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Zagreb International Review of Economics & Business, Vol. 27, No. 1, pp. 97-114, 2024

Faculty of Economics and Business, University of Zagreb and Sciendo. Printed in Croatia.
ISSN 1331-5609; UDC: 33+65
DOI: 10.2478/zireb-2024-0005

Defense Spending and Income Growth in Nigeria

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Abstract: *This study considers the effect of defense spending on income growth in Nigeria. The results show that defense spending adversely affects income growth in the short run and the long run. Education spending, health spending, transport and communication service spending, internal security spending and electric power consumption have short-run and long-run growth impacts on income in Nigeria. Also, the armed forces personnel proportion of the labour force impacted positively on income. It was concluded that resource distribution should favour provisions of socio-economic and infrastructural facilities for defense spending. Therefore, the government should allocate its resources to provide socio-economic and infrastructural facilities for sustainable income growth in Nigeria.*

Keywords: military spending; armed forces personnel; socio-economic services; income growth

JEL Classification: H56, H72, H54, Q43, Q47

Introduction

The attainment of sustainable economic growth is necessary for any country to maximize economic welfare and stimulate long-term growth of per capita income (Rooney, Johnson & Priebe, 2021; Kumar, 2013). Defense spending is a portion of government expenditure meant to grow the economy through the multiplier process. Defense spending can impact the economy favourably by increasing aggregate demand (Keynesian effects). This will lead to an increase in the utilization of idle capi-

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tal, higher employment, profit and higher investment which will cause the economy to grow. Developed countries commit a high percentage of their budget to defense while developing countries, specifically African countries, grapple with high debt burdens and lowest defense spending. Nigeria has been experiencing fiscal imbalance since 1970, shown in large-scale public spending that always results in a budget deficit. The effect is an unimpressive economic performance despite substantial oil revenue. Nigeria has also confronted threats to internal peace and security after the civil war. The Boko Haram problem threatened the peace and security of Nigerians, especially the northerners. There is a kidnapping problem in the West, South, and Eastern States of Nigeria. These problems are a threat to investment, growth, and sustainability. Due to the enormity of the challenges posed by the security problem, the Nigerian military has joined the police to control crime and maintain peace and security. These led to an unavoidable increase in security and defense spending (Kum, Olayiwola, and Aloysius, 2019).

The nexus between defense expenditure and economic growth has been examined in the literature. Policymakers have consistently looked for new strategies to increase the productive capacity of their economies. Internal Security and defense provide the social and political stability required for economic growth and development. Internal security and defense spending have continued to take an increasing proportion of government recurrent expenditure in Nigeria despite dwindling resources for economic activities (CBN, 2022; 2023). For instance, the proportion of internal security and defense expenditures was between 0.15% and 0.20% of government recurrent expenditures from 1981-2022 (CBN, 2022; 2023). Olaniyi and Adam (2003) also observe that a decrease in military expenditure may positively improve peoples' welfare considering the structure of a country's economy and the composition of the military spending. In general, the defence sector may lessen growth constraints by increasing the supply of skilled labour. It may also contend for limited economic resources with the more efficient civil economy, thus limiting the general productive efficiency of the economy.

According to Khidmat, Wang & Iqbal, (2018) whether military spending has a positive or a negative impact on income growth is an empirical rather than a theoretical question. Therefore, the pertinent preoccupation is to empirically examine whether defense expenditure increases income growth or not since it consumes an increasing portion of the country's resources. Previous studies have found that defense expenditure can positively and adversely impact the economy. For instance, Hassan, Waheeduzzaman & Rahman (2003) argued that military spending could positively or negatively impact the economy through increased security or crowding out of investment. Specifically, Emimola (2008), Anyanwu & Aiyedogbon, (2011), Azam, (2020), Ajala and Laniran (2021), Susilo, Sari, Putra and Pratiwi (2022) examined the relationship between defense expenditures and economic growth covering different periods and using different econometric estimation techniques for different countries. The empi-

rical analysis shows a mix of positive and adverse impacts of military spending on economic growth. However, Ajefu, (2015) established a negative long-run effect of defense burden and income growth in the short-run and long run in Nigeria. Given, the unprecedented increase in internal insecurity in Nigeria, culminating in increasing internal security and defense spending, coupled with contradictory empirical results on the impacts of defense spending on the economy in Nigeria, this study investigates the effect of defense spending on income growth in Nigeria. The study is different from the previous studies in terms of coverage and contributed to the literature by incorporating critical growth variables such as internal security spending, electricity power consumption, and armed force personnel as a proportion of labour as part of control variables to examine the effect of defense spending on income growth in Nigeria. The remaining part of the study comprises four sections. Section two dwells on the literature review, and section three entails methodology. Section four covers data analysis and discussion of results, and section five concludes.

