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RESEARCH ARTICLE

Impact of government spending in education and health sectors on Nigeria's economic growth: a time series analysis of capital and recurrent expenditures

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Abstract

This paper provides an in-depth exploration of the Impact of Government Spending in Education and Health on Nigeria's Economic Growth: a time series analysis of capital and recurrent expenditures from 1986 to 2023, using time series data and the Autoregressive Distributed Lag (ARDL) model. The study reveals that past GDP per capita significantly influences current output, indicating growth momentum. Government capital education expenditure (GCEEX) has a complex relationship, with short-term spending slightly negative but becoming positive in the long term. Capital health expenditure (GCHEX) contributes positively, while recurrent education expenditure significantly boosts GDP per capita in both short and long terms. Recurrent health expenditure, on the other hand, negatively impacts GDP per capita due to inefficiencies or crowding-out effects on private investment. The study further recommends Investing in educational infrastructure, vocational training centers, and technological resources is crucial for long-term economic growth. The Ministry of Education should prioritize these investments, while the National Planning Commission should coordinate long-term capital allocations. The Ministry of Health should prioritize infrastructure investments and oversee partnerships, while the Public-Private Partnership Commission should facilitate implementation. Consistent funding for teacher salaries, curriculum development, and training programs is vital for fostering a learning environment and building human capital. Addressing potential inefficiencies in recurrent health spending is also essential, with a comprehensive audit by the Ministry of Health and Auditor General.

Keywords: GDP; Government Spending on Health; Government Spending on Education

Introduction

Since the 1930s, Keynesian economics has significantly influenced the role of government in economic affairs worldwide. Today, government involvement is essential to nearly all economies, a shift catalyzed by the Great Depression of the late 1920s, which revealed major market failures. The market's inability to self-regulate led to overproduction, falling demand, and widespread unemployment, disrupting income and output levels. This inability to achieve full employment challenged the laissez-faire policies that dominated the pre-Keynesian era and underscored the need for central intervention. Consequently, government spending emerged as a primary tool for regulating economic activity, with aims such as full employment, price stability, and sustained

economic growth. Furthermore, government expenditure began addressing socio-economic disparities through the provision of public goods like education, healthcare, and infrastructure, thereby promoting a more balanced and equitable society (Ugochukwu & Oruta, 2021). Despite the recognized benefits of government intervention, debate over its extent remains. Some argue for a limited government role, while others contend that the absence of government guidance risks economic instability, prolonged recessions, and high unemployment rates. According to Nwosa (2014), the government's role often extends to providing financial bailouts, which may necessitate increased public spending to stabilize the economy. However, challenges persist in driving growth, particularly regarding structural transformations needed to enhance employment opportunities and reduce poverty. For African nations, investment in agriculture and development of agricultural value chains could stimulate growth in modern manufacturing and services, thereby driving employment and poverty reduction. Global governments bear the responsibility of formulating policies to achieve key macroeconomic objectives, with sustained economic growth being a primary indicator of economic health (Greg & Agboro, 2014). This growth is influenced by numerous factors, prompting governments to adopt diverse policies and strategies, including the use of fiscal policy. Government expenditure encompassing consumption, investment, and transfer spending is central to achieving national goals (Churchill, et al, 2015). This expenditure covers various areas such as education, healthcare, defense, and social security, categorized into recurrent (e.g., wages and salaries) and capital expenditures (e.g., long-term infrastructure investments). As posited by endogenous growth models, spending on human capital development especially in education plays a critical role in economic growth (Churchill, et al, 2015). The United Nations even recommends that countries allocate 25% of GDP to education to foster substantial economic progress. Despite rising global healthcare expenditures averaging 6% in low and middle-income countries and 4% in high-income countries approximately 100 million people are pushed into extreme poverty annually due to healthcare costs exceeding 35% of their income (WHO, 2019). The COVID-19 pandemic further exposed the inadequate healthcare infrastructure worldwide, highlighting the importance of government investment in health. Given that quality healthcare is a fundamental human right, governments must increase healthcare spending to prevent citizens from falling into poverty due to medical expenses. Policymakers advocate for cost-effective use of healthcare funds to ensure universal health coverage and advance Sustainable Development Goals (SDG 3).

The debate between Keynesian and Neo-Classical economists on government intervention's effectiveness continues, especially regarding public spending's impact on healthcare. While some argue that public expenditure can contribute positively to policy goals, others worry that excessive government involvement may hinder the private sector's growth, particularly in underdeveloped economies. On the other hand, research supports a positive correlation between government spending and economic growth, suggesting that public investment can stimulate both public and private sector demand, creating a multiplier effect (Evans & Karras, 1994; Anaman, 2004; Kustepelli, 2005; Heidari, Parvin & Fazeli, 2010). Nonetheless, critics contend that excessive government spending can stifle growth due to inefficiencies and potential misallocations, which may occur if spending is driven by political motivations rather than economic need. This inefficiency is documented in studies suggesting that high levels of government expenditure may dampen economic growth and reduce dynamism in the long term (Folster & Henrekson, 2001; Bassanini, Scarpetta, & Hemmings, 2001; Chandra, 2004). Nigeria, Africa's largest economy, exemplifies the complexities of balancing government spending and economic growth. Despite its wealth of natural resources, particularly in crude oil, Nigeria's economic trajectory remains volatile, with high unemployment, income inequality, poor infrastructure, and widespread poverty. These multifaceted challenges demand a comprehensive strategy focused on economic diversification, improved governance, enhanced infrastructure, and inclusive growth. This research aims to explore whether

