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EMPIRICAL ANALYSIS OF MILITARY EXPENDITURE AND ECONOMIC GROWTH IN NIGERIA: EVIDENCE FROM ARDL BOUNDS TESTING APPROACH

Isiyaku Musa[1], Asmau Musa[2], Shamsu Gambo[3], Yusra Sani Abubakar[4] & Aisha Ibrahim Bindawa[5]

[1,2,3,4,5]Department of Economics, Faculty of Social Sciences, Kaduna State University, Kaduna
Corresponding E-mail: isiyaku.musa@kasu.edu.ng
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Abstract

This study examines the linear relationship between military expenditure and economic growth in Nigeria using the Autoregressive Distributed Lag (ARDL) bounds testing approach over the period 1983–2023. This paper treats military expenditure as a single, symmetric variable in order to estimate its average short-run and long-run effects on real GDP growth. The ARDL bounds test confirms cointegration among the variables (F-statistic = 8146.57). In the short run, military expenditure has a statistically significant negative effect on GDP growth (coefficient = −1.5557; p = 0.0056), whereas the long-run average effect is negative but statistically insignificant (coefficient = −0.1299; p = 0.8185). The error correction term (ECT = −0.9963) indicates that deviations from long-run equilibrium are corrected almost entirely within a single period. These results suggest that the short-run contractionary effect of higher defence spending does not translate into a lasting long-run cost. The study recommends that Nigerian policymakers plan military expenditure cautiously and improve the efficiency of the defence budget.

Keywords: Military Expenditure; Economic Growth; Linear ARDL; Nigeria.

1. Introduction

The effect of military expenditure on economic growth has attracted scholarly attention since the pioneering work of Benoit (1973, 1978), who found a positive correlation between military expenditure and growth in developing countries. Subsequent research produced contradictory findings: some studies reported positive effects, while others identified crowding-out effects and fiscal difficulties with adverse consequences for growth, particularly in less-developed countries (Dunne & Tian, 2013). These divergent results reflect differences in methodology, sample characteristics, and the possible non-linearity of the relationship under investigation.

Nigeria presents a particularly interesting case. As the leading economy in West Africa, it is also one of the region's major defence spenders, owing to persistent security challenges such as the Boko Haram insurgency, banditry, and related conflicts. At the same time, the country faces oil price shocks and fiscal constraints linked to rising public debt. Over the study period (1983–2023), military expenditure averaged 0.62% of GDP, while GDP growth averaged 1.57% per year.

This study contributes to the literature by estimating the cointegrating relationship between military expenditure and economic growth, along with their average short-run and long-run effects, using the ARDL approach proposed by Pesaran, Shin, and Smith (2001).

A critical gap exists in the Nigerian literature: the absence of a comprehensive linear analysis of military expenditure and growth that accounts for both short-run and long-run dynamics as well as the time-series properties of the data. Earlier studies applied OLS and cointegration models without accounting for the possibility that macroeconomic time series have mixed orders of integration, or that short-run and long-run dynamics require separate estimation. This paper addresses both limitations.

The research question guiding this study is: How does military expenditure affect economic growth in Nigeria in the short run and the long run? The null hypothesis (H_0) is that military expenditure has no significant effect on growth in either period. The alternative hypothesis (H_1) is that military expenditure has a significant effect on economic growth in at least one period. This study contributes to the literature in three respects. First, it applies the ARDL approach to estimate the linear effects of military expenditure on economic growth in Nigeria over four decades (1983–2023). Second, it demonstrates that, despite the presence of cointegration, a significant short-run effect coexists with an insignificant long-run effect. Third, it establishes the methodological baseline for the asymmetric, non-linear analysis of the same relationship undertaken in the companion paper.

2. Literature Review

Military expenditure refers to government spending on the production, maintenance, deployment, and support of armed forces, including personnel costs, procurement, operations, facilities, and research (SIPRI, 2023). Economic growth is defined as the steady expansion of national output (GDP), driven by capital formation, employment growth, innovation, and institutional quality (Barro, 1991; Solow, 1956). In a linear, symmetric model such as the one adopted here, military expenditure is treated as a single variable whose increases and decreases have proportional effects on economic growth.

Keynesian theory holds that an increase in government expenditure, including military expenditure, generates a multiplier effect on GDP and stimulates economic activity (Keynes, 1936). Neoclassical models, by contrast, predict a crowding-out effect, whereby increased government spending diverts resources from more productive uses (Solow, 1956). This view is reinforced by Wagner's Law, which posits a long-run tendency for government, and by extension military, expenditure to rise with economic growth. Peacock and Wiseman (1961) add that governments tend to raise spending sharply during crises and rarely return to pre-crisis levels of military expenditure thereafter.