Literature Review

Conceptual Review

Government spending is a fiscal tool that provides a crucial function in the economy. During an economic downturn, government spending increases aggregate demand to stimulate the economy. The government's spending is generally classified into capital and recurrent expenditure. The recurrent expenditure is government spending on administration such as wages, salaries, interest on loans, and maintenance while capital expenditure is expenditures on roads, airports, health, education, electricity generation, and telecommunication (Olayiwola, Kazeem & Olusanya, 2021). Economists categorized public expenditures as productive and unproductive. Productive expenditures are spending on physical infrastructure, human capital programmes, and government-funded research programmes. These expenditures are called public investments because they aid economic growth and development. Military expenditure is the total financial resources spent on creating and maintaining the national military (defense) establishment, peace, and war. The International Monetary Fund (IMF) defined military expenditure as spending on the upkeep of military units, the acquisition of military equipment, military construction, recruiting, training, feeding, clothing, and housing members of the armed forces, and providing remuneration, medical care and other services for them (World Bank, 2024). It includes capital expenditures for the provision of quarters to the families of military force, military schools, and research and development (R&D) for defense. Expenditures for solidifying the public services to manage wartime exigency, grooming the civil defense force, and acquiring equipment are part of military and security spending (World Bank, 2024).

Defense expenditure in Nigeria is structured according to the United Nations Organization (UNO) classifications. However, the budget office usually approves recurrent expenditure and capital expenditure as two different portions of the defense expenditure in the annual budget of the federal government (CBN, 2022; 2023). The recurrent expenditure is personnel costs for the armed forces (the army, the navy, and the air force), costs of operations, and barrack rehabilitation. Capital defense expenditure consists of allocated funds for the purchase of military hardware and vehicles, the construction of barracks, and other infrastructure; the provision of roads, electricity, hospitals, and water for barracks and research and development (R&D). The expenditure for combat readiness which is the state of preparedness for war is also part of capital expenditure (CBN, 2022; 2023). This is part of the defense capital expenditure because the success of combat readiness of the military requires huge financial resources (CBN, 2023). Income growth was described as a sustained increment in productivity in a country in a specific fiscal year. It is usually measured by the growth of a country's gross domestic product (GDP). The growth of a country's GDP depends on government expenditure as well as the government's capability to efficiently distribute resources. Given this, it can be concluded that both government spending and government productivity are necessary for the existence of income growth in any economy.

Empirical Review

Studies on government spending and income growth have produced contrasting outcomes. Studies like Beraldo, Montolio, and Turati, (2009); Bojanic, (2013); and Kapunda & Topera, (2013) concluded that increasing government spending promotes income growth. Others such as Carter, Craigwell, & Lowe (2013); Chang et al., (2014); Ndambiri et al., (2012); Rooney, Johnson & Priebe, (2021) among others suggest that growing military spending lessens income growth. Thus, it may be concluded that the nexus between government expenditure (particularly defense spending) and income growth is inconclusive. Rooney, Johnson & Priebe, (2021) found that prioritizing defense spending over infrastructure investment might undermine the economic growth of the United States of America (US) and, the resources available for defense in the long run. Also, spending on US national defense was around half of the discretionary spending before the pandemic response, thus defense spending contributes significantly to annual deficits. Therefore, as public debt rises, there is a risk that defense spending might sooner or later have a harmful effect on growth. Azam, (2020) on the empirical evaluation of the impact of military spending on economic growth for a panel of 35 non-OECD countries over 1988–2019 in a panel autoregressive distributed lag (ARDL)/pooled mean group (PMG) technique found a clear negative effect of military spending on economic growth. Also, the pairwise Dumitrescu

Hurlin panel causality test results show a bi-directional causality between military expenses and economic growth. The author concluded that the estimates provide strong support that military expenditure is detrimental to economic growth, hence, policymakers need to redesign the military budget to stimulate economic growth and improve social welfare.

