that spanned from the first quarter of 1984 to the last quarter of 2014. The autoregressive distributed lag (ARDL) estimation method was employed in the study and the result shows that defence - arms interaction in Nigeria exerts negative impact on economic growth.

3 Methodology of the Research

3.1 Research Design

To empirically examine the impact of defence spending on economic growth in Nigeria, econometric method of analysis was adopted. The hypothesis developed is,

(H_0): There is no relationship between defence spending and economic growth in Nigeria. The data collected were subjected to different kind of tests namely Unit root test to examine the stationarity property of the time series data, Co-integration test to ascertain the existence of long run relationship of the variables, Error Correction Method (ECM) to ascertain the speed of adjustment from the short run equilibrium to the long equilibrium state, Ordinary Least Square (OLS) method to establish the nature of the long run relationship.

3.2 Model Specification

The model employed in this study is modified and extended aggregate production function framework (APF). The rationale for adopting APF in this work is that, along with "conventional inputs'' of labour and capital used in the neoclassical production function, "unconventional inputs" may be included in the model to capture their contribution to economic growth.

In order to capture the impact of defence spending on the aggregate production of the economy, the standard aggregate production function is modified and extended by including government defence expenditure (DF) and other control variables in the production function. The modified and extended aggregate production function of this study is written as

$$Y = F(K, L, DF, EXR, TO, INFL, FD, GCE) \quad \textbf{(1)}$$

In econometrics form, the model is stated as follows:

$$RGDP = b_0 + b_1 K + b_2 LF + b_3 DF + b_4 TO + b_5 EXR + b_6 GCE + b_7 INFL + b_8 FD + U \quad \textbf{(2)}$$

Where RGDP = Real Gross Domestic Product (proxy for economic growth), K = Gross Fixed Capital Formation (domestic physical capital), LF = Labour Force, DF = Defence Expenditure, EXR = Exchange Rate, GCE = Government Capital Expenditure (proxy for infrastructural development), TO = Trade Openness, INFL = Inflation Rate, FD = Financial Deepening. b_o is autonomous estimates of the endogenous function and b_1, b_2, b_3, b_4, b_5, b_6, b_7 and b_8 are the parameters of the behaviourial equation to be estimated and U is the error term for the model which captures unexplained influence on the dependent variable. Apriori expectation is as follows: b_1, b_2, b_3, b_4, b_6 and $b_8 > 0$ while b_5 and $b_7 < 0$. This implies that, all things being equal, domestic physical capital (k), labour force (LF), defence expenditure (DF), trade openness (TO), government capital expenditure (GCE) and financial deepening (FD) are expected to have positive effect on economic growth (RGDP). An increase in exchange rate (EXR) and inflation rate (INFL) will have negative effect on economic growth (RGDP).

The log linear form of the model is given as

$$ln(RGDP) = b_o + b_1 ln(K) + b_2 ln(LF) + b_3 ln(DF) + b_4 ln(TO) + b_5 ln(EXCR) + b_6 ln(GCE) + b_7 ln(INFL) + b_8 ln(FD) + U \quad \textbf{(3)}$$

Estimation Technique

Time series statistics for the period spanning 38years (1981 - 2018) of the included variables were used in the estimation procedure. The data collected were subjected to some verification tests such as unit root test using Augmented Dickey-Fuller (ADF) test and causality test using granger causality test. The study employed Ordinary Least Square (OLS) method of to evaluate the nature of relationship between the variables. To ascertain that the Ordinary Least Square (OLS) model

satisfies some basic econometric assumptions, some diagnostic tests such as auto-correlation (serial correlation) test using Durbin-Watson statistics, normality test using Jarque Bera test, ARCH test to check for heteroscedasticity, RESET and LM test to check for misspecification on the model were conducted.