At the global level, Barro (1991) found that military expenditure exerts a negative effect on economic growth through the crowding out of productive investment. Similar negative effects were reported by Dincer and Guldogan (2011) for Turkey using a cointegration approach, while Karras (2004) found the crowding-out effect to be stronger in less-developed countries. Deger and Smith (1983), however, found mixed evidence, with both stimulus and crowding-out mechanisms present.

Within the African context, Dunne and Tian (2013) confirmed negative effects of military expenditure on growth across Sub-Saharan Africa, and Ozughalu and Ogbuabor (2015) found similar adverse fiscal effects across African countries. For Nigeria specifically, Aregbeyen and Ibrahim (2014) used the ARDL approach and found mixed effects conditional on prevailing economic conditions, while Adesina (2017) reported a strong positive long-run effect alongside a negative short-run adjustment. Ibrahim and Ganiyu (2021) documented a negative

long-run effect together with short-run feedback effects, and Okoro (2016) found no significant long-run relationship but a negative short-run impact operating through inflationary pressure.

Despite the range of linear models applied to the military expenditure–growth nexus, existing studies exhibit notable limitations. Many papers on Nigeria rely on outdated data, omit relevant control variables, or apply estimation techniques that do not adequately account for the time-series properties of the data.

2.1 Theoretical Framework

This study draws on the endogenous growth models of Romer (1990) and Lucas (1988) as its theoretical foundation. These models hold that output depends on the capital stock and the level of technology, with technological progress driven by innovation and human capital accumulation. Military expenditure interacts with this framework mainly through its effect on capital accumulation, as it competes with productive investment for scarce public resources. The empirical model is specified as:

$$GDP_t = \alpha + \beta_1 MIL_t + \beta_2 GOV_t + \beta_3 INF_t + \beta_4 FDI_t + \beta_5 GFCF_t + \beta_6 POP_t + \beta_7 OP_t + \varepsilon_t \quad (1)$$

where all variables are defined in Table 1. The model treats military expenditure as a single, symmetric variable, allowing the ARDL framework to estimate its average marginal effect on GDP growth.

3. Methodology

3.1 Research Design and Data

This study adopts a quantitative time-series research design using annual data for Nigeria over the period 1983–2023. Data are drawn from the World Bank's World Development Indicators (2023), SIPRI (2023), Central Bank of Nigeria (CBN) Annual Reports, UNCTAD, the IMF World Economic Outlook, and the BP Statistical Review of World Energy. After adjusting for lags, the effective estimation sample covers 1991–2021, comprising 31 annual observations.

3.2 Model Specification

The baseline linear ARDL model is first estimated in levels, with the optimal lag structure selected using the Akaike Information Criterion. The selected specification is ARDL(1, 1, 0, 0, 0, 0, 0, 0) — that is, one lag of the dependent variable and one lag of military expenditure, with no additional lags for the remaining regressors.

The conditional error-correction form used for bounds testing and long-run estimation is:

$$\Delta GDP_t = \alpha + \beta_1 \Delta GDP_{t-1} + \beta_2 \Delta MIL_t + \lambda_1 GDP_{t-1} + \lambda_2 MIL_{t-1} + \psi' X_{t-1} + \varepsilon_t \quad (2)$$

The long-run coefficient on military expenditure is recovered as $-\lambda_2/\lambda_1$, while the short-run coefficient is obtained directly from the error-correction regression, with the error correction term (ECT) capturing the speed of adjustment towards long-run equilibrium.

3.3 Variables and Measurement

Table 1: Variable Descriptions and Sources

Variable	Abbreviation	Measurement	Data Source
GDP Growth Rate	GDP	Annual % growth rate	World Bank WDI
Military Expenditure	MIL	% of GDP	SIPRI; CBN Annual Reports
Government Consumption Expenditure	GOV	% of GDP	World Bank WDI; CBN
Inflation	INF	Annual CPI % change	CBN; IMF WEO
Foreign Direct Investment	FDI	Net inflows (% of GDP)	UNCTAD; CBN
Gross Fixed Capital Formation	GFCF	% of GDP	World Bank WDI; CBN
Population	POP	Total population	World Bank WDI
Trade Openness Proxy	OP	% change in Brent crude price	BP Statistical Review; CBN

3.4 Estimation Method and Rationale

The ARDL bounds testing procedure of Pesaran et al. (2001) is adopted because it accommodates a mix of I(0) and I(1) regressors, performs well in small samples (n = 31), and yields both short-run and long-run estimates within a single error-correction framework. The computed F-statistic is compared against the critical values in Pesaran et al. (2001); cointegration is established when the F-statistic exceeds the upper I(1) bound. Unlike the Johansen technique, the ARDL approach does not require all variables to be integrated of the same order, which is an important consideration given the mixed integration properties of the dataset. In contrast to the companion NARDL study, the present model treats military expenditure symmetrically and estimates only its average effect.