Manchester (2017) examines a potential two-way causality between defense spending and economic growth in the US between 1947 and 2016 with quarterly data and Granger Causality methodology. The results suggest that over the longer time span of 6-7 years, Granger Causality was not seen between defense spending and economic growth. However, the smaller sections' incremental periods analysis shows dissenting findings about the nature of causality. Korkmaz (2015) selected 10 countries in the Mediterranean region in a panel data analysis covering 2005-2012 to examine the effect of military spending on economic growth and unemployment. The author found negative impacts of military spending on economic growth. Hence, it was suggested that countries should create a more peaceful environment, decrease their defense spending and shift their investment resources to other areas to ensure economic growth. Susilo, Sari, Putra and Pratiwi (2022) provide an analysis of military expenditure, political stability, and the total workforce on economic growth during the COVID-19 pandemic with a cross-section data for 40 countries with upper-to-middle income levels to examine the evolution of the periods 2010-2019 and 2019-2020. For the period 2010-2019, there was a general decrease in the percentage of GDP on military spending, but the real value per capita increased in many countries, due to the effect of the increase of real production per capita. In the year 2020, the pandemic diminished the real value of military expenditure in a few countries. The results showed a positive significant impact on the value of GDP, implying an increase in economic growth during the COVID-19 pandemic.

Rashid and Arif (2012), examined the effects of military spending on economic growth in 14 developing countries for the period 1981-2006 in a panel data analysis. The study revealed a positive impact of military spending on economic growth in the countries studied. Tiwari and Shahbaz (2013) in an Autoregressive Distributed Lag bounds (ARDL) method examined the impact of defense expenditure on economic growth for India. The authors found a positive long-run relationship between defense spending and economic growth but a negative effect after a threshold point. The results further show a bidirectional causal relationship between defense expenditure and economic growth. Halicioglu (2004) supports Tiwari & Shahbaz (2013) by finding a positive long-run relationship between defense expenditure and output in Turkey. The long-run impact and causal effect between military spending and economic growth were tested in the ASEAN-5 economy by Hirnissa & Baharom (2009) from 1965 to 2006. A positive long-run effect of defense spending on economic growth was found in only three of the five countries examined. In the examination of the effect of military spending on economic growth in Africa, Dunne and Vougas (1999),

established that military spending has an adverse effect on the growth of GDP in African countries. By reducing the acquisition of productive resources and the productivity of existing resources, military spending worsens economic growth. With the use of Spearman rank order correlation and regression analysis, Benoit (1973, 1978) show that defense spending promotes growth in a sample of 44 less developed countries (LDCs') between 1950 and 1965. Also, employment and GDP had a growth effect on income due to the growth of defense spending.

Ajala and Laniran (2021) examined the nexus between military expenditure and economic growth in Nigeria from 1981 to 2017 with military expenditure as a share of government expenditure using the ARDL estimation technique. The result shows a significant positive long-run relationship between military expenditure and economic growth. Adekunle and Oyelekan (2022) empirically examined the relationship between military expenditure, health expenditure and economic growth in Nigeria from 1981 to 2020. The study found an adverse effect of military spending on economic growth in Nigeria. Oriavwote & Eshenake (2013), established a negative effect of security spending on economic growth in Nigeria using Error Correction Model (ECM) technique. Though, with inconsistent spending, budgeting, and execution in the defense sector, spending on internal security contributed to the attainment of the targeted level of economic growth in Nigeria. Olofin (2012) examined the impact of defense expenditure on poverty reduction in Nigeria from 1990 to 2010; using four models in a dynamic ordinary least square (DOLS). The poverty indicator built from the human development index was used as the dependent variable in two models and the infant mortality rate was the dependent variable in the other models. The result shows that expenditure per soldier, military participation rate, trade, population, and output per capita were positively related to the poverty indicator and military expenditure; secondary school enrolment and output per capita have negative effects on the poverty level. These findings confirm the trade-off between the well-being and capital intensiveness of the military in Nigeria, affirming the vulnerability of the poor in Nigeria. Enimola (2008) studied the link between the level of economic growth and defense spending in Nigeria between 1977 and 2006 using a supply model based on the production function of Feder (1982) and extended by Biswas and Ram (1986). The result found a unidirectional causality between economic growth and defense spending.