Unit Root Test: Non-stationary data are unpredictable and the result obtained by using them may be spurious. Hence, the need for unit root test to ascertain the stationarity of the data before estimation. Stationarity of the variables was tested using Augumented Dickey – Fuller (ADF) and Phillips – Perron unit root tests. The ADF test was estimated using the regression equation:

$$\Delta Y_1 = \alpha_1 + \alpha_2 + \beta Y_{t-1} + \Sigma^{m}_{i=1}\, \theta i \Delta Y_{t-1} + \mu_t \quad \textbf{(4)}$$

Where Y is variables of interest, Δ is thedifference operator, t is the time trend, andμ is the white noise residual of zero mean, and constant mean and constant variance (α_1, α_2, β_1, - - - β_m) is the set of parameters to be estimated. The null hypothesis is that the variable under investigation has a unit root, against the alternative that it does not. The null hypothesis is rejected if the series is stationary. Phillips-Perron test use nonparametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms.

Granger Causality Test: The granger causality was adopted to examine the causal relationship between two variables. It follows that if the p values of the variable Y significantly contribute to forecast the value of another variable X, then Y has a Granger causality relationship with X and vice versa. The test is based on the equation below:

$$Y_i = \omega_0 + \Sigma^{p}_{z=1}\, \omega_z Y_{t-z} + \Sigma^{q}_{t=1} \tau_i X_{t-1} + \mu_t \quad \textbf{(5)}$$

$$Xi = \psi_0 + \Sigma^{p}_{z=1}\, \varphi_z X_{t-z} + \Sigma^{q}_{t=1} \alpha_i Y_{t-1} + \varepsilon_t \quad \textbf{(6)}$$

Where Yi and Xi are the tested variables, μ_t and ε_t are error terms, and t implies the time period, z and i are the number of lags. The null hypothesis is $\tau_i = \alpha_i = 0$ for all i. In the alternative hypothesis $\tau_i \neq 0$ and $\alpha_i \neq 0$, for at least some i, if the coefficient τ_i are significant but α_i are not significant, then X is Granger causal to Y. However, if both coefficients are significant, the causality runs both ways.

Co-integration Test: Vector autoregressive (VAR) was adopted for co-integration tests to determine whether the variables in the model are co-integrated or not. Co-integration was also tested to determine the need for using Error Correction Model (ECM). The Johansen co-integration methodology is given as:

$$Y_t = Z + \Sigma_{t=1}{}^{p}\, U_i\, Y_{t-1} + \varepsilon_t \quad \textbf{(7)}$$

Where, Z is a (nx1) vector of deterministic variables, ε is a (nx1) vector of white noise error terms and Ui is a (nxn) matrix of coefficients. The ECM has co-integration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustment dynamics.

Error Correction Mechanism (ECM): The model may not be in equilibrium in the short-run, but in equilibrium in long-run. To correct short-run disequilibrium, error correction term was included in the model. Error correction mechanism was first used by Sargam (1983) and latter popularized by Engle and Ganger (1987) to correct

disequilibrium. The granger representation theorem states that if two variables are co-integrated, then the relationship between the two can be expressed as ECM.

3.3 Data and Data Sources

The variables of interest in the study were real gross domestic product (RGDP) (proxy for economic growth) and defence expenditure (DF). The control variables employed were exchange rate (EXR) (reflects credibility of policies), gross fixed capital formation (GFCF) (reflects level of investment), labour force (LF), government capital expenditure (GCE) (captures infrastructural development) and trade openness (TOP) (captures the openness of the economy), inflation rate (INFR) (reflects macro-economic stability) and financial deepening (FD). The data on these variables were obtained from the publications of appropriate government agencies and international organizations such as Central Bank of Nigeria Statistical Bulletin (2018), the World Bank Development Indicator (WDI online version 2018) and Stockholm International Peace Research Institute (SIPRI, 2018). Specifically, quantitative data on defence expenditure (DF) were obtained from Stockholm International Peace Research Institute (SIPRI, 2018) and Central Bank of Nigeria data base, data on Gross Fixed Capital Formation (GFCF), Government Capital Expenditure (GCE), financial deepening (FD), inflation rate (INFL) and Real Gross Domestic Product (RGDP) were obtained from the Central Bank of Nigeria Statistical Bulletin (CBN, 2018) as well as CBN database (various years), while data on exchange rate (EXR), Trade Openness (TO) and Labour Force (LF) were obtained from the World Bank Development Indicator (WDI online version 2018).

