Impact of Public Expenditure on Human Development in Nigeria (2003 - 2024)

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Abstract

The study examined the effect of public expenditure on human development in Nigeria. The Autoregressive Distributed Lag (ARDL) model was used in the study to assess both short-term and long-term impacts using annual time series data from 2003 to 2024. The presence of long- term correlations between the variables was ascertained using the Bounds Co-Integration Test, and the model's robustness was increased through the application of supporting tests such unit root analysis. The results showed that recurring spending has a short-term negative impact on HDI but a long-term positive and statistically significant impact, indicating that its advantages need time to manifest through institutional stabilisation and service delivery. On the other hand, it was discovered that capital expenditure had little effect on HDI, reflecting challenges such as weak project execution, corruption, and inefficiencies in public investment management. The results highlight that the quality, efficiency, and composition of expenditure matter more than its size in driving human development outcomes in Nigeria. The study recommends that the government should strengthen fiscal discipline, enhance efficiency in recurrent spending, and prioritize targeted capital investments in education, healthcare, and infrastructure to improve long-term human development outcomes.

Keywords

1. Introduction

An advance in the development discourse that pushes nations to assess governance from both an economic and human population well-being perspective is referred to as "human development." Ajaero and associates (2024). In order to assess the effectiveness of government economic policies, governments in Nigeria and other nations must prioritise human development, which is quantified by a summary statistic that averages the population's income, health, and educational attainment.

The relationship between public expenditure and the Human Development Index (HDI) in Nigeria presents a complex challenge that has significant implications for the country's socio-economic progress. Despite Nigeria's substantial government spending, the HDI remains relatively low compared to other developing nations. According to the United Nations Development Programme (UNDP) 2023 report, Nigeria's HDI is 0.539, ranking it 161 out of 191 countries, indicating medium human development but reflecting persistent challenges in health, education, and income dimensions. This paradox raises concerns about the efficiency and effectiveness of public expenditure in translating financial resources into tangible improvements in human development [1].

Statistically, a large portion of Nigeria's public expenditure is allocated to recurrent costs such as salaries and debt servicing, which limits the funds available for capital investments in critical sectors like education, healthcare, and infrastructure. Nigerian budget allocated approximately 39% to recurrent expenditure, while capital expenditure accounted for about 22%, this imbalance hampers the government's ability to address fundamental human development needs Nigerian Ministry of Finance (NMF) 2023 [2]. The persistent low levels of literacy, high infant and maternal mortality rates, and inadequate access to basic healthcare and education services underscore the inefficiencies in public spending. The Nigerian Literacy Survey (2022) indicated a literacy rate of about 62%, while the National Bureau of Statistics (NBS) reported infant mortality at 67 deaths per 1,000 live births, both reflecting sub-optimal outcomes for the level of expenditure.

To address these issues, Nigerian policymakers have introduced several reforms and initiatives aimed at improving the effectiveness of public expenditure and enhancing human development. The National Development Plan (2021-2025) emphasizes increased investment in human capital sectors, targeting improvements in health, education, and social protection. Furthermore, the government has adopted the Medium-Term Expenditure Framework (MTEF), which seeks to align budgetary allocations with strategic development priorities, ensuring more focused and outcome-based spending.

Efforts to strengthen transparency and accountability, including the establishment of the Treasury Single Account (TSA) and the adoption of performance-based budgeting, aim to curb leakages and improve fund utilization. Additionally, the National Social Investment Programmes (NSIP) have been implemented to directly support vulnerable populations through conditional cash transfers, school feeding programs, and skills acquisition initiatives, thereby directly impacting human development indicators [3].

Despite these policy measures, significant challenges remain in the effective implementation and monitoring of government expenditure. Strengthening institutional capacity, enhancing data availability for evidence-based planning, and promoting community participation in budgeting processes are crucial steps needed to ensure that public expenditure translates into meaningful improvements in Nigeria's Human Development Index [4]. The study aims to investigate the following goals derived from the research questions: Analyse the impact of ongoing spending on Nigerian human development; Analyse how Nigerian human development is impacted by capital expenditure.

2. Literature Review

Public expenditure is the term used to describe the transfer of funds from the government to other economic sectors, whether or not the gesture is returned (CBN, 2016). Government spending is another name for public expenditures. According to Miftahu and Rosni (2017), as referenced in Ebipre and Eniekezineme (2020), public spending is done for two main reasons: to increase allocative efficiency in the face of externalities and to provide the infrastructure required for peace and order. The second justification is the supply of necessary infrastructure, which would eventually boost economic activity and productivity.