Methodology

The Keynesian theory (1936) of public expenditure argues that economic growth occurs as a result of rising public sector expenditure. In this context, government expenditure is treated as an independent exogenous variable and could be used as an efficient policy variable to influence economic growth. According to the Keynesian sc-

hool of thought, public spending boosts economic activities as well as acts as a tool to stabilize the short-run fluctuations in aggregate expenditure (Olayiwola, Bakare-Aremu and Abiodun, 2021). This view is consistent with the evidence found in some previous empirical studies such as Olayiwola, Bakare-Aremu and Abiodun, (2021) that found evidence of a positive long-run relationship between public health expenditures and economic growth within the context of Wagner's theory of ever-increasing State activities. The Keynesian macroeconomic model advocates active government intervention in the economy through an increase in government spending, and money supply to stimulate the demand for goods and services during periods where there is a lack of demand (low demand) and put the unemployed back to work. This illustrates the importance of aggregate demand in the Keynesian macroeconomic framework to determine the level of output and income in the economy. Keynes (1936) argued that market economies had no automatic capacity to generate full employment and that economic policy should be closely linked to social policy. Investment in education, health, roads, electricity, defense, and water supply are necessities that can launch the economy from the primitive stage to the take-off stage of economic development, making government spend an increasing amount of time to develop an egalitarian society (Olayiwola, Bakare-Aremu and Abiodun, 2021).

This study is premised on the Keynesian growth framework. The theory explains the source of growth in an economy. Keynes (1936) argued that public spending is an exogenous component that uses policy instruments to speed up income growth. This framework represents the hypothesised relationship between defense spending, internal security, health, education, general administration, and the growth of real GDP (the index of income growth). Thus, the functional relationship between income growth and defense spending is stated as:

$$INC_g = f(DFS) \tag{1}$$

Equation (1) states that income growth *(INCg)* depends on defense spending *(DFS)*. Other forms of government expenditure incorporated into the equation based on the Keynesian (1936) framework include recurrent government expenditures on general administration *(GAD)*, recurrent government expenditures on education *(EDS)*, recurrent government expenditures on health *(HTS)*, recurrent government expenditures on transport services and communication *(TSS)*, recurrent government expenditures on internal *(INS)*. Other control variables are electric power consumption (kWh per capita) *(EPC)* and armed forces personnel (% of the total labour force) *(AFP)*. Thus, using Khalid and Razaq (2015) model on the impact of military spending on economic growth in the USA, the functional relationship between defense spending and income growth is:

$$INC_g = f(DFS, GAD, EDS, HTS, TSS, INS, EPC, AFP) \tag{2}$$

Equation (2) stated that income growth *(INCg)* depends on defense spending *(DFS),* general administration spending *(GAD),* education spending *(EDS),* health spending *(HTS),* transport services and communication spending *(TSS),* internal security spending *(INS)*, electric power consumption *(EPC)* and the proportion of labour force in armed forces *(AFP)*. Thus, explicitly, equation (2) can be stated as:

$$INC_g = \beta_0 + \beta_1 DFS + \beta_2 GAD + \beta_3 EDS + \beta_4 HTS + \beta_5 TSS + \beta_6 INS + \beta_7 EPC + \beta_8 AFP + \mu_t \quad (3)$$

Theoretically, it is expected that:

$$\beta_1 - \beta_8 > 0 \quad (4)$$

Estimation Techniques

The estimation method was chosen by investigating the stationarity level of the series with a unit root test. The general form of the unit root model is:

$$y_t = \alpha + \delta t + \beta y_{t-1} + \sum_{j=1}^{p} pj \; y_{t-j} + \varepsilon_t, \; t = 1,...,T, \quad (5)$$

Where $\Delta y_t = y_t - y_{t-1}$ in the series t is (trend factor); α is the constant term, ε_t is the stochastic error term, *and* β is the lag length. The order of integration of the variables was determined with the use of Augmented Dickey-Fuller (ADF) and Phillips-Perrons unit root tests. The unit root tests in Table (3) indicate a different order of integration for the variables, thus, the Auto-regressive Distributed Lag (ARDL) method was used for the estimation. The ARDL model of the equation is:

$$\begin{aligned} lnINC_t = \alpha_i &+ \sum_{i=1}^{p} \beta_0 \, lnINC_{t-1} + \sum_{i=0}^{q} \beta_1 \, lnDFS_{t-1} + \sum_{i=0}^{q} \beta_1 \, lnGAD_{t-1} \sum_{i=0}^{q} \beta_1 \, lnEDS_{t-1} \\ &+ \sum_{i=0}^{q} \beta_1 \, lnHTS_{t-1} + \sum_{i=0}^{q} \beta_1 \, lnTSS_{t-1} + \sum_{i=0}^{q} \beta_1 \, lnINS_{t-1} + \sum_{i=0}^{q} \beta_1 \, lnEPC_{t-1} \\ &+ \sum_{i=0}^{q} \beta_1 \, lnAFP_{t-1} \\ &+ \mu_{it} \end{aligned} \quad (6)$$

The presence of co-integration was determined for a long-run relationship using the bounds test (Pesaran, Shin, and Smith, 2001) and the Granger-causality test was used for the causality test between defense spending and income growth in Nigeria.