3.4 Hypothesis Testing and Interpretation

The student t-test was used to test the significance of the regression co-efficient and the F-test to ascertain the significance of all independent variables to the dependent variable. This study utilizes significant level of 5%. Therefore, if p-value of the variable indicate less than 0.05 (5%), it means we reject H_0 and accept H_1.

3.5 Diagnostic Test

A good model of Ordinary Least Square (OLS) estimation should satisfy some basic econometric assumptions such as absence of correlation among the independent variables, normally distributed residuals and the error term should be constant (Gujarati, 2004). To ascertain some of these econometric criteria, normality test was carried out using Jarque Bera test, ARCH test was used to check for heteroscedasticity test, Durbin Watson test to check for autocorrelation and RESET and LM test to check for misspecification of the model used for this study.

4 Empirical Results

4.1 Descriptive Statistics

Table 4.1: Descriptive Statistics

	LRGDP	LEXR	LDF	LK	LLF	LGCE	LTOP	FD	INFL
Mean	10.26894	3.421651	8.856757	8.372678	17.44251	4.921613	-3.383749	11.05262	19.32105
Median	10.04588	4.577649	8.967189	7.974951	17.43983	5.665265	-2.442442	8.209316	12.55000
Maximum	11.15353	5.723847	11.04004	9.772176	17.92143	7.427798	-0.757153	20.77330	72.80000
Minimum	9.530920	-0.494296	6.986104	7.494753	16.95217	1.410987	-7.013116	5.917270	5.400000
Std. Dev.	0.561194	1.972466	1.295637	0.729960	0.278112	1.992512	2.283249	5.377672	17.25631
Skewness	0.344411	-0.764310	0.076639	0.625915	0.043491	-0.562547	-0.381899	0.875430	1.741086
Kurtosis	1.630051	2.280102	1.757769	1.897648	1.857892	1.779899	1.533736	1.962942	4.831548
Jarque-Bera	3.722790	4.520309	2.480501	4.405247	2.077296	4.361266	4.327755	6.556586	24.51015
Probability	0.155456	0.104334	0.289312	0.110513	0.353933	0.112970	0.114879	0.037693	0.000005
Sum	390.2197	130.0227	336.5567	318.1617	662.8154	187.0213	-128.5825	419.9995	734.2000
Sum Sq. Dev.	11.65274	143.9530	62.11094	19.71514	2.861819	146.8938	192.8894	1070.016	11017.86
Observations	38	38	38	38	38	38	38	38	38

Source: Author's Computation

Table 4.1 presents the descriptive statistics of the variables employed in the study. As shown in the table, real gross domestic product (lnRGDP) averaged N10.269billion and ranged from N9.531billion to N11.154billion. The average exchange rate (lnEXR) was N3.421 and varies from –N0.494 to N5.724 while average defence spending (lnDF) was N8.857billion and ranges from N6.986 billion to N11.040billion. The gross fixed capital formation (lnK) averaged N8.373billion and varies from N6.7.495billion to N9.772billion. The average labour force (lnLF) was 17.442 million and ranges from 16.952million to 17.921million whereas the average government capital expenditure was N4.922billion and varies from N1.411billion to N7.428billion. Trade openness averaged -3.388 and ranged from -7.013 to -0.757 while financial deepening averaged 11.053 and varied from 5.917 to 20.773. The average inflation rate (lnINFL) was 19.321 per cent and ranged from 5.400 per cent to 72.800 per cent. The inflation rate has the highest mean value of 19.321 while trade openness has the least mean value of -3.3837. Also, inflation rate has the highest maximum value of 72.800 as well as the highest standard deviation of 17.256. Labour force has the most minimum standard deviation of 0.278 and the highest median of 17.439. The total number of observations for the study was 38 covering the period 1981- 2018.

