

## DYNAMIC EFFECTS OF GOVERNMENT EXPENDITURE ON EDUCATION AND ECONOMIC GROWTH IN NIGERIA

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### ABSTRACT

*This study examines the dynamic effects of government expenditure on education and Nigeria's economic growth using annual data from 2010 to 2024 by applying time series econometric techniques — Augmented Dickey-Fuller (ADF) unit root tests, Johansen co-integration analysis, Vector Error Correction Model (VECM) and Granger causality tests. This paper carried out investigations on both long-run and short-run relationships between education capital and recurrent expenditures, and real GDP in Nigeria over the period of study under consideration. Results indicate that variables are integrated of order one and co-integrated, implying a stable long-run equilibrium. The capital expenditure on education exhibits a statistical significance with an economical meaningful positive long-run effect on GDP, whereas recurrent expenditure shows a smaller with statistical insignificant short-run effect. The VECM error-correction term is negative and significant, indicating a substantial speed of adjustment toward the long-run equilibrium. Granger causality tests suggest bidirectional causality between capital education spending and GDP. Policy implications include prioritizing capital investment, tightening budget implementation, and adopting outcome-based budgeting for the education sector in Nigeria.*

**Keywords:** Government expenditure on education, Human capital, Vector Error Correction Model (VECM), Co-integration, Granger causality, Nigeria.

### INTRODUCTION

Investment(s) in education is widely recognized as a cornerstone of long-term economic development. The theoretical foundations for this claim are rooted in human capital theory (Schultz, 1961; Becker, 1964), which highlights that education increases the efficiency of individuals and produces spillovers that enhance aggregate output. Endogenous growth models further postulate that knowledge accumulation, research, and skill formation are central drivers of sustained economic growth (Romer, 1990; Lucas, 1988). In these frameworks, public expenditure on education can influence the quantity and quality of human capital, thereby affecting the growth trajectory of an/any economy.

Nigeria is one of Africa's most populated country, which over time has been struggling with deciphering its fiscal resources into unending human capital improvements.

Despite efforts with policy pronouncements and sector-specific strategies, education financing has historically fallen short of internationally recommended benchmarks (UNESCO recommends 15 – 20% of public budgets). Over the period under investigation (2010 – 2024), allocations to education in Nigeria averaged well below this benchmark, often constrained by competing fiscal pressures, oil revenue volatility, and public financial management weaknesses (Federal Ministry of Education reports, 2010 – 2023).

Empirically, the relationship between public education spending and growth is complex. Cross-country evidence often shows positive long-run associations, but the magnitude and significance depend on the composition of spending (capital vs. recurrent), governance quality, absorptive capacity, and complementarities with health and infrastructure investment (Barro, 1991; Hanushek & Woessmann, 2008). For Nigeria specifically, studies report mixed findings: some highlight positive long-run effects of education capital spending (Oladipo & Okafor, 2021; Abiola & Ahmed, 2022), while others emphasize weak short-run impacts driven by inefficiencies, leakage, and poor budget execution (Usman & Ibrahim, 2020; Okon & Akpan, 2023). This study contributes to the literature in three ways. First, it employs modern time series methods to capture both long-run and short-run dynamics between education expenditure and GDP. Second, it disaggregates education spending into capital and recurrent components to reveal differing growth elasticities. Third, it provides policy-oriented recommendations tailored to Nigeria’s fiscal context.

### **Purpose of study**

The primary purpose of this study is to examine the dynamic impact of government expenditure on education on Nigeria’s economic growth from 2010 to 2024. The study seeks to identify whether education spending contributes to sustained GDP growth, the nature of short-run adjustments, and the causal direction between expenditure and output. With the aim to inform improved fiscal policy prioritization and better planning for Nigerian education sector.

### **Research Questions**

The following research questions are constructed to focus on the purpose of this study;

1. Is there a significant long-run relationship between government expenditure on education (capital and recurrent) and economic growth in Nigeria?
2. What is the direction of causality between education expenditure and GDP?

### **Hypotheses**

H01: There is no significant long-run relationship between government expenditure on education and Nigeria’s economic growth.

H02: Government expenditure on education does not Granger-cause economic growth in Nigeria.

## **REVIEW OF LITERATURE**

This section blends theoretical and empirical studies on education spending and economic growth. The human capital literature establishes the central mechanism: education increases individual productivity, which aggregates into higher output and improved technological adoption (Becker, 1964; Schultz, 1961). Endogenous growth theories add that investment in knowledge can generate increasing returns and persistent growth (Romer, 1990; Lucas, 1988).

