

The Relationship Between Governments' Budgetary Allocations to Education and Educational Outcomes in Nigeria: An ARDL Approach

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Abstract- *This study examined the relationship between government budgetary allocation to education and education outcomes in Nigeria from 1990 to 2024. The study employed the Autoregressive Distributed Lag (ARDL) technique to examine both the short-run and long-run relationships among education outcomes, government education expenditure, GDP per capita, population growth and inflation. The Augmented Dickey-Fuller test established that the variables were integrated at mixed orders of $I(0)$ and $I(1)$, providing justification for the ARDL approach. The bounds test produced an F-statistic of 4.778, which exceeded the 5% upper-bound critical value, confirming the existence of a long-run relationship among the variables. The long-run results showed that government education expenditure had a positive but statistically insignificant relationship with education outcomes. In the short run, population growth had a positive and statistically significant effect. The error-correction coefficient was negative and statistically significant at -0.931, indicating rapid adjustment towards long-run equilibrium, with approximately 93.1% of disequilibrium corrected within one year. The study concludes that increasing education expenditure alone may not guarantee improved educational outcomes and recommends greater emphasis on efficient allocation, implementation, monitoring and accountability of education resources.*

Keywords: *government expenditure; education outcomes; education financing; ARDL; nigeria; population growth; education policy.*

I. INTRODUCTION

Education is universally acknowledged as a foundational driver of national development, human capital formation, and long-term economic growth. Governments worldwide deploy fiscal policy through budgetary allocations to build robust educational infrastructures, enhance teacher capacity, and ensure

equitable access to quality learning. Within developing economies, the magnitude of public expenditure channeled into the education sector is frequently treated as a primary indicator of political commitment to sustainable prosperity. However, the efficiency with which these financial inputs translate into tangible human development remains a critical area of empirical inquiry, particularly in sub-Saharan Africa where resource constraints intersect with soaring demographic pressures (Businessday NG, 2025).

In Nigeria, the relationship between government financing and educational advancement has historically been a subject of intense policy debate and academic scrutiny. Despite successive national administrations pledging commitments to human capital development, Nigeria's budgetary allocations to education have persistently fallen short of internationally recommended benchmarks. While global frameworks such as the UNESCO threshold advocate for allocating 15% to 20% of public expenditure or 4% to 6% of Gross Domestic Product (GDP) to education, Nigeria's aggregate federal and state allocations have traditionally hovered below these targets, often oscillating around 5% to 8% of national budgets (Businessday NG, 2026). This chronic under-allocation is frequently cited by policymakers as the root cause of systemic deficits within the country's schooling system.

Nevertheless, recent fiscal trends reveal a fascinating paradox: nominal government spending on education has expanded significantly, yet foundational learning outcomes remain deeply depressed. Federal budgetary allocations expanded exponentially, jumping from approximately N1.54 trillion to over

N3.52 trillion, alongside parallel increases in state-level budgets (The State House Abuja, 2025). Despite this nominal expansion in funding, national assessments indicate that less than 30% of primary school pupils achieve minimum literacy and numeracy benchmarks, millions of children remain out of school, and school infrastructure across basic and secondary levels remains dilapidated (Businessday NG, 2026).

However, the persistent disconnect points to a structural failure extending far beyond mere budgetary scarcity. Studies argued that Nigeria's education crisis is compounded by severe inefficiencies in budget execution, heavy recurrent expenditure skew (where personnel costs absorb vast proportions of allocations), weak institutional accountability, and poor capital project implementation (Businessday NG, 2025). When budgetary increases fail to produce proportional improvements in student performance, graduation rates, or institutional capacity, fiscal expansion ceases to be an effective driver of development, highlighting a structural disconnect between financial inputs and educational value extraction. It is on this premise that this study tends to investigate the relationship between governments' budgetary allocations to education and educational outcomes in Nigeria using an ARDL approach.

Research Questions

- i. What is the trend of government budgetary allocation to education in Nigeria?
- ii. What is the relationship between government budgetary allocation to education and education outcomes in Nigeria?

Objectives of the Study

The main objective is to examine the relationship between government budgetary allocation to education and education outcomes in Nigeria.

Specifically, the study seeks to:

- i. examine the trend of government budgetary allocation to education in Nigeria;

- ii. examine the relationship between government budgetary allocation to education and education outcomes; and

Research Hypothesis

The null hypothesis for the study was tested at 5% level of significant:

H0: Government budgetary allocation to education has no significant relationship with education outcomes in Nigeria.