4.2 Unit Root Test

Table 4.2: Unit Root Test Result

Variables	Augmented Dicky-Fuller				Order of integration	Philip-Perron				Order of Integration
	At Levels		At 1st Dfference			At Levels		At 1st Dfferences		
	ADF Statistic	5% Critical value	ADF Statistic	5% Critical value		ADF Statistic	5% Critical value	ADF Statistic	5% Critical value	
RGDP	-0.027819	-2.945842	-3.395053	-2.945842	I(1)	0.684590	-2.943427	-3.242632	-2.975842	I(1)
DF	-8.373416	-3.626784	-2.945842	-2.611531	1(1)	-0.656377	-2.943427	-8.611659	-2.945842	I(1)
LF	-0.393030	-2.943427	-10.41079	-2.945842	I(1)	-0.439406	-2.943427	-10.41079	-2.945842	I(1)
K	-0.826076	-2.945842	-7.402767	-2.945842	I(1)	-1.002808	-2.943427	-7.396129	-2.945842	I(1)
GCE	-0.885941	-2.943427	-6.271410	-2.945842	I(1)	-0.883069	-2.943427	-6.267521	-2.945842	I(1)
EXR	-2.017188	-2.943427	-5.164830	-2.945842	I(1)	-2.169884	-2.943427	-5.164830	-2.945842	I(1)
TOP	-2.241483	-2.943427	-7.485748	-2.945842	I(1)	-2.241483	-2.943427	-7.903492	-2.945842	I(1)
FD	-0.634177	-2.943427	-4.107308	-2.945842	I(1)	-0.866730	-2.943427	-4.749757	-2.945842	I(1)
INFL	-2.884157	-2.945842	-5.592995	-2.945842	I(1)	-2.943427	-2.943427	-9.445171	-2.945842	I(1)

Source: Author's Computation

The unit root test was carried out to examine the unit root properties of the time series data in order to avoid a spurious regression. The unit root test was conducted for levels and first difference using the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests. The assumption underlying this test is that; accept H_0 if the ADF statistics is greater than the reported ADF critical values of the chosen level of significance, reject H_0 otherwise. The ADF and PP results are shown in Table 4.2 indicates that all the variables (RGDP, DF, EXR, K, LF, GCE, and TO) were stationary at first difference 1(1) at 5% level of significance. Their t-statistics values were higher than the critical value at 5% level of significance. The implication that the time series were stationary at first difference is that the behaviour of the variables varied around the mean value and invariant overtime (Enders, 2009).

4.3 Co-integration Test Results

The co-integration test was carried out using Johansen co-integration test to determine whether there is a long-run relationship among the variables. The Johansen co-integration test result is presented in Table 4.3. The trace value test indicates six (6) co-integrating equations at 5% level of significance while maximum eigen value test shows five (5) co-integrating equations at 5% level of significance. This shows that the variables were co-integrated and consequently, real gross domestic product (RGDP) proxy for economic growth has a long run relationship with the variables employed in the model.

Table 4.3: Johansen Co-Integration Test Result

Hypothesized No. of CE(s)	Trace Statistics	5% Critical Value	Hypothesized No. of CE(s)	Max-Eigen Statistics	5% Critical Value
None *	356.5596	208.4374	None *	95.15039	59.24000
At most 1*	261.4092	169.5991	At most 1*	75.08118	53.18784
At most 2 *	186.3280	134.6780	At most 2 *	49.94553	47.07897
At most 3 *	136.3825	103.8473	At most 3 *	43.33115	40.95680
At most 4 *	93.05132	76.97277	At most 4 *	37.88862	34.80587
At most 5 *	55.16270	54.07904	At most 5	24.29481	28.58808
At most 6	30.86789	35.19275	At most 6	13.34273	22.29952
At most 7	17.52516	20.26184	At most 7	10.15829	15.89210
At most 8	7.366869	9.164546	At most 8	7.366869	9.164546