According to Pula and Elshani (2018), public spending is money spent by the government to guarantee that residents have access to social goods, welfare, and security. Public expenditure enhances economic activity, which further stabilises the economy. Public spending guarantees the availability of consumer products and the payment of investments while maintaining a fair income distribution. According to Musgrave (1959), public expenditure is the total sum of money spent by the government on goods and services, including welfare programs, infrastructure, and public services. Musgrave emphasizes that public expenditure is essential for the provision of collective goods and services that benefit society as a whole Baumol (1986) define public expenditure is defined as the financial outlay by government entities to fulfill their responsibilities and obligations to the public. This includes spending on education, healthcare, and public safety, which are crucial for maintaining social order and promoting economic stability Stiglitz, (2000) define public expenditure encompasses all government spending aimed at influencing the economy and improving social welfare. Stiglitz highlights that such expenditures are vital for addressing market failures and ensuring equitable distribution of resources among citizens [5].

Human development, according to Sen (1993), cited in Bagolin (2008), is the process that enhances people's capacities to do or be what they consider valuable. Sen also asserts that human development positively enhances people's freedom, allowing them to choose "who to be, what to do, and how to." The United Nations Development Programme [UNDP] (1990) defines human development as a process of expanding people's choices to live long and healthy lives, to be educated, and to enjoy a decent standard of living [6].

Alkire (2010) states that following UNDP reports from 1990 to 2000 characterised human development in a number of ways, including environment, social and relational aspects, health and life, education, a good standard of living, political freedom, creativity and productivity, and culture and the arts. ul Haq (1999) Therefore, human development encompasses all facets of development, including investments in fundamental technology, social services or safety nets for the impoverished, international trade, savings, fiscal policy, and the economy. Therefore, with people at the centre of growth, human development aims to advance society overall as well as economically [7]. According to Vijesandiran and Selvarasa (2018), human development is essential for reducing poverty because it advances those who are in charge of production and have the power to change society. It also improves natural and physical capital as well as human resources.

2.1 Theoretical Framework

The study's foundation is human capital theory, which holds that improving economic performance and productivity may be achieved by investing largely in health and education. Government spending on public services, particularly in education and healthcare, directly contributes to improving life expectancy, literacy rates, and income levels, thereby influencing HDI [8]. This theory underscores the rationale for public intervention to correct market failures in the provision of essential human services.

2.2 Empirical Review

Obayori et al (2024) examined government spending in education and human development index in Nigeria 1990-2020 Parsimonious Error Correction Model (PECM) with Augmented Dickey-Fuller (ADF) unit root tests. The findings showed that capital expenditure in education positively and significantly impacts HDI, while recurrent expenditure has a positive but insignificant effect. The study recommends prioritize capital spending in education to enhance infrastructure, and ensure efficient utilization of recurrent expenditure for salaries and remuneration [9].

Ajaero et al (2024) examine public expenditure and human development in Nigeria 2003-2022, utilizing multiple regression analysis using Least Squares System Regression. The result showed that capital expenditure significantly enhances HDI, whereas recurrent expenditure shows an insignificant effect [10]. The study recommends that increase capital investments in infrastructure, especially in rural areas, to boost human development.

Agbeni et al. (2024) looked at Nigeria's poverty rates, economic development, and government spending using a disaggregated approach from 1991 to 2023. The Granger causality test, threshold regression technique, autoregressive

distributed lag (ARDL) model, and error correction model were all used in the study. The results demonstrated that government spending had a negligible effect on reducing poverty; ongoing investments in health, education, and agriculture have a negative but negligible effect on economic growth. In order to achieve sustained economic growth and poverty reduction, the report suggests increasing funding for priority areas like infrastructure, agriculture, health, and education. Syder and Bello (2024) examined public expenditure pattern and economic performance: The Nigerian Analytical Evidence 1981-202. Augmented Dickey-Fuller. The study reviewed that capital expenditure positively influences economic performance, while recurrent expenditure and public debt have negative impacts [11]. The study recommends government should enhance fiscal discipline, reduce recurrent expenditure, and focus on capital projects to stimulate economic growth.

Duruechi and Chigbu (2022) looked at how government capital spending affected Nigeria's economic growth between 1990 and 2020. To determine the impact of government capital expenditures broken down into economic services, social and community services, transfers, and administration on economic development as measured by per capita income, the study used ordinary least square analyses. The results showed that capital expenditures collectively had a favourable and noteworthy impact on Nigeria's economic growth [12]. In Nigeria, social and community services had a major impact on per capita income, whereas economic services, transfers, and administration had negligible positive and negative effects. The report suggests that the government provide more funds for major projects [13].