government expenditure in education and healthcare can be a lever for economic growth in Nigeria, a pressing question given the country's substantial human and natural resource potential.
By analysing available empirical evidence and applying appropriate analytical techniques, this study seeks to provide a comprehensive understanding of Impact of Public Investment in Education and Health on Nigeria's GDP: A Time Series Analysis of Capital and Recurrent Expenditures framework.
The study thus uses the following specific objectives:

- examine the relationship between government education capital expenditure on economic growth in Nigeria.
- assess the extent to which government health capital expenditure on economic growth in Nigeria.
- investigate the relationship between government education recurrent expenditure on economic growth in Nigeria; and
- evaluate the effect of government health recurrent expenditure on economic growth in Nigeria**.**

Literature review

Conceptual Review

Economic Growth

Economic growth is a complicated, long-term process that is constrained by factors such as population growth, limited resources, insufficient infrastructure, poor resource utilization, and excessive governmental interference, institutional and cultural models that make expansion difficult, and so on. Economic growth is achieved through the optimal utilization of available resources and the expansion of a country's production capability. It makes income transfer between the population and society easier. For periods of a decade or more, the cumulative impacts, or tiny disparities in rise rates, become significant. In a dynamic, expanding society, redistribution of money is easier than in a static society (Haller, 2016). According to Jhinghan (2011), a country experiences economic growth when its labour force, capital, consumption, and trade volume all expand quantitatively and sustainably together with its per capita production or income. He says further that economic development is economic growth plus change. An economy may not evolve, but it may grow. It is hard to envade economic progress in the absence of economic growth. Despite having different concepts, economic development and growth can occasionally be used interchangeably.

Government Expenditure on Education

As stated by Okoro (2014), government expenditure on education encompasses a comprehensive range of financial allocations aimed at bolstering the development and enhancement of the education sector. Capital expenditure within the education sector involves investments in construction, renovation, and upkeep of educational infrastructure. These investments encompass the establishment and maintenance of schools, colleges, universities, libraries, laboratories, and other educational facilities. Furthermore, capital expenditure extends to the procurement of essential equipment, furniture, and technological resources required to facilitate effective learning environments. Such investments play a pivotal role in expanding educational access, elevating the quality of educational settings, and ensuring institutions are adequately equipped to meet the evolving needs of students and educators alike. Conversely, recurrent expenditure pertains to the ongoing operational costs associated with the provision of educational services. This encompasses salaries and benefits for teaching staff, administrative personnel, and other educational professionals. Additionally, current expenditure covers expenses related to the procurement of textbooks, teaching materials, and instructional aids,

alongside utility bills, maintenance costs, and other day-to-day operational expenses crucial for sustaining the functioning of educational institutions.

Government Expenditure on Health

According to System of Health Account (SHA 2014), government health expenditures are defined as any activity by the federal government whose main goal is to apply qualified health knowledge to improve, maintain, and prevent a person's health status from deteriorating as well as to mitigate the effects of illness. The term "government expenditure on health" describes the financial resources allocated to the delivery of healthcare products and services by the government throughout a predetermined time frame. It includes all forms of healthcare spending, including government support, out-of-pocket expenses, contributions to health insurance, and donations (WHO, 2017). It is the entire amount of money, from both public and private financing sources, spent on education products and services. It includes a variety of components, including payments to healthcare providers, medications, medical supplies and equipment, hospital services, preventative care, and administrative expenses.