Source: Author's Computation, 2021

4.4 Error Correction (ECM) Model

The error correction model (ECM) result presented in Table 4.4 shows that most of the variables used in the determination of economic growth did not have the hypothesized signs. The coefficient of defence expenditure (LDF) had negative sign instead of the expected positive sign. This implies an increase in defence spending deters economic growth in the short run. The impacts of other variables were as follows: LK, LGCE and FD positively influenced economic growth. On the other hand, LEXR, LLF, TOP and INFL had negative influence on economic growth. The lagged error correction term (ECM) was included in the model to capture the long run dynamics between the co-integrating series and was found to be statistically significant. It's coefficient, -0.170567, shows the speed of adjustment rate of 17 per cent to correct the previous year's disequilibrium in the path of long run equilibrium growth. This was considered low. The R^2 of 0.299 indicates that about 30 per cent of

the variations in RGDP were explained by the model. The F- statistic indicated that the variables were jointly significant at 5% level, and the Durbin Watson (DW) statistics showed the absence of auto correlation in the model.

Table 4.4: Error Correction (ECM) Model Result

Dependent Variable: D(LRGDP)

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	0.049015	0.015350	3.193224	0.0036
D(LDF)	-0.003412	0.010101	-0.337803	0.7381
D(LEXR)	-0.046867	0.024996	-1.874955	0.0717
D(LK)	0.026298	0.011219	2.344128	0.0267
D(LTLF)	-0.266784	0.462540	-0.576781	0.5689
D(LGCE)	0.020879	0.023543	0.886875	0.3830
D(TOP)	-0.000406	0.000867	-0.468646	0.6431
D(FD)	0.002406	0.004226	0.569294	0.5739
D(INFL)	-0.000457	0.000461	-0.991183	0.3304
ECM(-1)	-0.170567	0.112225	-1.519864	0.1402
R-squared	0.299485	Mean dependent var		0.041099
Adjusted R-squared	0.065980	S.D. dependent var		0.042351
S.E. of regression	0.040930	Akaike info criterion		-3.328431
Sum squared resid	0.045233	Schwarz criterion		-2.893048
Log likelihood	71.57598	Hannan-Quinn criter.		-3.174938
F-statistic	1.282563	Durbin-Watson stat		1.081382
Prob(F-statistic)	0.290972			

Source: Author's Computation, 2021

4.5 Ordinary Least Square (OLS) Estimation Results

The Ordinary Least Square (OLS) estimation result presented in Table 4.5 shows that most of the variables have the expected result. The coefficient of defence expenditure (LDF) conforms to apriori expectation; indicating that increase in defence expenditure (LDF) leads to increase in economic growth in Nigeria within the period under study. As for the control variables, the coefficient of LK, LLF and LFD have positive sign while LEXR and LINF have negative sign, all in conformity with apriori expectation. This implies that increase in LK, LLF and LFD stimulate economic growth in Nigeria and, increase in inflation rate (LINF) and exchange rate (LEXR) deter economic growth of Nigeria. In addition, LGCE and TOP have negative coefficients against the hypothesized positive sign. The implication is that increase in GCE and TOP affect economic growth adversely. The R^2 of 0.981% indicates that 98 per cent of the variations in RGDP were explained by the model. The F- statistic indicated that the variables were jointly significant at 5% level, and the Durbin Watson (DW) statistics showed the absence of auto correlation in the model.