The impact of public spending on the development of human capital in Nigeria between 1960 and 2019 was studied by Eneisik (2021). Ordinary least squares were used in the study to analyze the effect of public health expenditure and education expenditure on human development index in Nigeria [14]. The study findings showed that both health and education expenditure have positive but insignificant effect on human capital development in Nigeria.

The study recommends focus on the welfare of the staff for effective quality on human capital development.

Etim et al. (2021) used the Fully Modified Least Squares Model to examine how public spending affected Nigeria's economic progress between 2000 and 2019. Public capital spending, public recurrent expenditure, external borrowing, and the human development index were the variables used. The results demonstrated that every independent variable significantly and favourably impacted Nigeria's economic growth. The report suggests that government policies be strengthened.

Utpal and Christopher (2020). Examine Namibia's government spending on growth and human capital using a time series analysis spanning 1980 to 2015. The results show a strong, long- term positive correlation between government spending on education and the gross tertiary enrolment rate, net primary enrolment rate, and literacy rate. However, there is little evidence of a co-integration between the gross enrolment rate at the primary and secondary levels and government spending on education. Significant effects of spending on healthcare, education, and long-term GDP growth through enhanced human resources were found using the vector auto-regression approach. The study recommends government should strengthen it capital spending more to improve human capital [15].

Samuel and Ngozi (2019) looked into the development of human capital and government spending on education in West African nations. The outcome demonstrates that more government spending on health and education has a favourable and noteworthy effect on primary and secondary school enrolment. Government health spending and primary and secondary school enrolment are bidirectionally causally related, according to the Granger causality conclusion. The outcome also demonstrates a two-way causal relationship between secondary school enrolment and government spending on education. According to the report, the government should make its policies stronger to ensure that resources are used efficiently.

Omodero (2019) investigated the connection between Nigerian human development and government general spending between 2003 and 2017. The variables in the study were capital spending, inflation, corruption, and the human development index (HDI). The data was analysed using the multiple linear regression model and the ordinary least square method. Findings revealed that capital expenditure has negative and insignificant influence on HDI while recurrent expenditure has strong and positive influence on HDI [16]. Further analyses revealed that while corruption did not have any impact on HDI, inflation has a negative and insignificant effect on HDI. The study recommends rule of law should be strength to curb corruption.

Ogar et al. (2019) used the vector autoregressive approach (VAR) to examine the effect of public spending on economic development in Nigeria for the period. The study found that while government fiscal deficit had a negative, negligible link with economic growth in Nigeria, government capital expenditure had a positive, albeit negligible, impact on economic growth [17]. The expansion of the Nigerian economy was positively but marginally impacted by recurring expenditures, although in the short term, these expenditures had a positive but negligible impact. Okoye et al. (2019) used autoregressive distributed lag to assess the long-run and short- run correlations between government spending and economic growth from 1981 to 2017. In order to account for inflation, public spending in Nigeria was broken down into capital and ongoing expenditures. GDP was used as a proxy for economic growth. While the short-run test indicated a negative significant link between lagged recurrent expenditure and economic growth, the long-term findings demonstrated no meaningful relationship between public spending and GDP [18]. In the short term, there was also a high correlation between lagging capital spending and economic growth. In order to boost growth, the report suggests allocating more funds for capital projects.

Using capital spending, recurring expenditure, and debt recovery as independent variables and the human development index as the dependent variable, Ihenetu and Sotonye (2019) investigated the relationship between budget execution and human development in Nigeria between 1999 and 2018. Using the ordinary least square multiple regression test, the study found that while recurrent expenditure had a substantial impact on HDI over the study period, capital expenditure and debt recovery had no discernible influence on human development. It was discovered that the implementation of the budget had an overall impact on the period's development. It suggests reducing recurring expenses and placing more emphasis on capital expenditures.

Omodero (2018) examined government sectoral spending and human development in Nigeria between 1999 and 2016, with a focus on the impact of specific non-development government spending on GDP, such as defence and security, healthcare, education, and public debt servicing. The findings revealed among others that government spending on public debt servicing, defense and security had significant positive influence on GDP while the other predictor variables had negative impacts on GDP. Based on the outcome, According to the report, government funds should be redirected to healthcare, education, and agriculture since these sectors can significantly contribute to the nation's economic expansion [19].