Empirical Review

Onya, et al. (2024) evaluated public health expenditure, government effectiveness and labour productivity in West Africa between 1980 and 2022. The study employed the Multiple Regression, Mediation, Correlation Analysis and Error Correction Model (ECM). The variables used were investment, life expectancy rate, GDP, government effectiveness, material mortality rate, labour productivity, public health expenditure, and labour force. The findings revealed that public health expenditure and government's effectiveness have some positive but insignificant impacts on labour productivity in the short run and public health expenditure indicated a long term, significant and adverse impact on the productivity of labour in Togo, Guinea, Nigeria, Mali and Senegal. Also, the study concluded that there is a need for a careful examination of public health expenditure to ensure its positive impact on labor productivity in West Africa. Banik, et al. (2023) explored healthcare expenditure, good governance and Human Development in Sub-Saharan Africa and South Asian Nation between 2005 and 2019. A two-step Windmeijer finite sample-corrected system-generalized method of moments (sys-GMM) estimation technique, and Principal Component Analysis were employed and also particularly using a large panel of 161 countries and the variables used were human development index, political stability, and healthcare expenditure. The findings revealed that allocating more healthcare support alone is insufficient to improve human development. The paper concludes that higher healthcare spending could help directly in improving the human development and help in achieving SDG 3. The paper recommends that it is required to analyze which individual dimension of governance is most significant in improving human development. Between 1999 and 2020, Okerekeoti (2022) explored government expenditure on education and economic growth in Nigeria. Regression Analysis was employed while real GDP and government expenditure on education were used as the variables. The findings revealed that there is a positive and significant effect between government expenditure on education and Real GDP at 5% level of significance. The paper recommended there should be an increase in the reallocation of public spending towards education in order to raise income in the long run which would cause an improvement in the well-being of the citizenry. Also, Government spending should be oriented towards increasing investment in physical and human capital. Verazulianti, et al. (2021) investigated how important health and education are for provincial economic growth in Indonesia. Generalized Methods of Moments (GMM) was the model employed, and the variables are growth of bank credit, education growth, growth of labour, growth of foreign direct investment, growth of provincial government expenditure, growth of

health outcome, and growth of provincial government infrastructure expenditure. The result showed that improving health and education outcomes is key for sub-national economic growth. However, foreign direct investment, domestic direct investment, and public spending on infrastructure failed to support growth in the sub-national level. The paper recommended that good quality health and educational services need to be equally distributed across all sub-national regions. Not only will such policy enhance human capital by increasing health and education outcomes, but it will also make domestic labor more productive and generate the promised beneficial effect of FDI and DDI in boosting sub-national and national growth. Anowor, et al. (2020) aimed at finding the relationship between health financing and economic performance in the ECOWAS Sub-Region between 1985 and 2017. Panel Autoregressive Distributive Lag (PARDL) technique was employed as the methodology in the paper. Output per capita, government expenditure on health, private expenditure on health, population growth rate, and price level were the variables. The findings showed that in the long-run, private and public expenditures on healthcare were statistically significant to grow output per capita. The paper recommended that all sectors, especially the public sector to lessen the burden of the private sector given the deplorable inequality gap existing within the ECOWAS Sub-region, should improve their commitment towards providing adequate healthcare; and that incentives to the private sector are of the essence to strengthen the healthcare system since they (out of pocket healthcare expenditure) bore 70% of the total cost of healthcare in the region. Using Neoclassical Production Function, Amaghionyeodiwe (2019) explored government spending on education and economic growth from 1990 to 2016 for 15 selected ECOWAS countries. Variables employed were gross domestic product and public expenditure on education. The results showed that government spending on education and economic growth in West African countries are positively and significantly related. It was concluded that spending on education can create better human capital which can in return accommodate the use of modern technology in the production process by minimizing huge adoption costs. In addition, it was recommended that West African countries should accord more importance to the education sector and accordingly increase its share of total government expenditure on education as a way of improving the various tiers of formal education namely primary, secondary and post-secondary education in the region. This will help enhance the availability of more skilled manpower for the long-term economic growth and development. Sarwar and Tingqiu (2019) investigated the nexus among economic growth, education, health issues, and carbon emission in 161 countries. Solow growth model was employed and the variables adopted were health, carbon emission, and economic growth. The findings revealed that higher educational standard and capital investment helps to control the health issues in the long- and short-run and higher carbon emission creates health issues. The paper recommended that industries and government have to promote the energy efficient and green technologies which help to control the carbon emission without effecting the economic development. Between 1981 and 2017, Okoye et al (2019) investigated government expenditure and economic growth in Nigeria. Variables used were capital expenditure, total expenditure, recurrent expenditure, inflation, and gross domestic product and the model employed was the Auto-regressive Distributed Lag. It was indicated that there is a significant short-run negative effect of lagged current expenditure on economic growth and there is a strong positive effect of lagged capital expenditure on growth. The paper concluded that there is a non-sustainable pattern of government expenditure in Nigeria. The paper, therefore, recommended that more funds should be allocated to capital expenditure to enhance capacity for sustainable growth.

Theoretical Framework

The Keynesian school of thought emerged during the Great Depression of the 1930s, a period marked by widespread economic turmoil, high unemployment, and a severe contraction in economic activity. John Maynard Keynes, a British economist, published his seminal work, The General Theory of Employment,

Interest, and Money in 1936, which laid the foundation for what is now known as Keynesian economics. Keynes challenged the classical economic view that markets are always self-correcting, and that supply creates its own demand (Say's Law). Instead, he argued that aggregate demand, which is the total demand for goods and services in an economy, is the primary driver of economic growth and employment. Keynesian economics emphasizes that aggregate demand is the key determinant of economic output and employment levels. According to Keynes, fluctuations in aggregate demand led to economic cycles of boom and bust. When aggregate demand is insufficient, it can result in economic recessions or depressions, characterized by high unemployment and low output. Conversely, when aggregate demand is strong, it can lead to economic expansion, increased output, and job creation.