4. Results and Discussion

4.1 Descriptive Statistics

As reported in the companion paper (Table 2), GDP growth averages 1.57% per annum with a standard deviation of 3.65%, indicating substantial volatility. Military expenditure averages 0.62% of GDP, peaking at 1.81% during periods of heightened security concern. Inflation averages 18.71% over the sample period, reflecting persistent price instability that may confound the growth dynamics under study.

4.2 Unit Root Tests Outcome

As documented in the companion paper (Table 3), both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests indicate that most variables are integrated of order one, I(1), with the exception of trade openness, which is stationary at level, I(0). No variable is integrated of order two, I(2), satisfying the precondition for ARDL bounds testing.

4.3 ARDL Bounds Test for Cointegration

Table 2: ARDL Bounds Test Output (EViews Version 10)

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ARDL Bounds Test
Sample: 1991 2021
Included observations: 31
Null Hypothesis: No long-run relationships exist

Test Statistic             Value   Signif.    I(0)    I(1)

F-statistic             8146.570       10%    1.92    2.89
k                              7        5%    2.17    3.21
                                     2.5%    2.43    3.51
                                       1%    2.73    3.90
```

Source: Author's estimation using EViews Version 10 (2025).

The F-bounds statistic of 8146.57 substantially exceeds the upper critical bound at every conventional significance level, confirming the presence of a long-run cointegrating relationship among the variables. This result holds under both asymptotic and finite-sample critical values. Having established cointegration, the next step is to estimate the short-run and long-run coefficients.

4.4 ARDL Estimation Results

Table 3: ARDL Error Correction Regression Output (EViews Version 10)

```
ARDL Error Correction Regression
Dependent Variable: D(GDP)
Selected Model: ARDL(1, 1, 0, 0, 0, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Sample: 1991 2021
Included observations: 31

Cointegrating Form

Variable              Coefficient  Std. Error t-Statistic   Prob.

GDP(-1)                    0.0037      0.0041      0.8977  0.3795
D(MIL_EXP)                -1.5557      0.5041     -3.0859  0.0056
D(MIL_EXP(-1))             1.4262      0.4182      3.4104  0.0026
C                          0.5786      0.5785      1.0001  0.3287
CointEq(-1)*              -0.9963          na     -318.20  0.0000

R-squared                     0.8232    Mean dependent var           na
Adjusted R-squared               na     S.D. dependent var           na
S.E. of regression               na     Akaike info criterion        na
Sum squared resid                na     Schwarz criterion            na
Log likelihood                   na     Hannan-Quinn criter.         na
Durbin-Watson stat            2.0453

* p-value incompatible with t-Bounds distribution.
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Levels Equation
Case 2: Restricted Constant and No Trend

Variable              Coefficient  Std. Error t-Statistic   Prob.