Edeme et al. (2017) investigated how governmental spending on human development in Nigeria was distributed between 2007 and 2017. In order to ascertain the impact of public spending, as measured by government spending, on housing, energy, education, health, agriculture, rural development, water resources, and environmental protection, the study employed a panel approach. HDI is used to measure human development. The analysis found that while government spending on housing, energy, and environmental protection has a declining marginal impact on human development in Nigeria, government spending on education, health, agriculture, rural development, and water resources had a positive marginal effect. The study suggests that in order to promote higher-quality human development, the government should raise public spending.

Using data from Nigeria from 1990 to 2015, Ogbonnaya et al. (2017) examined the connection between government investment in human capital and human capital development. Autoregressive distributed lag techniques are used in the study. The findings show that government expenditure on health has a beneficial, if mostly negligible, short- and long-term influence on the development of human capital in Nigeria. This is not the case for government spending on education, which explains why Nigeria has a low human development index. The report recommends that in order to enhance the educational system, greater focus be placed on the educational sector [20].

Michael (2017) examined the relationship between government investment in human capital and economic growth in sub-Saharan Africa, using data from Ghana, South Africa, and Nigeria (1980-2013). The findings demonstrate that while the literacy ratio (LR) is marginally beneficial across all nations, two of the three human capital proxy variables-health (GIH) and education (GIE)-have a significant positive impact on growth only in Nigeria. The study suggests cooperation in terms of knowledge and skill proficiency.

Paul and Akindele (2016) looked at how Nigeria's economic growth was affected by the development of human capital. To evaluate the link between the variables included in the study, ADRL-Co-integration analysis is employed. The study's conclusions showed that, although statistically insignificant, there is a positive long-term correlation between secondary school enrolment, public education spending, life expectancy rate, gross capital formation, and economic growth [21]. The findings also demonstrated a negative long-term correlation between economic growth, public health spending, and enrolment in elementary and postsecondary education. Restructuring policies to accommodate capital investment is suggested by the study.

Babalola (2015) examined the relationship between fiscal policy and economic development between 1981 and 2013, using pairwise correlation to ascertain how fiscal policy, as measured by government capital expenditure, investment, and recurrent expenditure, and economic development, as measured by real per capita income, were related. The findings showed that both short- and long-term economic development is positively and significantly impacted by government investment and recurring spending. While tax income had a large adverse effect in both the short and long term, capital expenditures only had a positive impact in the short term. According to the analysis, tax revenue should be used more wisely [22].

Abu and Abdullahi (2010) investigated how government spending affected Nigeria's economic expansion between 1970 and 2008. The study used disaggregated analyses and found that while government spending on health, communication, and transportation boosted economic growth in Nigeria, government spending on education, total recurrent expenditure, and total capital expenditure had a negative impact [23]. The study suggests that in order to spur growth, government spending should also concentrate on education.

3. Methodology

3.1 Nature and Sources of Data

The analysis of the study make use of time series secondary data spanning from 2003 to 2024. The Nigerian Bureau of Statistics, the Central Bank of Nigeria (CBN) Statistical Bulletins, the United Nations Development Programme (UNDP), and additional secondary sources such as publications and internet articles would be the sources of the data [24].

Table 1. Description, Measurement and Sources of Variables

Variable	Description/Measurement	Source
Human Development Index (HDI)	characterises human progress as the process of expanding people's options. These decisions cover topics like attaining a respectable quality of living, becoming educated, and living a long and healthy life. Political freedom, human rights, and self-respect are also included. The main goal of human development is to establish conditions that allow people to reach their greatest potential and live creative, fruitful lives.	UNDP (2024)
Capital Expenditure (CEXP)	capital expenditure refers to the funds used by the government to acquire, upgrade, or maintain physical assets such as infrastructure, buildings, and equipment. This type of expenditure is aimed at long-term investment for development projects that contribute to economic growth and enhance public services.	CBN (2024)
Recurrent Expenditure (REXP)	Encompasses the ongoing costs associated with the day-to-day operations of the government. This includes expenses for salaries, utilities, maintenance, and other operational costs necessary to sustain public services and administrative functions	CBN (2024)
Interest Rate (INTR)	interest rate as the cost of borrowing, or the return for lending, expressed as a percentage of the principal amount	World Bank (2024)

Source: *Author's Compilation, 2025*

Table 1 explains the definitions, measurement methods, and sources of the four core variables used in the study (HDI, Human Development Index; CEXP, capital expenditure; REXP, current expenditure; and INTR, interest rate). It helps readers understand the meaning of each variable in the model and the source of the data.

3.2 Model Specification

Using the neo-classical growth model, the study looked at the relationship between agricultural output and financial inclusion in Nigeria. The econometric model is constructed by us; the study assumes that the production in the economy for control at a time is given by the following production function.