One of the central tenets of Keynesian economics is the belief in the necessity of government intervention in the economy, especially during periods of economic downturns. Keynes argued that during a recession, private sector spending alone may not be sufficient to restore full employment. Therefore, the government must step in to stimulate demand through increased public spending, tax cuts, or other fiscal policies. This intervention can help boost aggregate demand, leading to higher output and employment. A key concept introduced by Keynes is the multiplier effect, which describes how an initial increase in government spending can lead to a more significant overall increase in economic activity. For example, when the government spends money on infrastructure projects, it creates jobs and income for workers. These workers, in turn, spend their income on goods and services, further stimulating demand and creating additional jobs and income in the economy. The multiplier effect shows how government spending can have a magnified impact on overall economic output and growth. Keynes advocated for the use of counter-cyclical fiscal policies, where the government increases spending during economic downturns and reduces spending during periods of economic expansion. This approach helps to smooth out economic cycles, preventing deep recessions and controlling inflation during booms. By managing aggregate demand, the government can help stabilize the economy and promote sustained growth. Unlike classical economics, which focuses on long-term equilibrium, Keynesian economics places significant emphasis on short-term economic management. Keynes believed that in the short run, prices and wages are often rigid, and markets may not clear, leading to unemployment and idle resources. Therefore, short-term government intervention is crucial to address these issues and restore economic stability.

Methodology

This study employed an ex-post facto research design, involving the collection and analysis of existing data. Variables such Real Gross Domestic Product per Capita (RGDP_PER_CAP) and four components of government expenditure, Government Capital Education Expenditure (GCEEX), Government Capital Health Expenditure (GCHEX), Government Recurrent Education Expenditure (GREEX), and Government Recurrent Health Expenditure (GRHEX) were utilized, with data sourced from the Central Bank of Nigeria statistical bulletins, providing reliable time series data. The data analysis employed the Autoregressive Distribution Lag (ARDL) test, allowing for the examination of relationships and dynamics among the variables under investigation. The theoretical foundation is anchored on the Keynesian theory, and it is mathematically represented as:

$$Y = C + I + G + (X - M) \quad (1)$$

Modifying the Keynesian theory and adapting the model framework represented as:

$$RGDP = f(GCEEX, GCHEX, GREEX, GRHEX, \mu) \quad (2)$$

It is expressed explicitly as

$$RGDP_t = \alpha_o + \alpha_1 GCEEX_t + \alpha_2 GCEEX_t + \alpha_3 GREEX_t + \alpha_4 GRHEX_t + \mu_t \quad (3)$$

Where;

RGDP = Real Gross Domestic Product per Capita,

GCEEX= Government Capital Education Expenditure,

GCHEX= Government Capital Health Expenditure,

GREEX= Government Recurrent Education Expenditure,

GRHEX= Government Recurrent Health Expenditure,

α_0 = Intercept or autonomous parameter

$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ = Coefficients of Government spending variables, Government Capital Education Expenditure (GCEEX), Government Capital Health Expenditure (GCHEX), Government Recurrent Education Expenditure (GREEX), Government Recurrent Health Expenditure (GRHEX)

The ARDL technique estimates the model using Stata's regression tool. As a result, specification tests for linear (time series) regressions may be performed using normal post-estimation commands, and dynamic predictions can be obtained using the forecast command suite (Kripfganz & Schneider 2018)

Specifying the equation in ARDL will be as follows;

$$\Delta RGDP_t = \alpha + \sum_{i=1}^{q} \beta_1 RGDP_{t-1} + \sum_{i=1}^{q} \beta_2 GCEEX_{t-1} + \sum_{i=1}^{q} \beta_3 GCHEX_{t-1} + \sum_{i=1}^{q} \beta_4 GREEX_{t-1} + \sum_{i=1}^{q} \beta_5 GRHEX_{t-1} + \beta_6 \Delta RGDP_{t-i} + \beta_7 \Delta GCEEX_{t-i} + \beta_8 \Delta GCHEX_{t-i} + \beta_9 \Delta GREEX_{t-i} + \beta_{10} \Delta GRHEX_{t-i} + \mu_t \quad (4)$$

Specifying the equation in ECM will be as follows;

$$\Delta RGDP_t = \alpha + \sum_{i=1}^{q} \beta_1 RGDP_{t-1} + \sum_{i=1}^{q} \beta_2 GCEEX_{t-1} + \sum_{i=1}^{q} \beta_3 GCHEX_{t-1} + \sum_{i=1}^{q} \beta_4 GREEX_{t-1} + \sum_{i=1}^{q} \beta_5 GRHEX_{t-1} + \beta_6 \Delta RGDP_{t-i} + \beta_7 \Delta GCEEX_{t-i} + \beta_8 \Delta GCHEX_{t-i} + \beta_9 \Delta GREEX_{t-i} + \beta_{10} \Delta GRHEX_{t-i} + ECM \quad (5)$$

Where:

Δ = First difference operator

α = Constant parameter

β_1, β_2 to β_{10} = Parameter Co-efficient

μ_t = Error term, and

ECT = Error correction term

Results and discussion

Descriptive Statistics

The descriptive statistical provides overview of several economic indicators which include Real Gross Domestic Product per Capita (RGDP_PER_CAP) and four components of government expenditure Government Capital Education Expenditure (GCEEX), Government Capital Health Expenditure (GCHEX), Government Recurrent Education Expenditure (GREEX), and Government Recurrent Health Expenditure (GRHEX). The analysis covers 38 observations, representing 38 years' time periods, allowing us to examine the characteristics of these variables over time and assess their potential implications for the real economy.