H1: Government budgetary allocation to education has a significant relationship with education outcomes in Nigeria.

II. LITERATURE REVIEW

Conceptual Review

Concept of Government Budgetary Allocation

Government budgetary allocation refers to the systematic process through which public financial resources are distributed among various sectors, ministries, departments, and agencies to achieve targeted socio-economic objectives (Ohaegbulem & Chijioke, 2023). It functions as a primary fiscal policy instrument that mirrors a government's economic priorities, political commitments, and developmental agenda. Structurally, public budgets are bifurcated into recurrent expenditure which covers operational costs, overheads, and personnel emoluments such as teachers' salaries and capital expenditure, which is dedicated to infrastructural development, physical expansion, and long-term asset creation (Dataphyte, 2025). To this end, public expenditure on education represents the aggregate financial commitment channeled by federal, state, and local tiers of government toward sustaining and improving the educational system, encompassing basic, secondary, and tertiary levels (Ebi, 2017).

Government Education Expenditure and Human Capital Development

Government expenditure on education is an important investment in human capital development because it provides resources for teaching, infrastructure, learning materials, teacher development, and skills acquisition. Studies indicates that additional years of schooling are associated with

higher earnings and productivity, while adequate and efficiently utilized education financing can improve educational outcomes and contribute to economic development (UNESCO, 2026; World Bank, 2025). In Nigerian situation, the effectiveness of education expenditure remains a concern, as relatively low public investment and weaknesses in the efficiency and implementation of education spending can limit its contribution to human capital development (UNESCO, 2024). Thus, the impact of government education expenditure depends not only on the amount allocated but also on how efficiently and equitably the resources are utilized to produce meaningful educational outcomes.

Education Financing and Educational Efficiency

The nexus between education financing and efficiency centers on whether higher fiscal expenditure necessarily produces superior educational outcomes. While human capital theory suggests increased investments improve performance, empirical evidence in developing nations often reveals a paradox where nominal funding increases fail to drive proportional growth in student success (Hanush & Woessmann, 2020; Ohaegbulem & Chijioke, 2023). This inefficiency is frequently driven by poor resource allocation and structural bottlenecks, such as recurrent expenditure skews where personnel costs absorb most funds, leaving little for capital development (Businessday NG, 2025).

Empirical Review

Nwachukwu et al. (2024) investigated government expenditure on education and human capital development across Sub-Saharan Africa from 2014 to 2024, focusing on Nigeria and peer nations like Ghana, Kenya, and South Africa. Utilizing an Autoregressive Distributed Lag (ARDL) model, the study revealed that while per capita education spending exerts a positive long-run influence on school enrollment and human development index (HDI) scores, Nigeria specifically exhibited a lagging structural impact due to recurrent expenditure absorbing over 80% of total education budgets. The authors concluded that weak governance and low capital allocations severely dampen the translation of budgetary increases into measurable educational

outcomes. Ohaegbulem and Chijioke (2023) examined Nigeria's budgetary allocations to the education sector from 1960 to 2023 against UNESCO benchmarks. Employing a time-series descriptive and comparative evaluative framework, their findings demonstrated that persistent under-allocation averaging below 8% of national budgets directly correlates with depressed foundational literacy rates, declining infrastructure quality, and systemic institutional decay. They emphasized that unless funding scales up to meet the 15%–20% international threshold, public financing will remain inadequate for driving sustainable educational advancement.

Omodero (2022) conducted an empirical assessment of public expenditure on education and manpower development in Nigeria covering a 30-year period (1990–2019) using Ordinary Least Squares (OLS) regression techniques. The study revealed that public recurrent expenditure on education, primary school enrollment, and tertiary school enrollment had a statistically significant positive effect on the Human Development Index (HDI). However, public capital expenditure and secondary school enrollment displayed insignificant impacts during the period, driven by poor budget execution, leakages, and inadequate monitoring frameworks.

Theoretical Framework

This study is anchored on the Endogenous Growth Theory, originally pioneered by Paul Romer and Robert Lucas. This theory posits that long-run economic growth is primarily driven by internal human capital accumulation and knowledge creation rather than exogenous market forces (Lucas, 1988; Romer, 1986). Within this framework, education is viewed as a vital productive investment that enhances the cognitive abilities, technical skills, and overall efficiency of the workforce. Consequently, government budgetary allocations to the education sector serve as a critical public policy instrument for generating and scaling this human capital. When public resources are effectively channeled and converted into quality educational outcomes, the resulting knowledge accumulation fosters technological innovation and sustained economic development, providing the core theoretical

justification for evaluating how fiscal allocations impact the education sector in Nigeria.