Data Sources and Measurement of Variables

This study employs time series data from 1981 to 2022. The data were obtained from World Development Indicators (2024) and Central Bank of Nigeria 2022 and 2023 Statistical Bulletin. The dependent variable is income growth (INC_g), (proxy by the growth of real GDP). The independent and control variables are recurrent government expenditures on defense *(DFS)*, recurrent government expenditures on general administration *(GAD)*, recurrent government expenditures on education *(EDS)*, recurrent government expenditures on health *(HTS)*, the recurrent government on transport services and communication *(TSS)*, recurrent government spending on internal security *(INS)*, electric power transmission consumption, *(EPC)* and armed forces personnel *(AFP)*

Table 1: Measurement of Variables

S/N	Variables	Measurement	Source
1.	Income Growth *(INC_g)*	GDP per capita (constant 2015 US$)	WDI, 2024
2.	Defense Spending *(DFS)*	Recurrent Government Expenditures on Military and Defense	CBN, 2022; 2023
3.	General Administration *(GAD)*	Recurrent Government Expenditures on General Administration	CBN, 2022; 2023
4.	Education Spending *(EDS)*	Recurrent Government Expenditures on Education	CBN, 2022; 2023
5.	Health Spending *(HTS)*	Recurrent Government Expenditures on Health	CBN, 2022; 2023
6.	Transport Services *(TSS)*	Recurrent Government Expenditures on Transport Services	CBN, 2022; 2023
7.	Internal Security *(INS)*	Recurrent Government Expenditures on Internal Security	CBN, 2022; 2023
8.	Electric Power Consumption *(EPC)*	Electric power consumption (kWh per capita)	WDI, 2024
9.	Armed Forces Personnel *(AFP)*	Armed Forces Personnel (% of total labor force)	WDI, 2024

Results and Discussion

Descriptive Statistics

Table 2 shows the descriptive statistics of the variables. The average income growth *(INCg)*, defense spending *(DFS)*, general administration spending *(GAD)*, educational spending *(EDS)*, health expenditure *(HTS)*, transport services and communication spending *(TSS)*, internal security spending *(INS)*, electric power transmission consumption *(EPC)*, and armed personnel *(AFP)* are ₦1,908.9, ₦212, ₦265.7, ₦161.4, ₦98.0, ₦17.2, ₦247.2, 100.3kWh, and 0.3% respectively. The standard deviation is ₦463.5 for income growth *(INCg)*, ₦178.1 for defense spending *(DFS)*, ₦309.6 for general administration *(GAD)*, ₦209.7 for educational spending *(EDS)*, ₦133.6 for health expenditure *(HTS)*, ₦20.9 for transport and communication services *(TSS)*, ₦196.7 for internal security, 23.3kWh for electric power consumption *(EPC)*, and 0.02% for armed forces personnel *(AFP)*.

The maximum values are ₦2,679.6 for *INCg*, ₦693.9 for *DFS*, ₦992.2 for *GAD*, ₦702.9 for *EDS*, ₦437.5 for *HTS*, ₦90.0 for *TSS*, ₦770.2 for *INS*, 154.2kWh for *EPC* and 0.4% for *AFP*. The minimum values are ₦1,408.2 for *INCg*, ₦4.2 for *DFS*, ₦0.9 for *GAD*, ₦0.2 for *EDS*, ₦0.04 for *HTS*, ₦0.03 for *TSS*, ₦4.4 for *INS*, 51.1kWh for *EPC* and 0.24% for *AFP*.

Table 2: Descriptive Statistics of the Variables Used

Variables	*Obs*	*Mean*	*Std. Dev.*	*Max*	*Min*
INC_g	42	1908.9	463.5	2679.6	1408.2
DFS	42	212.0	178.1	693.9	4.2
GAD	42	265.7	309.6	992.2	0.9
EDS	42	161.4	209.7	702.9	0.2
HTS	42	98.0	133.6	437.5	0.04
TSS	42	17.2	20.9	90.0	0.03
INS	42	247.2	196.7	770.2	4.4
EPC	42	100.3	23.3	154.2	51.1
AFP	42	0.3	0.02	0.4	0.24

Note: Figures are in billions except EPC and AFP

Source: Author Computation, 2024

Stationarity Test

The time series properties of the data were examined using a unit root test. The unit root test was based on the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The results of ADF and PP tests in Table 3 indicate that all variables were I(1). This implies that all variables are integrated into order one. Given this situation, Vector Auto-regressive Analysis (VAR) or ARDL can be employed for the estimation, thus ARDL was chosen for the estimation. The Akaike Information Criterion gives the optimum lag length as 4.