Table 4.5: Ordinary Least Square Estimation Results

Dependent Variable: LRGDP

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-14.28385	6.644827	-2.149620	0.0401
LDF	0.024781	0.024600	1.007386	0.3221
LEXR	-0.031521	0.037409	-0.842610	0.4063
LK	0.079222	0.022105	3.583845	0.0012
LLF	1.316579	0.411865	3.196628	0.0033
LGCE	-0.036623	0.038423	-0.953146	0.3484
TOP	-0.000272	0.002139	-0.127307	0.8996
LFD	0.122394	0.082026	1.492137	0.1465
INFL	-0.000639	0.000922	-0.693538	0.4935
R-squared	0.981720	Mean dependent var		10.26894
Adjusted R-squared	0.976677	S.D. dependent var		0.561194
S.E. of regression	0.085705	Akaike info criterion		-1.872417
Sum squared resid	0.213015	Schwarz criterion		-1.484568
Log likelihood	44.57592	Hannan-Quinn criter.		-1.734423
F-statistic	194.6763	Durbin-Watson stat		0.891476
Prob (F-statistic)	0.000000			

Source: Author's Computation, 2021

4.6 Granger Causality Test

Table 4.6: Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F- statistics	Probability
LDF does not Granger Cause LRGDP	37	3.69285	0.0631
LRGDP does not Granger Cause LDF		4.84809	0.0346

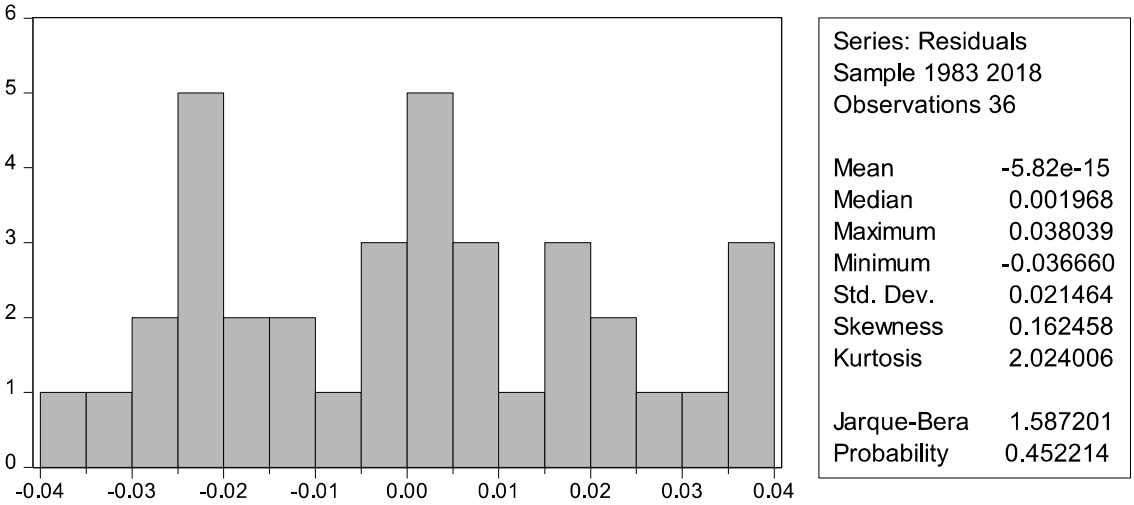
Source: Computed by the Author

The result of pairwise Granger's causality test is presented in Table 4.6. The rule states that if the probability value lies between 0 and 0.05, there is a causal relationship. From the result presented in the table, defence spending does not granger cause real gross domestic product since probability value of 0.0631 is greater than 0.05. However, real gross domestic product granger cause defence spending because the probability value of 0.0346 is less than 0.05. Therefore, there is a unidirectional causal relationship between defence spending and real gross domestic product.

4.7 Diagnostic Test Results

Result of Normality Test: The Jarque-Bera normality test was carried out to ascertain the distribution of the residuals in the model using histogram-normality test. The result is presented in figure 1. The results show a probability value of 0.452214 which is greater than 0.05. This result indicates that the residual in the model is normally distributed.