III. METHODOLOGY

Research Design

The study adopts an ex-post facto research design because it relies on historical annual data that have already occurred and cannot be manipulated by the researcher. The design is appropriate for examining the relationship between government budgetary allocation to education and education outcomes in Nigeria using time-series econometric techniques.

Model Specification

A basic functional relationship was specified as:

$$EDOUT = f(EDUEXP, GDPPC, POPGT, INF)$$

Where:

EDOUT = Education outcome

EDUEXP = Government Recurrent Expenditure on Education

GDPPC = GDP per capita

POPGT = Population Growth

INF = Inflation rate

The econometric model be expressed as:

$$EDUOUT_t = \beta_0 + \beta_1 EDUEXP_t + \beta_2 GDPPC_t + \beta_3 POPGT_t + \beta_4 INF_t + \varepsilon_t$$

β_0 = Intercept term.

$\beta_1, \beta_2, \beta_3, \beta_4$ = Coefficients representing the magnitude and direction of the relationship in the variables

ε = Error term, accounting for unexplained variation in the model.

Data Sources and Measurement of Variables

The study uses annual secondary data covering 1990–2024. Data on government education expenditure are obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin, while education outcomes and the selected macroeconomic control variables are obtained from the World Development Indicators (WDI) of the World Bank, subject to data availability. The dependent variable is education outcome (EDUOUT), proxied by primary school enrolment/completion. The main explanatory variable is government expenditure on education (GEX), with GDP per capita (GDPPC), population growth (POPGT) and inflation (INF) included as control variables.

Variable	Symbol	Measurement/Proxy	Expected Sign
Education outcome	EDUOUT	Selected education outcome indicator (%)	Dependent
Government education expenditure	LGEX	Government expenditure on education; transformed into natural logarithm where appropriate	+
GDP per capita	LGDPPC	GDP per capita; natural logarithm	+
Population growth	POPGT	Annual population growth (%)	±
Inflation	INF	Inflation, consumer prices (%)	–/±

Estimation Technique

The study employs the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration. The ARDL technique is appropriate because the variables are integrated at a mixed order of I(0) and I(1), It also allows the estimation of short-run dynamics and long-run relationships within a single framework.

The ARDL error-correction representation is expressed generally as:

$$\Delta EDUOUT_t = \alpha_0 + \sum \alpha_i \Delta EDUOUT_{t-i} + \sum \beta_i \Delta X_{t-i} + \lambda_1 EDUOUT_{t-1} + \lambda_2 LGEX_{t-1} + \lambda_3 LGDPPC_{t-1} + \lambda_4 POPGT_{t-1} + \lambda_5 INF_{t-1} + \varepsilon_t$$

The Augmented Dickey-Fuller (ADF) test is used to determine the stationarity properties of the variables. This preliminary test is necessary to ensure that no variable is integrated of order two, I(2), which would

invalidate the conventional ARDL bounds testing procedure

Post-estimation diagnostic tests were also conducted to assess the adequacy of the estimated model. The Breusch-Godfrey LM test is used to test for serial correlation, the heteroskedasticity test is used to examine whether the variance of the residuals is constant, and the Ramsey RESET test is used to

assess functional-form specification. The Jarque-Bera test is used to examine residual normality, while the CUSUM and CUSUMSQ tests are employed to assess parameter stability