Table 3: Unit Root Test Results

Variables	Levels	First Difference	Levels	First Difference	Decision
INC_g	-2.33	-2.19	-3.13	-3.99***	I(1)
DFS	-1.83	-3.53**	-1.93	-7.06*	I(1)
GAD	-1.11	-4.89*	-1.85	-11.03*	I(1)
EDS	-0.52	-5.29*	-2.69	-11.44*	I(1)
HTS	0.09	-3.99**	-3.35***	-14.70*	I(1)
TSS	-1.22	-5.51*	-2.19	-9.67*	I(1)
INS	-1.89	-3.18***	-1.83	-6.46*	I(1)
EPC	-2.35	-3.14***	-3.25***	-8.38*	I(1)
AFP	-3.02	-2.41	-3.44***	-8.72*	I(1)

*, ** and *** denote significance at 1%, 5% and 10% levels respectively.

Source: Author computation, 2023

Granger-Causality Test

The Granger-Causality results in Table 4 show the causal relationship among the variables. From the granger-causality result, there is the existence of a unidirectional causal relationship that runs from INCg to defense spending (DFS). This implies that income growth increases defense spending while the increase in defense spending does not generate income growth. The result also revealed a unidirectional causality moving from transport service and communication spending (TSS) to INCg (income growth), income growth to health expenditures, and electric power transmission and distribution expenditures to income growth. The causality test results also show a bi-directional causal nexus between income growth and educational expenditures EDS. Thus, both income growth and educational expenditures grow each other.

Table 4: Granger-Causality Tests between variables

Null Hypothesis:	Obs	F-Statistic	Prob.
DFS does not Granger Cause INCg	42	0.6032	0.5545
INCg does not Granger Cause DFS		0.2869	0.0752*
GAD does not Granger Cause INCg	42	0.79965	0.4607
INC_g does not Granger Cause GAD		0.61119	0.5506
EDS does not Granger Cause INCg	42	4.03972	0.0283*
INCg does not Granger Cause EDS		0.67725	0.5159
HTS does not Granger Cause INCg	42	0.43972	0.6483
INCg does not Granger Cause HTS		4.95489	0.0138*
TSS does not Granger Cause INCg	42	4.37497	0.0209*
INCg does not Granger Cause TSS		5.22997	0.0108*
INS does not Granger Cause INCg	42	6.54070	0.0044*
INCg does not Granger Cause INS		2.08192	0.1423
EPC does not Granger Cause INCg	42	4.03725	0.0273*
INCg does not Granger Cause EPC		1.50632	0.2370
TSS does not Granger Cause AFP	42	0.63071	0.5416
AFP does not Granger Cause TSS		1.17259	0.3282
HTS does not Granger Cause AFP	42	0.61807	0.5477
AFP does not Granger Cause HTS		0.19646	0.8230

Bound Test for Co-integration

The bound test result in Table 5 was conducted to check for the existence of co-integration. The computed F-statistic is greater than the critical upper bound values at the conventional significance levels, thus, the null hypothesis of no co-integration is rejected. Consequently, the variables are co-integrated, implying that a long-run relationship exists in the model.

Table 5: Bounds Test Results

Test Statistic	Value	Significance	Lower Bound	Upper Bound
			I(0)	I(1)
F-Statistics	6.906210	10%	1.85	2.85
K	8	5%	2.11	3.15
		2.5%	2.33	3.42
		1%	2.62	3.77

Source: Authors Computation

ARDL Results of Defense Spending and Income Growth in Nigeria

Table 6 shows the short-run and the long-run ARDL results of the effects of defense spending on income growth in Nigeria. The results show that defense spending has a growth effect on income in the short-run but an adverse effect on income growth in the long-run. Only the short-run result is significant at the 1% level. General administration spending improves income growth both in the short-run and the long run with both results significant at 1% and 10% levels respectively. Education spending promotes income growth in the short-run and the long-run, with only long-run results significant at the 5% level. Health spending increases income in the short-run and the long-run with the short-run result significant at a 5% level. Transport and communication services spending also have a positive effect on income in Nigeria in the short-run and the long-run. Both the short-run and the long-run results are significant at 10% and 5% levels respectively. Spending on internal security also improves income in the short-run and long-run with both results significant at 1% and 5% levels. Electric power consumption has a significant positive impact on income in the short-run and the long-run. Finally, the short-run and long-run results of armed force personnel reinforced the growth effect of internal security on income in Nigeria. Both results have growing effects on income in Nigeria. These results were corroborated by Olofin (2012) and Dunne and Vougas (1999) studies on military spending and economic growth in Nigeria and the developing economy.