Figure 1: Results of Jarque-Bera Normality Test



5 Summary of Findings, Conclusion and Recommendations

5.1 Summary of Findings

This study employed modified and extended aggregate production model to examine the impact of defence expenditure on economic growth in Nigeria for the period (1981-2018). The data used for the study were sourced from CBN Statistical Bulletin, Stockholm International Peace Research Institute (SIPRI) and the World Development Indicator (WDI)-online. The econometric technique adopted in the study were unit root test, co-integration analysis, error correction model (ECM) and Ordinary Least Square (OLS) technique to analyze the time series data for the period under review. The ADF and PP tests results indicate that all the variables (RGDP, DF, EXR, GFCF, LF, GCE, and TO) were stationary at first difference 1(1) at 5% level of significance. The Johansen co-integration test result shows that the variables were co-integrated at 5% level of significance and consequently, there existed a long run relationship between the variables employed in the model. The error correction model (ECM) result shows the coefficient of defence expenditure (LDF) had significant negative sign which implies an increase in defence spending significantly deters economic growth in the short run.

The impacts of other variables were as follows: LK, LGCE and FD had significant positive influence on economic growth in the short-run whereas LEXR, LTLF, TOP and INFL had significant negative influence on economic growth. The findings of the study based Ordinary Least Square (OLS) result indicates that defence expenditure has significant positive impact on the aggregate output (RGDP) of the Nigerian economy in the long-run and consequently on economic growth of Nigeria. Also, gross fixed capital formation (LK) and labour force (TLF) had positive relationship with real gross domestic product (RGDP) in the long-run. This means that increase in gross fixed capital formation (LK) and labour force (TLF) will increase economic growth in Nigeria. Exchange rate (EXR), government capital expenditure (GCE) and trade openness (TOP) were negatively related to real gross domestic product (RGDP) in Nigeria in the long-run. This means that an increase in exchange rate (EXR), government capital expenditure (GCE) and trade openness (TOP) will lead to a decrease in real gross domestic product (RGDP) and consequently, reduction in economic growth. The R^2 of 0.981% indicates that 98 per cent of the variations in RGDP were explained by the model. The F- statistic indicated

that the variables were jointly significant at 5% level, and the Durbin Watson (DW) statistics showed the absence of auto correlation in the model.

5.2 Conclusion

The study investigated the impact of defence spending on economic growth in Nigeria for the period, 1981-2018. In doing this, the study tries to establish the relationship between real gross domestic product (proxy for economic growth) and defence spending together with other control variables such as exchange rate, gross fixed capital formation, labour force, government capital expenditure and trade openness. The results revealed that defence spending has significant negative effect on output in the short-run and significant positive impact on economic growth in the long-run.

5.3 Recommendations

Based on the findings of this study, the following recommendations are proffered towards improving security in Nigeria and enhancing the positive impact of defence expenditure on the economic growth:

1. There should be proper funding of Research and Development (R&D) activities of the armed forces, police force and other national security outfits in order to improve their skills, enlarge their capacities and especially, indigenize their technology.
2. The development of security information communication technology (ICT) tools and its robust utilization in Nigeria should be given more attention. Nigeria has not experienced external attack for many years now and there had been no cause to defend the country against external attack. The implication is that security issues in Nigeria had been internal security problem and the primary duty of the armed forces, police force and other national security outfits whom huge public resources had been expended to maintain had been that of domestic surveillance.
3. For proper domestic surveillance to be carried out, the armed and security forces in Nigeria should be restructured with state, local government and community policing incorporated, and traditional institutions should be involved and their constitutional roles in this regard well defined.
4. To reduce internal security problem in Nigeria, there is need for fairness, equity and good governance as well as accountability, prudent and transparency in the management of public resource.
5. There should be synergy between the armed forces, police force and other national security outfits in country as well as defence sector and other sectors of the Nigerian economy for sustained economic growth.Hence collaboration between defence sector and other sectors like agriculture, manufacturing, communication, sciences and technology is highly recommended.