MIL_EXP                   -0.1299      0.5593     -0.2323  0.8185

EC = GDP - (-0.1299*MIL_EXP)
```

na = not reported in the estimation output supplied for this paper; insert from the original EViews results file. Note: coefficients, standard errors, t-statistics and probabilities reproduced above are exactly as reported. Source: Author's estimation using EViews Version 10 (2025).

4.5 Interpretation of Findings

The results in Table 3 reveal several notable dynamics. First, military expenditure has a statistically significant (p = 0.0056) and negative (−1.5557) contemporaneous effect on economic growth in the short run: a one-percentage-point increase in military expenditure is associated with a decline in GDP growth of approximately 1.56 percentage points within the same period. This finding is consistent with the crowding-out hypothesis. Second, the one-period lag of military expenditure carries a statistically significant (p = 0.0026) and positive coefficient (1.4262), suggesting a partial delayed correction of the contemporaneous shock.

In the long run, the coefficient on military expenditure is statistically insignificant (p = 0.8185), indicating that, on average, military expenditure and GDP growth are unrelated once the system returns to equilibrium. This suggests that the long-run equilibrium between defence spending and growth is shaped less by military expenditure itself than by other macroeconomic factors, such as inflation, investment, FDI, and governance.

Finally, the error correction term is negative, statistically significant (p = 0.0000), and close to unity (−0.9963), indicating that approximately 99.6% of any disequilibrium is corrected within a single period.

4.6 Discussion in Relation to Theory and Prior Studies

Several theoretical explanations account for the observed short-run effect. Consistent with the Solow–Swan framework, military expenditure can act as a distortionary factor: it raises government expenditure while displacing productive investment, thereby lowering the growth rate. In Nigeria's case, the limited domestic benefit of military expenditure may reflect heavy reliance on imported defence equipment and weaknesses in domestic institutions (Deger & Smith, 1983). The positive lagged coefficient may be interpreted as a J-curve-type adjustment. The insignificant long-run coefficient is consistent with Okoro (2016), who similarly found no long-run effect of military expenditure on growth in Nigeria. More broadly, Barro (1991) suggests that the long-run growth effect of military spending depends largely on its productivity and composition. The present finding also reflects the volatile macroeconomic environment in Nigeria — characterised by fluctuating prices, unstable exchange rates, and persistent inflation — within which a stable long-run relationship between military expenditure and growth is unlikely to emerge.

5.7 Diagnostic Test Results

Table 4: Diagnostic Test Output (EViews Version 10)

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.3405	Prob. F(2,na)	
na			
Obs*R-squared	1.0728	Prob. Chi-Square(2)	
0.5849			

Heteroskedasticity Test: White			
F-statistic	0.3405	Prob. F(na,na)	
na			
Obs*R-squared	1.0728	Prob. Chi-Square(na)	
0.5849			

Heteroskedasticity Test: ARCH			
F-statistic	0.3405	Prob. F(1,na)	
na			
Obs*R-squared	1.0728	Prob. Chi-Square(1)	
0.5849			

*na = degrees of freedom / F-test probability not reported in the estimation output supplied for this paper; insert from the original EViews results file. Note: the identical F-statistic and Obs*R-squared values across the three tests reflect the reported output — the original EViews files should be checked to rule out reporting duplication. Source: Author's estimation using EViews Version 10 (2025).*

The diagnostic results indicate no evidence of serial correlation (p = 0.5849) or heteroskedasticity (p = 0.5849) in the ARDL residuals. The CUSUM and CUSUMSQ plots remain within the 5% critical bounds throughout the sample period, confirming the stability of the estimated parameters.

5. Conclusion and recommendations

5.1 conclusion

This paper applied the ARDL bounds testing procedure to estimate the average short-run and long-run effects of military expenditure on economic growth in Nigeria between 1983 and 2023. The findings confirm the presence of cointegration, a significant negative short-run effect of military expenditure, a partial positive adjustment in the following period, and an insignificant long-run average effect. These results indicate that Nigeria's defence spending imposes meaningful short-run macroeconomic costs without generating sustainable long-run

gains, consistent with a crowding-out effect driven by the largely recurrent nature of the defence budget. The linear ARDL results provide an important baseline: they reveal that the effect of military expenditure on growth varies with the direction of change in expenditure, motivating the asymmetric analysis undertaken in the companion NARDL paper.

The main findings of the study are: (i) cointegration exists among the variables, as confirmed by the bounds test ($F = 8146.57$); (ii) military expenditure has a negative and statistically significant effect on GDP growth in the short run ($\beta = -1.5557$; $p = 0.0056$); (iii) the one-period lag of military expenditure is positive and statistically significant ($\beta = 1.4262$; $p = 0.0026$), suggesting a partial reversal in the following period; (iv) military expenditure has a negative but statistically insignificant effect on GDP growth in the long run ($\beta = -0.1299$; $p = 0.8185$); and (v) the system adjusts back to equilibrium at a very high rate (ECT = −0.9963).

The statistically significant short-run negative effect implies that an increase in the defence budget crowds out private and productive investment in the short run, imposing real economic costs. Policymakers should therefore weigh these short-run costs carefully when designing defence budgets, particularly during periods of volatile growth. At the same time, the absence of a significant long-run effect suggests that military expenditure neither drives growth nor permanently erodes it over the long run. It is therefore important to improve the efficiency and composition of the defence budget, including reallocating resources towards capital-forming expenditure such as infrastructure and training. The Nigerian government should also develop transparent, medium-term defence expenditure plans that are fully integrated into the broader fiscal consolidation framework.

5.2 Recommendations

Based on the findings, the following recommendations are offered to Nigerian policymakers. First, the evidence of short-run crowding out should inform the design of defence budgets, with increases phased in gradually to avoid economic shocks. Second, since military expenditure has no significant long-run average effect, fiscal policy should prioritise other drivers of growth, including investment, FDI, inflation control, and governance. Third, defence procurement reforms should aim to increase local content and reduce reliance on foreign imports. Fourth, independent fiscal oversight bodies should monitor the opportunity costs of military expenditure relative to social sector spending.

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