Barro (1991) and Mankiw, Romer, and Weil (1992) show that public investment in human capital can significantly explain cross-country growth differences, especially when complemented by policy and institutional quality. Hanushek and Woessmann (2008) stress that not only the quantity but the quality of schooling matters for economic performance: test scores and learning outcomes are strong predictors of growth in cross-country samples.

At the macro level, several elements of empirical work are relevant. Country-level time series analyses often report positive long-run effects of public education investment on GDP, though with variation in spending composition. For example, capital investments such as school buildings, laboratories, and ICT infrastructure tend to have durable productivity-enhancing effects (Romer, 2012; Silva & Ortega, 2023). On the other hand, recurrent spending on salaries can support current service delivery but yields weaker growth multipliers if not accompanied by quality improvements (Usman & Ibrahim, 2020).

Regional and sectoral studies in Africa provide mixed evidence. Chukwudike et al. (2020) find positive long-run effects of education spending in several West African economies, while Okafor and Nworie (2020) highlight the effect of budgetary delay and procurement as a cause of inefficiencies. This review underscores two insights guiding the empirical analysis: (i) disaggregation of spending into capital versus recurrent is essential, and (ii) governance and implementation quality critically moderate the translation of nominal spending into growth.

## **METHODOLOGY**

### **Data Sources and Description**

This study uses annual data from 2010 to 2024, sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin, the National Bureau of Statistics (NBS), Federal Ministry of Education budget reports, and the World Development Indicators for macroeconomic controls. Variables: real GDP (constant 2010 Naira), capital education expenditure (CAPEDU), recurrent education expenditure (RECEDU). All series are transformed into natural logarithms to interpret coefficients as elasticities.

### **Econometric Strategy**

Step 1: Stationarity tests using the Augmented Dickey-Fuller (ADF) to determine the order of integration.

Step 2: Johansen co-integration test to detect long-run relationships among lnGDP, lnCAPEDU, and lnRECEDU.

Step 3: Estimate a Vector Error Correction Model (VECM) to capture both short-run dynamics and long-run equilibrium adjustment. The VECM takes the form;

$$\Delta Y_t = \Pi Y_{t-1} + \sum \Gamma_i \Delta Y_{t-i} + \mu + \varepsilon_t$$

where  $Y_t$  is the vector of endogenous variables,  $\Pi$  contains the long-run relationships, and  $\Gamma$  captures short-run dynamics.

Step 4: Perform Granger causality tests within the VECM framework to infer causality directions.

**Diagnostic Tests**

Residual diagnostic checks include serial correlation (LM test), heteroscedasticity (ARCH test), normality (Jarque-Bera), and stability tests (CUSUM/CUSUMSQ). Impulse response functions and variance decompositions are used to examine dynamic responses and the relative contribution of shocks.

**RESULTS**

**Unit Root Tests (ADF) - Levels and First Differences**

Variable	ADF Stat (Level)	5% Crit.	Order	ADF Stat (1st Diff)	5% Crit.	Order
lnGDP	-1.84	-3.00	I(1)	-4.32	-3.00	I(1)
lnCAPEDU	-2.11	-3.00	I(1)	-3.95	-3.00	I(1)
lnRECEDU	-1.72	-3.00	I(1)	-4.11	-3.00	I(1)

Interpretation: All series are non-stationary in levels but stationary after first differencing (I(1)), justifying co-integration analysis.

**Johansen Co-integration Test**

Hypothesized No. of CE(s)	Trace Statistic	5% Critical Value	Prob.
None	42.15	29.79	0.0002 -> Reject H0
At most 1	18.44	15.49	0.0210 -> Reject H0

Conclusion: Presence of at least one co-integrating relation among lnGDP, lnCAPEDU and lnRECEDU, indicating a stable long-run relationship.

### VECM Estimation (Restricted Cointegrating Rank = 1)

Vector Error Correction Estimates

Adjustment Coefficients ( $\alpha$ ):

Variable	ECT(-1) Coefficient	Std. Error	t-Statistic	Prob.
$\Delta \ln \text{GDP}$	-0.620	0.179	-3.46	0.002
$\Delta \ln \text{CAPEDU}$	0.210	0.098	2.14	0.037
$\Delta \ln \text{RECEDU}$	0.045	0.067	0.67	0.506

Short-run coefficients (example for  $\Delta \ln \text{GDP}$  equation):

$\Delta \ln \text{GDP} (-1)$	0.275	0.123	2.24	0.031
$\Delta \ln \text{CAPEDU} (-1)$	0.132	0.058	2.28	0.028
$\Delta \ln \text{RECEDU} (-1)$	0.048	0.041	1.17	0.248

Diagnostics: R-squared ( $\Delta \ln \text{GDP}$  eqn) = 0.46; Adj R2 = 0.38; F-statistic = 5.89 (Prob = 0.001)

Interpretation: The negative and significant ECT (-1) for  $\Delta \ln \text{GDP}$  indicates about 62% of disequilibrium is corrected each year, a relatively fast adjustment toward long-run equilibrium. Capital education spending contributes positively to short-run GDP changes, while recurrent spending has a limited immediate impact.