IV. RESULTS AND DISCUSSION

Trend analysis of government budgetary allocation to education in Nigeria

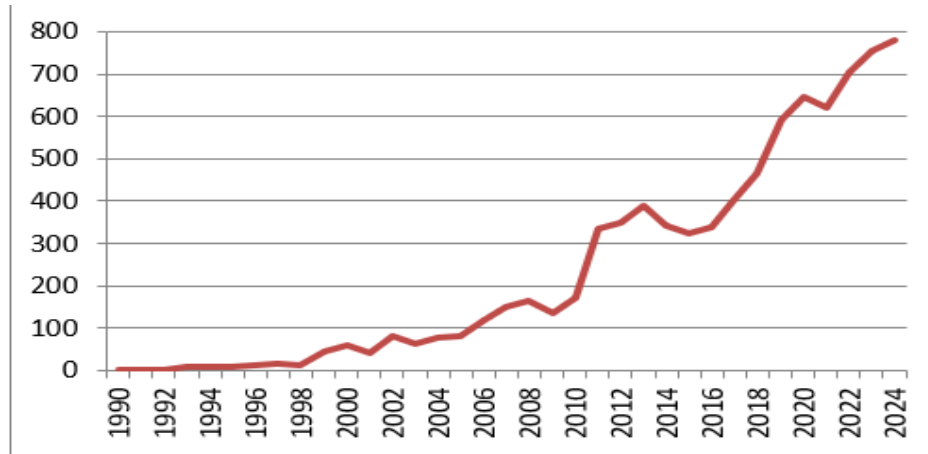


Fig 1: Trend analysis of government budgetary allocation to education in Nigeria

The trend analysis of government expenditure on education (GEX) in Nigeria from 1990 to 2024 reveals a distinct pattern of continuous nominal upward progression across three key phases: a period of early stagnation and depressed allocations below 15 billion Naira through the 1990s; a steady medium-term expansion following the return to democracy where spending rose from 43.61 billion Naira in 1999 to 170.80 billion Naira by 2010; and a sharp recent acceleration that crossed the 500 billion mark in 2019 and peaked at 781.07 billion Naira by 2024.

However, despite this consistent nominal growth across the three-decade span, macroeconomic pressures such as high inflation, currency depreciation, and rapid population expansion mean these upward figures often fail to translate into real, per-student resource improvements, reinforcing the broader economic paradox where expanded nominal budgets coexist with depressed educational outcomes.

Test for Descriptive Statistics

Table 1: Descriptive Analysis of Variables

Variables	Mean	Median	Maximum	Minimum	Std. Dev.
EDUOUT	85.16	85.06	96.66	25.57	11.88
LGEX	4.41	4.92	6.66	-1.23	1.99
LGDPPC	7.56	7.61	7.86	7.24	0.23
POPGT	2.57	2.64	2.8	2.08	0.24
INF	18.71	13.01	72.84	5.39	15.87

The descriptive statistics provide vital macroeconomic context for understanding the relationship between government budgetary allocation to education (LGEX) and education outcomes (EDUOUT) in Nigeria. The wide dispersion in EDUOUT (ranging from a dismal minimum of 25.57 to a peak of 96.66) mirrors the structural instabilities and disparities plaguing the Nigerian educational sector despite nominal funding variations (LGEX spanning from -1.23 to 6.66). Furthermore, the high volatility and severe inflationary pressures reflected in INF (mean of 18.71 with a maximum of 72.84) help explain why nominal increases in educational budgetary allocations often fail to translate into real resource adequacy or sustained improvements in learning outcomes. Additionally, the steady demographic

pressure indicated by POPGT (averaging 2.57%) exerts continuous strain on public educational infrastructure, reinforcing the premise that financial allocations must account for macroeconomic instability and population growth to effectively drive human capital development in Nigeria.

Correlation Analysis

The correlation matrix provides preliminary evidence of the association among the variables. Government education expenditure and GDP per capita have a relatively strong positive correlation of 0.812. The correlation between government education expenditure and education outcomes is weak and negative (-0.138). These coefficients are descriptive associations and do not establish causality.

Table 2: Correlation Matrix

Variables	EDUOUT	LGEX	LGDPPC	POPGT	INF
EDUOUT	1.000	-0.138	-0.357	0.104	0.159
LGEX	-0.138	1.000	0.812	-0.444	-0.410
LGDPPC	-0.357	0.812	1.000	-0.356	-0.371
POPGT	0.104	-0.444	-0.356	1.000	-0.087
INF	0.159	-0.410	-0.371	-0.087	1.000

Test for Stationarity

The Augmented Dickey-Fuller (ADF) is used to test for the stationarity of the variables and it is presented in the table below

Table 3: Unit root result

Variables	STATIONARITY AT LEVEL FORM			STATIONARITY AT FIRST DIFFERENCE			Remark
	ADF Statistics	Critical Values at 5%	Prob.	ADF Statistics	Critical Values at 5%	Prob.	
EDUOUT	-4.27	-3.55	0.01				Stationary at level form
LEDUEXP	-3.02	-3.55	0.14	-8.61	-2.95	0.00	Stationary at first difference
LGDPPC	-2.70	-3.57	0.24	-3.22	-2.95	0.03	Stationary at first difference
POPGT	-1.90	-3.55	0.63	-2.05	-1.95	0.04	Stationary at first difference
INF	-2.25	-3.55	0.45	-9.83	-3.57	0.00	Stationary at first difference