Table 1: Summary of Descriptive Statistics

	RGDP_PER_CAP	GCEEX	GCHEX	GREEX	GRHEX
Mean	278524.2	138.7225	97.71790	198.1930	120.6636
Median	271203.2	25.88000	20.96400	81.66544	48.16071
Std. Dev.	66892.68	203.4909	137.5179	230.8521	147.2050
Skewness	0.145493	1.489961	1.291335	1.032892	1.073810
Kurtosis	1.317514	3.869679	3.144282	2.804864	2.847573
Jarque-Bera	4.616102	15.25744	10.59409	6.817103	7.339555
Probability	0.099455	0.000486	0.005006	0.033089	0.025482
Observations	38	38	38	38	38

Source: Author's Computation, using E- views 12, 2024

The table provides a descriptive statistical overview of several economic indicators which include Real Gross Domestic Product per Capita (RGDP_PER_CAP) and four components of government expenditure Government Capital Education Expenditure (GCEEX), Government Capital Health Expenditure (GCHEX), Government Recurrent Education Expenditure (GREEX), and Government Recurrent Health Expenditure (GRHEX). The analysis covers 38 observations, representing 38 years' time periods, allowing us to examine the characteristics of these variables over time and assess their potential implications for the real economy.

RGDP PER CAP has a mean of 278,524.2, suggesting a high average level of real GDP per capita across the observed periods. However, its relatively large standard deviation (66,892.68) indicates substantial fluctuations in real economic activity. The median (271,203.2) is slightly below the mean, implying that, while the data is symmetric, there are instances where RGDP_PER_CAP exceeds the central tendency, likely reflecting periods of above-average economic growth. GCEEX, GCHEX, GREEX, and GRHEX have much lower mean values compared to RGDP_PER_CAP, reflecting their nature as specific components of government spending. The highest mean among these is for GREEX (198.1930), suggesting that, on average, government recurrent spending on education is the most significant expenditure among the listed components. Meanwhile, GCEEX (138.7225) and GRHEX (120.6636) are also substantial but somewhat lower.

The Skewness values for all government expenditure variables are positive and greater than 1 (for GCEEX, GCHEX, GREEX, and GRHEX), indicating a right-skewed distribution where extreme high values occur more frequently than low ones. RGDP_PER_CAP, however, has a low skewness (0.145493), implying a more symmetric distribution around its mean, with fewer extreme outliers on either end. Also, the Kurtosis values further support the skewness interpretation. For government expenditure components, kurtosis values are slightly above 3 (except GREEX), suggesting that these distributions are moderately leptokurtic, with more

frequent extreme values than a normal distribution would predict. RGDP_PER_CAP has a kurtosis of 1.317514, indicating a platykurtic distribution with fewer outliers and a relatively flat shape around the mean.
The Jarque-Bera test results indicate that normality cannot be assumed for most variables except RGDP_PER_CAP, with a JB statistic of 4.616102 and a probability of 0.099455. For other variables (GCEEX, GCHEX, GREEX, GRHEX), p-values are below the 5% significance threshold, suggesting these expenditure categories are not normally distributed. The non-normal distribution in government spending categories might reflect the uneven allocation of resources, possibly due to shifting government priorities or policies over time. The high mean of RGDP_PER_CAP suggests a robust real sector with substantial income generated per capita. However, the variability indicated by its standard deviation might be reflective of economic cycles, wherein periods of expansion are followed by contractions. This fluctuation can impact consumer confidence, investment, and overall economic stability. In contrast, the government expenditure variables display significant skewness and kurtosis, pointing to occasional spikes in government spending, which might correspond with policy shifts, such as increased spending during economic downturns to stimulate demand, or specific periods of targeted investment in areas like education and health. The high average recurrent expenditure on education (GREEX) suggests that human capital development is a priority, potentially fostering long-term economic growth through skill enhancement and increased productivity. Given the non-normality in government expenditure components, policymakers should account for the uneven distribution and variance in these data when designing fiscal policies. An understanding of the skewness and kurtosis of these expenditures can assist in creating smoother, more predictable spending patterns that align with macroeconomic goals, thus stabilizing the real sector.