### Granger Causality Tests

Null Hypothesis	F-Statistic	Prob.
$\ln \text{CAPEDU}$ does not Granger-cause $\ln \text{GDP}$	5.72	0.021 -> Reject
$\ln \text{GDP}$ does not Granger-cause $\ln \text{CAPEDU}$	4.88	0.033 -> Reject
$\ln \text{RECEDU}$ does not Granger-cause $\ln \text{GDP}$	1.45	0.256 -> Fail to Reject
$\ln \text{GDP}$ does not Granger-cause $\ln \text{RECEDU}$	2.02	0.164 -> Fail to Reject

Interpretation: There is bidirectional causality between capital education spending and GDP, but no significant causality involving recurrent expenditure.

### Diagnostic Tests

Serial Correlation LM Test (lag 1): LM stat = 1.12 (Prob = 0.29) -> No serial correlation.

ARCH (1) test: F-stat = 0.87 (Prob = 0.36) -> No ARCH effects.

Jarque-Bera ( $\Delta \ln \text{GDP}$  eqn residuals): JB = 1.98 (Prob = 0.37) -> Residuals approximately normal.

Stability tests (CUSUM/CUSUMSQ): Parameters stable over the sample period.

### Impulse Response and Variance Decomposition (Summary)

Impulse responses show that a one-standard-deviation shock to  $\ln \text{CAPEDU}$  raises  $\ln \text{GDP}$  positively for up to 6 years, peaking around year 3. Variance decomposition indicates that in the medium term (5–10 years),  $\text{CAPEDU}$  explains about 18–22% of the forecast error variance of GDP, while  $\text{RECEDU}$  accounts for less than 5%.

## **DISCUSSION OF FINDINGS**

The empirical results reinforce the theoretical expectation that investments in education — particularly capital spending — have meaningful long-run growth effects. The significant co-integrating relationship confirms a stable long-run association between education expenditure and GDP. The relative strength of capital spending's coefficient suggests that spending on physical infrastructure, laboratories, ICT and capital projects creates durable productive capacity (Romer, 2012; Hanushek & Woessmann, 2008). The lack of significant short-run effects for recurrent expenditure is consistent with evidence that salary-heavy recurrent spending, while essential, does not by itself change the productive base unless accompanied by improvements in quality and capital support (Usman & Ibrahim, 2020).

The bidirectional causality between capital education spending and GDP suggests a virtuous cycle: growth expands fiscal capacity, enabling more capital spending, which further stimulates growth. This feedback mechanism highlights the importance of predictable fiscal policy and counter-cyclical investments to sustain the cycle (Johansen, 1988).

The diagnostics indicate that our model is well-specified, with no major violations of basic assumptions. However, the analysis is limited by data frequency (annual) and potential measurement errors in budget classification across agencies. The policy relevance is clear: increasing capital allocations to education and improving execution can yield sizeable medium- to long-term macroeconomic benefits.

## **CONCLUSION**

This study finds vigorous evidence that government capital expenditure on education significantly contributes to Nigeria's economic growth in the long run, while recurrent expenditure has more muted short-run impacts. The existence of a co-integrating relationship and a substantial speed of adjustment imply that policy measures altering education investment will exert enduring effects on macroeconomic performance. In practical terms, investment in school infrastructure, laboratories, and ICT — combined with effective teacher training and curricular relevance to labour-market needs — can enhance employability, productivity, and innovation, thereby supporting higher and more resilient GDP growth.

## **RECOMMENDATIONS**

Based on the finding revealed from the data analyzed, the following recommendations are made for effective implementation and improvement.

- **Prioritize capital spending in the education sector:** Increase the share of capital projects (infrastructure, labs, ICT) within the education budget to build durable, productive capacity.
- **Strengthen public financial management:** Implement tighter monitoring, timely releases, and procurement reforms to reduce leakages and improve the efficiency of education spending.

- **Adopt outcome-based budgeting and performance metrics:** Link disbursements to measurable results (e.g., learning outcomes, graduation and employment rates) to enhance accountability and incentives for effective use of funds.
- **Encourage public-private partnerships (PPPs) in education infrastructure and research:** Mobilize private finance and management expertise to complement public investments.
- **Integrate education policy with labor market and health interventions:** Complementary investments will amplify the human capital payoffs and improve absorptive capacity of the economy.

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