The values of R^2 and adjusted-R^2 in the short-run are 0.97 and 0.92. This shows that the explanatory power is robust. The Durbin-Watson statistics show evidence of no serial correlation with a value of 2.8. The ECM dynamic result in the short-run was appropriately signed at a 1% significance level.

Table 6: Short-run and Long-run ARDL Estimate of the Effects of Defense Spending on Income Growth

Short-Run		**Long-Run**	
Variables	**Dependent Variable:** D(ININCG)	**Variables**	**Dependent Variable:** D(ININCG)
	Coefficients		**Coefficients**
D(ININCG(-1))	0.6554 (0.0900)*	ININCG(-1)	-0.6554 (0.1813)*
D(INDFS(-1))	-0.1412 (0.01483)*	INDFS(-1)	-0.0605 (0.0741)
D(INGAD(-1))	0.1604 (0.0141)*	INGAD(-1)	0.1604 (0.0743)***
D(INEDS)	0.0101 (0.0085)	INEDS(-1)	0.0655 (0.0249)**
D(INHTS(-2))	0.0129 (0.0039)**	INHTS(-1)	0.0058 (0.0204)
D(INTSS)	0.0152 (0.0067)***	INTSS(-1)	0.1062 (0.0412)**
D(ININS(-1))	0.1143 (0.0139)*	ININS	0.0990 (0.0350)**
D(INEPC)	0.1658 (0.0191)*	INEPC(-1)	0.3722 (0.0645)*
D(INAFP(-1))	0.4326 (0.0507)*	INAFP(-1)	0.4326 (0.1634)**
CointEq(-1)*	-0.2581 (0.0196)*	C	-0.0739 (0.6647)
Sum squared resid	0.0002		
Log likelihood	174.7606		
S.E. of regression	0.0044		
R-squared	0.9688		
Adjusted R-squared	0.9209		
Durbin-Watson stat	2.7502		
Mean dependent var	0.0058		
S.D. dependent var	0.0157		
Akaike info criterion	-7.7313		
Schwarz criterion	-6.7076		
Hannan-Quinn criter.	-7.3640		

*, **, *** Significant at 1%, 5% and 10% level

Standard Errors are in Parenthesis

The diagnostic tests in Table 7 for the robustness checks indicate that the model is without the problem of serial correlation and heteroscedasticity. More so, the model is correctly specified with normally distributed errors.

Table 7: Short-Run Diagnostics Tests of ARDL Model of Effects of Defense Spending on Income Growth

Test Statistics	LM Version	F Version
A: Serial Correlation	CHSQ(1) = 27.25450 (0.0000)	F(2,4) = 4.640839 (0.0907)
B: Functional Form	CHSQ(5) = 0.791260 (0.4647)	F(1, 5) = 0.626093 (0.4647)
C: Normality	CHSQ(1) = 5.1562 (0.0228)	NA
D: Heteroscedasticity	CHSQ(1) = 28.29806 (0.6545)	F(32, 6) = 0.495787 (0.9077)
A:Lagrange multiplier test of residual serial correlation B:Ramsey's RESET test using the square of the fitted values C:Based on a test of skewness and kurtosis of residuals D:Based on the regression of squared residuals on squared fitted values		

Figures 1 and 2 show the CUSUM test figures. The CUSUM test shows parameter instability if the cumulative sum goes outside the area between the two critical regions. From Figures 1 and 2, the cumulative sum lies between the 5% two critical bounding lines. The CUSUM test results indicate the stability of the model and parameters.