Unit Root Test Results

The provided unit root test results, specifically the Augmented Dickey-Fuller (ADF) test statistics, assess the stationarity of various economic variables, helping determine whether they are stable over time or contain unit roots that imply non-stationary behaviour.

Table 2: Summary of Unit Root Test Result

Variables	ADF Values	Critical Values	Order of Int.
EXR	-3.736767	-3.552973	I(0)
GCEEX	-7.509408	-2.945842	I(1)
GCHEX	-7.450973	-3.540328	I(1)
GREEX	-4.801127	-2.945842	I(0)
GRHEX	-4.439978	-3.574244	I(1)

Source: Author's Computation, using E- views 12, 2024

These unit root test results reveal a mixed order of integration among the variables, with both I(0) and I(1) orders of integration present. Economically, this distinction implies that some variables (EXR, GREEX) exhibit more stable, mean-reverting behavior, suitable for immediate analysis, while others (GCEEX, GCHEX, GRHEX) reflect lasting responses to economic shocks or policy shifts, requiring differencing for accurate modeling.

Cointegration Result

The ARDL bounds testing approach assesses the presence of a long-term relationship among variables in a time series model, especially useful in small samples. This technique is commonly applied in economic research to determine if the variables under study exhibit cointegration

Table 3: Summary of Cointegration Result

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.825354	10%	2.2	3.09
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Source: Author's Computation, using E- views 12, 2024

From Table 3 above, At all significance levels (10%, 5%, 2.5%, and 1%)**, the F-statistic of 7.825354 exceeds the upper bound (I(1)) values (e.g., 4.37 at 1%). Therefore, we reject the null hypothesis at all conventional significance levels. This result further suggests strong evidence of a long-term equilibrium relationship among the variables included in the model. The existence of cointegration implies that the variables have a stable long-term association, potentially driven by economic theory or structural relationships.

ARDL Model Results of the Short-Run, Long-Run ECM and Test of Hypothesis

The coefficient of `CointEq(-1)` is -0.017574 (p = 0.0013), which is statistically significant and negative, as expected. This coefficient suggests that approximately 1.76% of the short-term disequilibrium is corrected in each period, indicating a slow but significant adjustment process toward the long-term equilibrium. In economic terms, any deviation in real GDP per capita from its equilibrium path due to short-run shocks will gradually adjust back to its long-term trend.

The Autoregressive Distributed Lag (ARDL) model results offer a comprehensive examination of both short-run and long-run dynamics between the variables, with an included Error Correction Mechanism (ECM) term that measures the speed of adjustment back to equilibrium after any short-term disturbances.

The R-squared (R^2) value of 0.99 demonstrates the high explanatory power of the model, indicating that 99% of the variation in Gross Domestic Product (GDP) can be explained by changes in the included independent variables. This leaves only a minimal 1% attributable to other factors outside the model, suggesting that the specified variables capture the primary drivers of GDP fluctuations effectively.

Moreover, the Prob(F-statistic) value of 0.0000, being well below the 0.05 threshold, confirms the overall statistical significance of the model. This suggests that the model is well-suited for economic analysis and policy formulation, as it provides a reliable fit to the data.

The Durbin-Watson statistic of 2.053084, close to the benchmark value of 2, indicates a low likelihood of autocorrelation in the residuals, although it leans slightly toward negative autocorrelation. This statistic supports the model's robustness and reliability in capturing the true underlying relationships among the economic variables included.

Table 4: Summary of Short Run and Long-Run and ECM Results of ARDL Model
Dependent Variable of Real Gross Domestic Product

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
RGDP_PER_CAP(-1)	1.383184	0.168128	8.22697	0.0000
RGDP_PER_CAP(-2)	-0.083521	0.26547	-0.314617	0.7556
RGDP_PER_CAP(-3)	-0.317237	0.178464	-1.777601	0.0872
GCEEX	-67.99329	35.33237	-1.924391	0.0653
GCEEX(-1)	84.19917	32.9199	2.557698	0.0167
GCHEX	28.9558	57.04589	0.507588	0.616
GREEX	150.3679	72.39252	2.077119	0.0478
GRHEX	-269.2197	123.8039	-2.174566	0.0389
C	4935.559	11658.04	0.423361	0.6755
CointEq(-1)*	-0.017574	0.004863	-3.613627	0.0013
R-squared	0.989525			
Adjusted R-squared	0.986302			
F-statistic	307.0253			
Prob(F-statistic)	0.0000			
Durbin-Watson stat	2.053084			
LONG RUN				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GCEEX	922.1538	4337.953	0.212578	0.0333
GCHEX	1647.655	5137.715	0.320698	0.051
GREEX	8556.295	25221.59	0.339245	0.0372
GRHEX	-15319.26	47174.31	-0.324737	0.048
C	280845.3	243846.6	1.151729	0.2599

Source: Author's Computation, using E- views 12, 2024

Post Estimation Tests

The post-estimation diagnostics provide crucial insights into the validity and robustness of the ARDL model, particularly regarding heteroskedasticity and serial correlation, both of which are essential in assessing the reliability of model estimates for economic analysis.