$HDI = F(CEXP, REXP)$

The model above is the baseline model, human development index (HDI), capital expenditure (CEXP), recurrent expenditure (REXP) and interest rate (INTR)

The linear regression equation based on the above functional relation is stated thus:

$HDI = \beta_0 + \beta_1 CEXP_t + \beta_2 REXP_t + \beta_3 INTR_t + \mu_t$

Where:

HDI= Human Development Index

CEXP = Capital expenditure

REXP = Recurrent expenditure

INTR= Interest rate

β_0 = Intercept/Constant

β_1 - β_2 = Slope

μ_t = Error Term

The a priori expectation is that $\beta_1 > 0$, $\beta_2 < 0$

Capital expenditure (CEXP) should increase while recurrent expenditure (REXP) and interest rate (INTR) should decrease.

3.3 Method of Data Analyses

This will be carried out to observe and examine the direction and pattern of distribution of variables employed in the study.

3.3.1 Descriptive Statistics

Descriptive statistics are succinct descriptive coefficients that provide an overview of a particular data collection, which may be a sample or a representation of the full set. Measures of population and central tendency are separated out in descriptive statistics. measurements of dispersion or variability [25]. The mean, median, and mode are indicators of central tendency, whereas the variance, standard deviation, minimum and maximum variables, kurtosis, and skewness are indicators of variability. In order to verify if the observations are normal, the Jarque-Bera test will also be taken into consideration.

3.3.2 Unit Root Test

Stationarity is a crucial component to be considered when modelling time series data. A stationary series possesses a constant mean, variance, and auto covariance for each lag. If the time series data reveal non-stationarity, then the mean variance and auto covariance is not constant. Non-stationarity data leads to spurious statistical inferences and makes results to be unrealistic, unreliable and inaccurate. There are several methods used in conducting unit root tests and the Augmented Dickey-Fuller (ADF) and Philip Perron (PP) tests are among the commonest [26].

The unit root model for Perron is given below as;

$$Y_t = \mu + \theta DU_t + \beta t + YDT_t + \delta D(T_b)_t + \alpha y_{t-1} + \sum_{i=1}^{k} Ci\Delta y_{t-1} + e_t$$

Let Y be the variable being studied, μ be the constant or intercept, Δ be the first difference operator, t be the time trend, DTb be the time at which structural change takes place, DT be the slope, and e be the error term. Only a single temporal modification in both intercept and slope is permitted by the model. The variables under consideration (HDI, CEXP, REXP, and INTR) are represented by the (nx1) column vector Xt, the (nx1) vector of constant terms μ, the co- efficient matrices Γ and Π, the difference operator Δ, and εt. In order to calculate the likelihood ratios (LR) test statistics that may be used to identify the distinct co-integration vectors of Xt, the multivariate Johansen Co-integration test necessitates the estimation of the VAR equation and the residuals. The maximal Eigenvalue test and the trace test are two statistics that can be used to test the co-integration rank [27].

3.3.3 Co-integration Test

In general, the ARDL approach, which was created by Pesaran, Shin, and Smith (2001) and is illustrated by Equation 3.4, would be used to conduct the bound co- integration test of the variables.

$$\Delta \ln y_{it} = \lambda_0 + \sum_{i=1}^{n} \lambda_0 \Delta \ln y_{u-1} + \sum_{i=1}^{n} \beta_j \ln y_{u-1} + \varepsilon_t$$

The long-term link between the study's variables was investigated using the ARDL bound test. The null hypothesis should be rejected since the F-statistic exceeds the upper bound's critical value. Conversely, the null hypothesis should be accepted if the lower critical bound value exceeds the F-statistic, which proves that the variables are co-integrated, and vice versa.

3.3.4 Estimation Technique

The study will employed autoregressive distributed lag (ARDL) technique of analysis in the study.

Auto Regressive Distributed Lag (ARDL)

The method of data analysis is used when variables are integrated of a mixed order of series such as I(0) and I(1). This is because all variables will not behave like constants which are required in OLS and as most of them are changing in time so OLS will mistakenly show high t-values and significant results but in reality, it would be inflated because of the commo time component. This is called spurious results in econometric where the R square of the model becomes higher than the Durbin-Watson Statistics [28]. ARDL hence becomes the most suitable estimating technique in such a scenario. The main benefit of ARDL is that it will yield a better estimate if the disturbance term u is autocorrelated, while the OLS will also be an inconsistent estimator in this situation. The following details describe the ARDL model used in this study:

$In\text{HDI}_t = \alpha_0 + In\beta_1\text{CEXP}_t + In\beta_2\text{REXP}_t + In\beta_3\text{INTR}_t + \mu_t$

3.3.5 Post Estimation Tests

Post-estimation tests like Breusch-Godfrey serial correlation LM test, heteroskedasticity test, etc. intends to be conducted to show that the model estimation is error-free.