The Augmented Dickey-Fuller (ADF) unit root test results indicate a mixed order of integration among the variables. Specifically, EDOUT is stationary at level form $I(0)$ with an ADF statistic of -4.27 and a probability of 0.01. Conversely, EDUEXP, POPGT, and INF are non-stationary at level form (with p-values of 0.14, 0.63, and 0.45 respectively) but become stationary after taking the first difference $I(1)$, recording significant p-values of 0.00, 0.04, and 0.00 at first difference. This combination of $I(0)$ and $I(1)$ variables provides the econometric justification for employing the Autoregressive Distributed Lag (ARDL) bounds testing approach

ARDL (Bounds) Test

Table 3: Result of the ARDL (Bounds) Test

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	4.78	10%	2.46	3.46
k	4	5%	2.95	4.09
Actual Sample Size	34	1%	4.09	5.53

The ARDL bounds test results confirm the existence of a stable long-run cointegrating relationship among the variables, as demonstrated by the computed F-statistic of 4.78, which exceeds the upper bound critical values at both the 10% (3.46) and 5% (4.098) significant levels. This empirical finding establishes that government budgetary allocation to education, GDP per capita, population growth, and inflation move together in the long run, validating the econometric model for examining long-run coefficients and short-run dynamic error correction.

Long-Run ARDL Estimates

Table 6: Long-Run ARDL Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGEX	1.18	2.40	0.49	0.63
LGDPPC	-14.11	20.35	-0.69	0.49
POPGT	-5.87	12.02	-0.49	0.63
INF	0.04	0.16	0.26	0.80

Table 8: Diagnostic Tests

Diagnostic Test	Statistic	Probability	Decision
Breusch-Godfrey LM	0.185	0.832	No serial correlation

Constant	203.43	138.70	1.47	0.15
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The selected model is ARDL(1,0,0,1,0). Government education expenditure has a positive coefficient of 1.183 but is statistically insignificant at the 5% level ($p = 0.627$). This implies that increases in government education expenditure are associated with improvements in education outcomes in the long run, although the evidence is insufficient to establish a statistically significant effect. GDP per capita has a negative and statistically insignificant coefficient of -14.112 ($p = 0.494$). Population growth is also negative and statistically insignificant (-5.866; $p = 0.630$), while inflation has a small positive and statistically insignificant coefficient of 0.041 ($p = 0.800$).

Short-Run Error Correction Results

Table 7: Short-Run ARDL/ECM Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POPGT)	121.37	41.38	2.93	0.01
CointEq(-1)	-0.93	0.16	-5.83	0.00
R-squared	0.52			
Adjusted R-squared	0.50			
Durbin-Watson	2.03			

The short-run error-correction model shows that population growth has a positive and statistically significant effect on education outcomes, with a coefficient of 121.366 and a probability value of 0.0068. The error-correction term is negative and statistically significant at -0.931 ($p = 0.0000$), confirming the existence of an adjustment mechanism towards long-run equilibrium. Approximately 93.1% of the previous period's disequilibrium is corrected within one year.

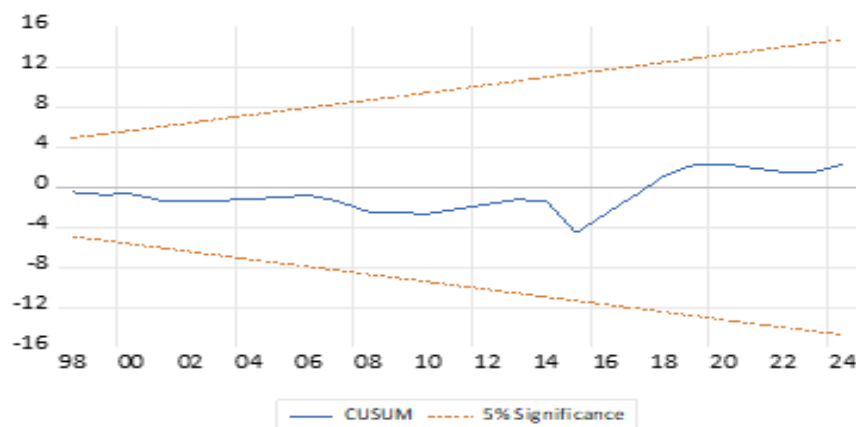
Diagnostic Tests

Heteroskedasticity	1.163	0.355	No heteroskedasticity
Ramsey RESET	1.098	0.304	Correct specification
Jarque-Bera	248.763	0.000	Residuals not normally distributed