Table 5: Post Estimation Tests

Test type	F-Statistic	Prob
Heteroskedasticity Test	0.493188	0.8498
Breusch-Godfrey Serial Correlation LM	0.8498	0.8727

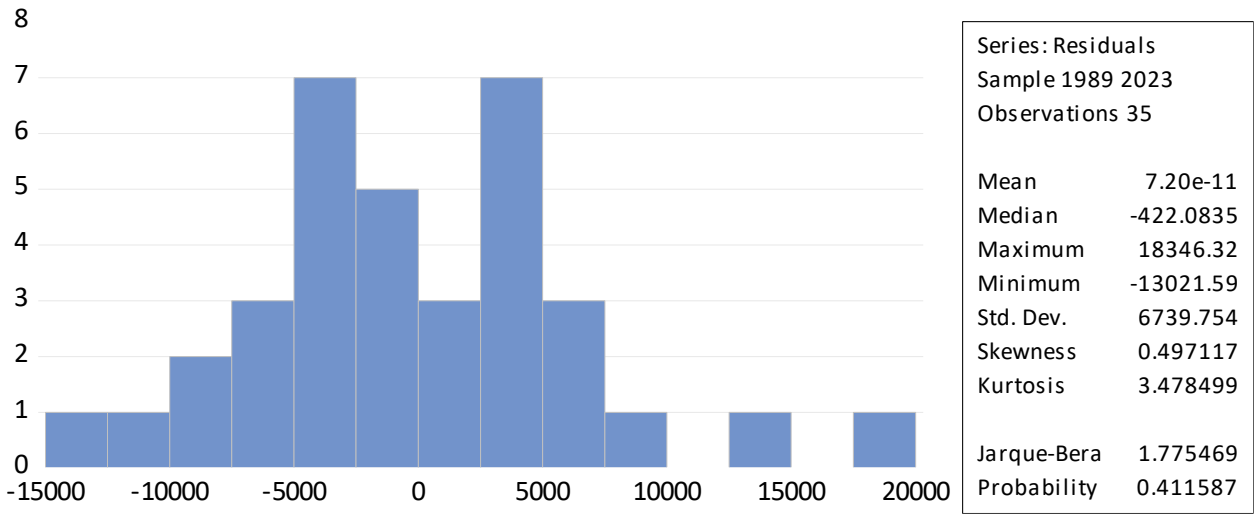
Source: Author's computation using EVIEWS 12.0, 2022.

Heteroskedasticity Test results shows F-statistics 0.493188 and the high p-value of 0.8498 well above the conventional significance levels (such as 0.05), suggests that we fail to reject the null hypothesis of homoskedasticity. This indicates that the residuals have a constant variance, supporting the reliability of the model estimates. In economic terms, this stability implies that the impact of independent variables on GDP is consistent across different levels of these variables, enhancing the robustness of the model for policy and economic analysis. Also, the Breusch-Godfrey Serial Correlation LM test shows a high p-value indicates that

we fail to reject the null hypothesis of no serial correlation in the residuals. This suggests that the model does not suffer from autocorrelation, meaning the residuals are independently distributed across time periods. In a research context, the absence of serial correlation supports the model's specification and stability, making it suitable for understanding economic relationships over time without concerns of biased standard errors or inflated test statistics.

Normality Test

Normality of residuals is important for valid inference in econometric models, as it underpins the reliability of confidence intervals and hypothesis tests.



Source: Author's computation using EVIEWS 12.0, 2022.
Figure 1: Normality Test

The Jarque-Bera test assesses whether the skewness and kurtosis of the residuals match a normal distribution. Here, the probability value (0.4116) is above the 0.05 significance threshold, meaning we fail to reject the null hypothesis of normally distributed residuals. This indicates no significant deviation from normality. The normality test confirms that the residuals approximate a normal distribution, supporting the reliability of statistical inferences drawn from this model. The nearly symmetrical and bell-shaped distribution suggests that the model captures the relationships among variables without systematic bias in errors, enhancing its suitability for economic analysis and forecasting.

Discussion of Findings

From the findings, the first lag of RGDP_PER_CAP has a positive and highly significant coefficient (1.383, $p < 0.0001$), indicating strong persistence in GDP per capita over time. This suggests that the level of economic output in prior periods significantly influences current output, which aligns with economic theories of momentum in economic growth, where past economic performance often impacts future performance due to sustained capital investments, consumer confidence, and technological progress. The second and third lags of RGDP_PER_CAP show negative but statistically insignificant coefficients, implying that although previous

values influence current GDP, their impact diminishes over time, aligning with the theory of diminishing marginal effects in time series economic relationships.