3.4 Presentation and Discussion of Results

Table 2. Descriptive Statistics Result

	CEXP	REXP	HDI	INTR
Mean	1202.490	4085.670	0.509545	16.25927
Median	939.7200	3557.980	0.505000	16.82042
Maximum	2522.470	9145.160	0.570000	20.71417
Minimum	241.6900	984.3000	0.450000	11.48313
Std. Dev.	690.9235	2442.342	0.033449	2.249378
Skewness	0.642063	0.477494	0.040427	-0.363421
Kurtosis	2.178659	2.147712	1.969401	2.840575
Jarque-Bera	2.129948	1.501864	0.979616	0.507571
Probability	0.344737	0.471927	0.612744	0.775858
Observations	22	22	22	22

HDI= Human Development Index ,CEXP = Capital expenditure, REXP = Recurrent expenditure and INTR= Interest rate

Source: Author's Computation E-view 13, version 2025

Table 2 show Capital expenditure (CEXP) and current expenditure (REXP) show significant fluctuations, indicating significant variations in government fiscal spending. The Human Development Index (HDI) is relatively stable, with a mean of approximately 0.51 and close to normal skewness and kurtosis. The interest rate (INTR) averages approximately 16.26%, with a distribution close to normality but slightly skewed to the left.

The study's variables-capital expenditure (CEXP), recurrent expenditure (REXP), interest rate (INTR), and human development index (HDI)-are distributed and have features that may be inferred from the descriptive statistics.

The mean values suggest that recurrent expenditure (₦4,085.67 billion) is significantly higher than capital expenditure (₦1,202.49 billion) over the study period, reflecting Nigeria's persistent bias toward recurrent spending in fiscal allocations. The HDI mean value of 0.5095 indicates that Nigeria's human development remained in the medium development category according to UNDP standards. The interest rate averaged 16.26%, suggesting relatively high borrowing costs which could influence investment decisions [29].

The standard deviations reveal substantial variability in expenditure variables, particularly REXP (2,442.34) compared to CEXP (690.92), indicating more pronounced fluctuations in recurrent spending patterns over time. In contrast, HDI exhibited minimal dispersion (0.033), implying relatively slow changes in human development over the years.

Skewness values for CEXP and REXP are positive, indicating right-skewed distributions where a few periods of exceptionally high expenditures occur relative to the mean. HDI is also slightly positively skewed, consistent with incremental improvements over time. The negative skewness of the interest rate (-0.363) suggests a slightly longer left tail, possibly driven by occasional reductions in rates.

Kurtosis values for all variables are below the threshold of 3 for a normal distribution, indicating relatively platykurtic distributions with lighter tails, except for INTR which is slightly leptokurtic (2.84), suggesting occasional extreme interest rate values.

The Jarque-Bera test statistics and associated probabilities confirm that all variables fail to reject the null hypothesis of normality at conventional significance levels, supporting the use of parametric econometric techniques in subsequent analysis [30]. The relatively small sample size (n = 22) also justifies the application of ARDL methodology, which is appropriate for small samples and mixed orders of integration.

3.4.1 Unit Root Test

To ascertain the stationary property of the time series variables, the data analysis starts with a unit root test on each variable. The unit root was tested using the Augmented Dickey-Fuller test, and all the variables were regressed on trend and intercept to see if they had trend. Upon finding that all the variables had trend and intercept, the unit root test was conducted using trend and intercept, as shown in table 4.2.

Table 3. Unit Root Test for Stationarity Result

Variables	ADF t-statistic	P. value	order of integration
LNCEXP	-5.517420	0.0013	1(1)
LNHDI	-4.188085	0.0183	1(1)
LNINTR	-4.324003	0.0141	1(1)
LNREXP	-4.393539	0.0123	1(1)

LNHDI= Log Human Development Index, LNCEXP = Log Capital expenditure, LNREXP = Log Recurrent expenditure and LNINTR= Log Interest rate

Source: Author's Computation E-Views Output, Version 13 2025.

Table 3 mention the four variables (LNCEXP, LNHDI, LNINTR, and LNREXP) underwent unit root test using the Augmented Dickey-Fuller (ADF) test all variables were found to be stationary at first difference.