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Table 4.1.1 Presentation of Data

YEARS	RGDP (₦Bil)	EXR (₦Bil)	DF (₦Bil)	GFCF (₦Bil)	LF (Mil)	GCE (₦Bil)	TO (₦Bil)
1981	15,258.00	0.61	1,319.1	8,822.13	23,026,874	6.57	0.002
1982	14,985.08	0.6729	1,112.5	6,841.75	24,104,271	6.42	0.0013
1983	13,849.73	0.7241	1,178.9	4,486.73	25,924,912	4.89	0.0012
1984	13,779.26	0.7649	9,282.0	2,871.65	25,088,809	4.1	0.0012
1985	14,953.91	0.8938	9,757.0	2,710.83	26,876,541	5.46	0.0014
1986	15,237.99	2.0206	9,069.0	2,353.33	27,300,506	8.53	0.00098
1987	15,263.93	4.0179	8,100.0	1,798.58	28,296,360	6.37	0.0032
1988	16,215.37	4.5367	1,230.0	1,878.75	28,852,476	8.34	0.0032
1989	17,294.68	7.3916	1,257.2	1,916.32	29,026,487	15.03	0.0081
1990	19,305.63	8.0378	2,229.0	2,656.97	29,286,947	24.05	0.0081
1991	19,199.06	9.9095	2,415.0	2,646.85	30,040,723	28.34	0.011
1992	19,620.19	17.2984	3,004.0	2,567.59	30,825,405	39.46	0.018
1993	19,927.99	22.0511	6,382.0	2,978.27	31,635,860	54.5	0.019
1994	19,979.12	21.8861	7,032.0	2,675.71	32,492,025	70.92	0.018
1995	20,353.20	21.8861	1,400.0	1,974.80	33,394,658	121.14	0.084
1996	21,177.92	21.8861	1,535.0	2,332.14	34,217,680	212.93	0.09
1997	21,789.10	21.8861	1,792.0	2,538.29	35,100,936	269.65	0.096
1998	22,332.87	21.8861	2,516.2	2,409.92	36,027,324	309.02	0.071
1999	22,449.41	92.6934	4,540.0	2,339.41	37,011,197	498.03	0.0009
2000	23,688.28	102.105	3,749.0	2,737.85	37,993,680	239.45	0.124
2001	25,267.54	111.943	6,347.2	2,143.53	38,927,763	438.7	0.13
2002	28,957.71	120.97	1,081.5	2,579.53	39,914,966	321.38	0.0011
2003	31,709.45	129.357	7,591.3	3,872.89	40,890,770	241.69	0.163
2004	35,020.55	133.5	8,504.7	2,943.22	41,723,316	351.3	0.19
2005	37,474.95	132.147	8,850.6	2,635.38	42,828,205	519.5	0.27
2006	39,995.50	128.652	9,985.3	4,200.47	43,882,211	552.39	0.26
2007	42,922.41	125.833	12,220.0	5,953.28	45,010,413	759.32	0.285

2008	46,012.52	118.567	19,152.0	5,910.08	46,203,876	960.89	0.35
2009	49,856.10	148.88	22,402.10	7,964.94	47,453,585	1152.8	0.28
2010	54,612.26	150.298	29,910.8	9,183.06	48,753,690	883.87	0.369
2011	57,511.04	153.862	36,904.5	9,870.20	50,041,195	918.55	0.456
2012	59,929.89	157.499	36,484.30	10,281.95	51,387,354	874.83	0.416
2013	63,218.72	157.311	38,050.00	11,478.08	52,794,893	1108.39	0.391
2014	67,152.79	158.553	37,381.50	13,595.84	54,234,993	783.12	0.0034
2015	69,023.93	193.279	39,749.70	14,112.17	55,790,869	818.37	0.289
2016	67,931.24	253.492	44,409.8	15,104.18	57,369,993	653.61	0.26963
2017	68,490.98	305.79	53,010.2	16,908.13	59,012,447	1242.3	0.362
2018	69,810.02	306.08	62,320.3	17,538.89	60,698,492	1682.1	0.469

Source: CBN Statistical Bulletin (2018), Stockholm International Peace Research Institute (SIPRI) (2018), World Development Indicator (WDI) (2018) and Central Bank of Nigeria Statistical Bulleten (Various Issues).