The current value of GCEEX has a negative but marginally insignificant coefficient (-67.99, p = 0.0653). This result might imply that increased government capital education expenditure in the short term could have a crowding-out effect on economic growth, possibly due to competition for resources or budget reallocation. However, the lagged term `GCEEX (-1)` has a positive and statistically significant coefficient (84.19, p = 0.0167), suggesting that government spending contributes positively to GDP growth with a lag, potentially due to the delayed impact of public sector investments and their subsequent multiplier effects in the economy. While In the long run, the coefficient of GCEEX is positive and significant (922.15, p = 0.0333), indicating that government capital education expenditure contributes to higher GDP per capita over time. This finding aligns with Keynesian economic theory, which posits that government spending can stimulate demand and, consequently, economic growth, especially in underutilized economies. In the long run, government investments in public education, infrastructure, and social services create an environment conducive to growth and productivity, contributing positively to GDP.

The coefficient for GCHEX is positive but statistically insignificant (28.96, p = 0.616). This finding suggests that in the short run, changes in gross capital formation may not have a substantial immediate effect on GDP per capita, likely due to the time it takes for capital investments to translate into productivity gains. Short-run impacts of capital investments are often limited, as they may require time for implementation and operationalization before contributing to economic output. Also, in the long run the coefficient for GCHEX is also positive but marginally significant (1647.66, p = 0.051), suggesting that government capital health expenditure drives long-term economic growth. Consistent with the Solow growth model, capital accumulation is fundamental to increasing productive capacity, enabling higher levels of output in the long run. This positive relationship highlights the importance of investments in capital goods for sustained economic growth.

Government recurrent education expenditure GREEX has a positive and significant effect on GDP per capita (150.37, p = 0.0478), indicating that Government recurrent education expenditure significantly boosts economic output in the short run. This is consistent with economic theory, as increases in residential investment not only reflect higher economic confidence. Government recurrent education expenditure GREEX has a substantial positive impact on GDP per capita in the long run (8556.30, p = 0.0372).

Finally in the short run Government recurrent health expenditure GRHEX has a negative and statistically significant coefficient (-269.22, p = 0.0389), suggesting that higher run Government recurrent health expenditure may negatively impact GDP per capita in the short term. Such a negative relationship may also reflect inefficiencies in government expenditure or a focus on non-productive public spending. Also interestingly, the coefficient for GRHEX is negative and significant (-15319.26, p = 0.048), indicating that higher Government recurrent health expenditure may detract from GDP per capita in the long term. This result could be attributed to potential inefficiencies or a crowding-out effect, where excessive Government recurrent health expenditure restricts the resources available for private investment. Additionally, it suggests that Government recurrent health expenditure may have diminishing returns over time and may not be as growth-enhancing as investment-oriented spending.

Conclusions and recommendations

The comprehensive investigation into the dynamics interplay between government spending in health and education sector on economic growth in Nigeria spanning over from 1986 to 2023 using time series data. The ARDL model's findings underscore the effectiveness of the included independent variables in explaining

variations in real GDP per capita, both in the short run and long run. The statistically significant, negative coefficient of the error correction term, `CointEq(-1)`, indicates that short-term deviations from the long-term equilibrium level of real GDP per capita are corrected at a rate of approximately 1.76% per period. This adjustment, though gradual, demonstrates a consistent reversion of GDP toward its equilibrium path following any short-term shocks, suggesting that the economy's underlying dynamics support a return to long-term stability.

Based on the findings of this study, the following recommendations are proposed:

i. Given GCEEX's significant positive effect on long-term economic growth, increasing investments in educational infrastructure, vocational training centres, and technological resources is crucial. Sustained and well-targeted investments in education capital can enhance human capital, yielding higher productivity and long-term economic growth. The Ministry of Education should identify priority areas within educational infrastructure and ensuring targeted investments that align with labour market needs. Also, the National Planning Commission Tasked with coordinating long-term capital allocations and overseeing strategic project timelines to optimize economic impacts should ensure the projects are achieved.
ii. Ministry of Health should prioritize infrastructure investments and oversee partnerships for maximum impact. Also, Public-Private Partnership Commission responsible for facilitating partnerships and incentivizing private investment in health infrastructure should put more effort to ensure implementation.
iii. GREEX has both immediate and long-term positive effects on GDP per capita, suggesting that consistent funding for teacher salaries, curriculum development, and training programs is vital. These areas should be prioritized within recurrent education budgets to foster a conducive learning environment and build human capital. Therefore, Ministry of Finance Should ensure sustained funding for recurrent education, focusing on sectors that align with labour market needs. And Ministry of Education Tasked with designing and implementing programs aligned with growth-enhancing sectors and workforce skills should come up with impactful programs.
iv. Given the negative association of GRHEX with GDP per capita, it is essential to identify and address potential inefficiencies within recurrent health spending. A comprehensive audit can help to ensure funds are allocated effectively and support high-priority areas. The Ministry of Health Should conduct a review of recurrent spending to optimize health allocations, with a shift toward preventive and high-impact areas. Also the Auditor General's Office should conduct efficient audits to identify and address waste or inefficiencies in health expenditure

Declaration

The authors declare that this manuscript is original, has not been published before, and is not currently being considered for publication elsewhere.

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