3.4.2 Co-integration Bounds Test

Using the ARDL Bound test to determine that all series are not stationary at the same order, the study moves on to the co-integration test. It is possible to examine the long-term equilibrium relationships between the series using the co-integration test. The bound test's F- Statistic value and the critical value boundaries, as shown by the regression result in the table below

Table 4. F-Bounds Test Result

Test Statistic					Value
F-statistic					10.040052
Critical Value					
	10%		5%		1%
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
30	2.676	3.586	3.272	4.306	4.614	5.966

Source: Author's Computation E-Views Output, Version 13, 2025

Table 4 list the results of the ARDL bounds test demonstrate that there is a long-term relationship between the dependent variable in the model and the exogenous variables. This is demonstrated by the computed F statistic of 10.040052, which is higher than the significance level (3.272), upper critical value (4.306), and lower critical values of 5%. demonstrates that there is a long-term link between the variables. In other words, since the F test statistic is below the crucial lower limits value I(0), the null hypothesis that there is no co-integration can be rejected at 5% significance levels.

3.4.3 Auto Regressive Distributed Lag (ARDL) Test

Table 5. Auto Regressive Distributed Lag (ARDL) Result

Dependent Variable: LNHDI		Long-Run			
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNHDI(-1)	1.042590	0.106328	9.805390	0.0000
LNCEXP	-0.002409	0.007974	-0.302037	0.7668
LNREXP	-0.051227	0.015994	-3.202837	0.0059
LNREXP(-1)	0.045718	0.014899	3.068606	0.0078
LNINTR	0.015852	0.022335	0.709749	0.4887
C	0.062268	0.182656	0.340900	0.7379
		Short-Run			
COINTEQ*	0.042590	0.005341	7.974145	0.0000
D(LNREXP)	-0.051227	0.012525	-4.090053	0.0006
R-squared	0.471561			
Adjusted R-squared	0.443749			
F-statistic	16.95498			
Prob(F-statistic)	0.000586			
Durbin-Watson stat	2.393107			

Source: Author's Computation E-Views Output, Version 13, 2025

Table 5 show the Auto Regressive Distributed Lag (ARDL) estimation results provide valuable insights into both the long-run and short-run dynamics between the Human Development Index (HDI) and the explanatory variables under consideration. In the long-run estimates, the lagged dependent variable LNHNDI(-1) has a coefficient of 1.042590 with a standard error of 0.106238, yielding a t-statistic of 9.805390 and a p-value of 0.0000. This positive and highly significant result suggests strong persistence in HDI over time, meaning that past HDI values have a substantial influence on current levels. This reflects inertia in human development outcomes and the tendency for such indicators to adjust slowly.

Government capital expenditure (LNCEXP) records a negative coefficient of -0.002409 with a t-statistic of -0.302037 and a p-value of 0.7668, indicating a statistically insignificant effect on HDI in the long run. This suggests that capital spending, on its own, does not have a measurable long-term effect on HDI within the study period. Recurrent expenditure (LNREXP) has a coefficient of -0.051227, significant at the 1% level (p-value = 0.0059), implying that higher recurrent spending is associated with lower HDI in the long run. This may reflect inefficiencies, leakages, or misallocations in recurrent spending. Interestingly, the lagged recurrent expenditure variable LNREXP(-1) shows a positive and significant coefficient of 0.045718 (p-value = 0.0078), suggesting that recurrent expenditure may yield beneficial effects on HDI only after some time lag, possibly due to the delayed impact of sustained spending on education, healthcare, and other social services.

The public investment variable (LNINTR) has a coefficient of 0.015852 with a p-value of 0.4887, showing a positive but statistically insignificant effect on HDI in the long run. Similarly, the constant term (C) is positive at 0.062268 but statistically insignificant (p-value = 0.7379), indicating that other unmeasured factors may be contributing to HDI beyond the included variables.

The error correction term (COINTEQ*), using the short-run estimates, has a p-value of 0.0000, a t-statistic of 7.974145, and a coefficient of 0.042590. The positive sign of this coefficient deviates from the typical negative expectation in error correction models, despite the fact that it is extremely significant. This implies that there might be distinct structural dynamics in Nigeria's economy or possible specification problems impacting the adjustment process, rather than the model demonstrating convergence towards long-run equilibrium following a shock. Further evidence that immediate increases in recurrent spending are linked to a fall in HDI comes from the short-run change in recurrent expenditure (D(LNREXP)), which has a coefficient of -0.051227, a t-statistic of -4.090053, and a p-value of 0.0006. This supports the conclusion that recurring budget allocations could be ineffective or poorly targeted, and it is consistent with the long-term outcome. With an R-squared of 0.471561 and an adjusted R-squared of 0.443749, the model's explanatory power is moderate, meaning that the factors it includes account for about 47% of the variation in HDI. It is confirmed that the explanatory factors are jointly significant in explaining changes in HDI by the F-statistic of 16.95498 and the p-value of 0.000586. According to the Durbin-Watson statistic of 2.393107, autocorrelation is not a significant issue in this specification.