Figure 1: Parameter Stability Test- CUSUM test of ARDL Model

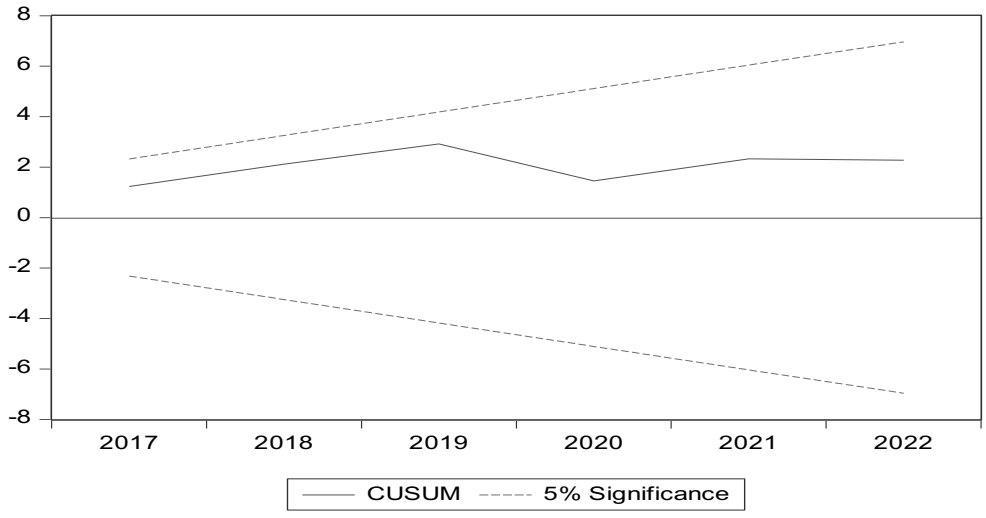
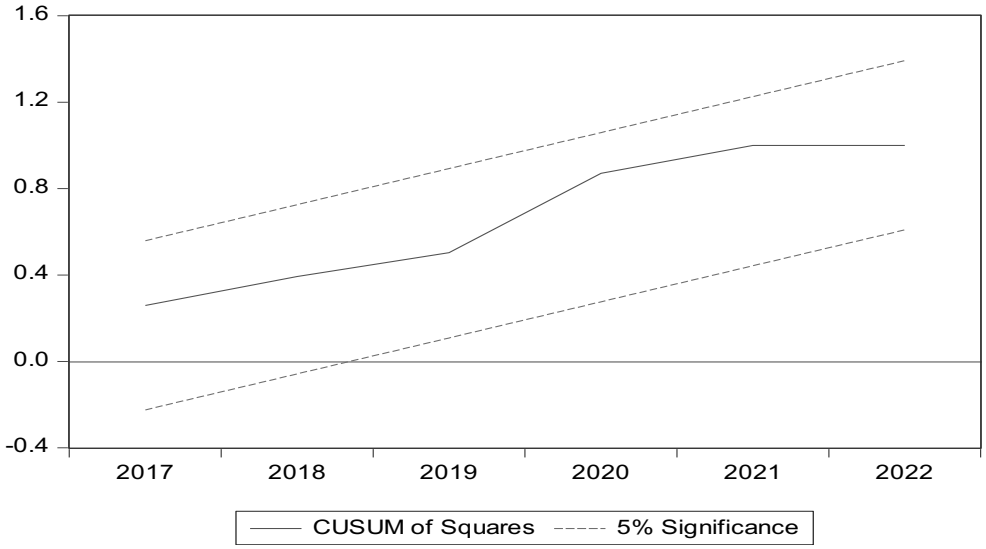


Figure 2: CUSUM Sum of Squares of ARDL Model



Conclusion

The performance of the Nigerian economy remained unsatisfactory for many years. There is still mass poverty in Nigeria despite the endowments of natural and human resources. This is due to the mismanagement of the revenue from the oil resources coupled with insecurity, insurgence, and religious, political, and social unrest since independence. This study examined the effects of defense spending on income growth in Nigeria. The results show that defense expenditure adversely affects income growth. The distinct contribution of this study is that, though defense spending adversely affects income growth maintenance of internal security and an appropriate proportion of armed personnel in the total labour force ensured income growth. Also, electricity power consumption, health expenditures, and educational spending grow income. Hence, redistribution of government spending in favour of social, economic and infrastructural facilities is indispensable to income growth. Therefore, the government should allocate more resources for the provision of socio-economic and infrastructural facilities in Nigeria.

Declarations

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest/Competing interests

There is no conflict of interest/Competing interests.

Availability of data and material

The data that support the findings of this study are openly available in the website of World
Bank (www.worldbank.org).

Code Availability

The computer program results are shared through the tables in the manuscript.

Authors' Contributions

Saheed Olayiwola: Conceptualization, Methodology, Software
Saheed Olayiwola: Data curation, Writing- Original draft preparation.
Saheed Olayiwola: Software, Validation.
Saheed Olayiwola and Ayodeji Oloruntuyi: Writing- Reviewing and Editing

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