The diagnostic tests indicate that the estimated model does not exhibit significant serial correlation, heteroskedasticity or functional-form misspecification. The Breusch-Godfrey LM test has a probability value of 0.832, while the heteroskedasticity test has a probability value of

0.355. The Ramsey RESET test also has a probability value of 0.304. These probabilities exceed 0.05, indicating that the null hypotheses are not rejected. The Jarque-Bera probability is 0.000, indicating that the residuals depart from normality.

Model Stability



The stability of the estimated parameters is assessed using the CUSUM and CUSUMSQ tests. The available CUSUM graph indicates that the CUSUM statistic remains within the 5% critical boundaries over the sample period, suggesting parameter stability.

Discussion of Findings

The finding of the study revealed that government education expenditure has a positive but statistically insignificant long-run relationship with education outcomes in Nigeria. This implies that increasing government financial allocation to education alone may not automatically translate into measurable improvements in education outcomes. The effectiveness of public education expenditure may depend on the efficiency of expenditure, accountability, implementation quality, infrastructure provision, teacher quality and the distribution of resources. The positive long-run coefficient of government education expenditure nevertheless indicates that the direction of the relationship is

consistent with the expectation that public investment in education can support better outcomes. Thus, the lack of statistical significance may reflect the time required for education investments to generate measurable outcomes, as infrastructure projects, teacher recruitment and training and institutional improvements may produce effects only after several years. The result is consistent with Emehelu and Oboreh (2024), who examined public education financing and educational outcomes in Nigeria using the ARDL approach for the period 1981–2022. Their study reported a positive but insignificant relationship between public education expenditure and educational outcomes and emphasised the importance of adequate and prudent financial management of the education sector. Similarly, Farayibi and Folarin (2021), using data for 31 sub-Saharan African countries from 2000–2019, found that the effect of government education expenditure on educational outcomes varies according to the particular measure of educational outcome employed. They also identified institutional rigidities and

inequitable allocation of education resources as factors that can limit the effectiveness of public education spending. This supports the argument that the size of education expenditure alone may not be sufficient; the allocation, implementation and institutional effectiveness of such expenditure are also important.

Further support from Musa, Onoja and Olaoluwa (2026) examined the threshold effect of public education expenditure on adult literacy in Nigeria using annual data from 1991–2024. Their findings indicate that public education expenditure had a positive and statistically significant relationship with adult literacy, but the effect became more pronounced when expenditure exceeded a threshold of approximately 1.02% of GDP. This suggests that the impact of government education spending may depend on whether the level of expenditure is sufficiently high to generate measurable improvements in education outcomes.

To this end, increasing education expenditure is necessary but may not be sufficient to improve educational outcomes in Nigeria. The effectiveness of expenditure may depend on the adequacy of funding, expenditure composition, implementation efficiency, accountability, institutional capacity and the extent to which resources reach schools and learners. Thus, the insignificant long-run coefficient obtained in this study should not be interpreted as evidence that government education expenditure is irrelevant.

V. CONCLUSION AND RECOMMENDATIONS

This study examined the relationship between government budgetary allocation to education and education outcomes in Nigeria over the period 1990–2024. The ARDL bounds test established the existence of a long-run relationship among the variables. Government education expenditure was found to have a positive but statistically insignificant long-run relationship with education outcomes, while population growth had a positive and statistically significant short-run effect. The significant and negative error-correction coefficient of -0.931 confirms rapid adjustment towards long-run

equilibrium. The study therefore concludes that adequate education financing is important, but the effectiveness of expenditure is equally critical for translating public resources into improved educational outcomes. It was therefore concluded that:

1. Government should increase and sustain education financing while ensuring that approved allocations are effectively released and implemented.
2. Greater emphasis should be placed on expenditure efficiency, transparency and accountability to ensure that education resources reach their intended purposes.
3. Education spending should prioritise infrastructure, teaching and learning materials, teacher recruitment and training, and other inputs that directly improve educational outcomes.
4. Population growth should be incorporated into education planning because demographic expansion increases demand for schools, teachers and educational facilities.
5. Education financing should be treated as a long-term investment, supported by stable policies and effective monitoring rather than short-term increases in annual budgetary allocations.

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