3.4.4 Post Estimation Test

Table 6. Post Estimation Test result

Variables	Statistics	P. Value
Normality Result	0.147631	0.928843
Breusch-Godfrey Serial Correlation Result	3.431574	0.0636
Breusch-Pagan-Godfrey Heteroskedasticity Result	0.893104	0.5102

Source: Author's Computation E-Views Output, Version 13, 2025

Table 6 show the post estimation in illustrates Furthermore, the findings of both the Breusch-Pagan-Godfrey Heteroscedasticity Test and the Jaque-Bera Normality Test demonstrate that the residuals exhibit homoscedasticity, characterized by a constant variance, thereby avoiding significant deviation from their anticipated mean values.

3.4.5 Hypothesis Decision

Based on the t-statistics table and the t-statistics probability value, the hypothesis outlined in the study's first chapter will be examined at the 5% level of significance. The choice rules are as follows: we reject H0 and accept H1 if the probability value is less than 0.05 (the 5% level of significance); otherwise, we accept H1.

The computed probability value of recurring expenditure from the first hypothesis is 0.0059, which is below the significance level of 0.05. We agree with the null hypothesis, which suggests that ongoing spending has a major impact on Nigeria's human development index. In the second hypothesis, we reject the null hypothesis, which states that capital expenditure has no significant impact on Nigeria's human development index, because the computed probability value of capital expenditure is 0.7668, which is higher than the 0.05 significance level.

4. Discussion of Findings

The ARDL reveals the relationship between public expenditure and human development in Nigeria across both short- and long-run horizons. The strong statistical significance of the lagged dependent variable for HDI underscores the persistence of human development outcomes over time. This persistence effect suggests that improvements in HDI are path- dependent, meaning once development gains are achieved whether through improved life expectancy, higher educational attainment, or better living standards they tend to sustain themselves if complementary policies are maintained. This finding is consistent with Adamu et al. (2023), who demonstrated that past investments in health and education in sub-Saharan African economies create long-term growth momentum, even when subsequent expenditure fluctuates.

Recurrent expenditure emerges as a double-edged sword. In the long run, its negative and statistically significant coefficient implies that disproportionate allocations toward recurrent costs-such as salaries, administrative expenses, and non-investment-based spending-may undermine human development. This aligns with Nwosa (2022), who found that recurrent- heavy budgets in Nigeria tend to divert resources away from productive infrastructure and capacity-building initiatives, thereby slowing improvements in HDI. However, the positive and significant coefficient of lagged recurrent expenditure suggests that its impact materializes over time, likely due to gradual service delivery improvements or institutional stabilization effects. Etim et al. (2021) similarly observed that recurrent spending on education and healthcare, when efficiently targeted, can yield significant long-run gains in human capital, even if the immediate effect is neutral or negative. Additionally, immediate increases in recurrent expenditure in the short run negatively influence HDI, supporting the view that short-term resource injections, if poorly targeted, may have counterproductive effects-either by fuelling inflationary pressures, overburdening administrative systems, or failing to address urgent social deficits.

Capital expenditure, surprisingly, shows an insignificant effect on HDI in the long run. This is counterintuitive to conventional development theory, which posits that investments in infrastructure-such as hospitals, schools, and water systems-should translate into higher HDI scores. The result likely reflects structural inefficiencies, delays in project execution, and possible misallocation of capital budgets. The findings resonate with a recent Heliyon (2023) study, which concluded that capital spending in Nigeria often fails to produce measurable development outcomes due to weak project management, corruption, and lack of maintenance culture. This suggests that the mere scale of capital allocation is insufficient; efficiency, transparency, and governance quality are equally crucial. The evidence aligns with global development finance literature, which stresses that fiscal effectiveness, not just fiscal scale, determines developmental outcomes.

5. Conclusion and Recommendations

The findings underscore that the size of Nigeria's public expenditure is less important than its composition, quality, and governance. While recurrent spending can eventually support human development, its short-run negative effects suggest that careful targeting and efficiency reforms are essential. The negligible impact of capital expenditure highlights deep-rooted challenges in public investment management, where large allocations fail to yield proportional social returns due to inefficiency, corruption, and weak project monitoring. Effective fiscal policy, therefore, must focus not only on budgetary expansion but also on institutional reforms that ensure expenditures both recurrent and capital are strategically deployed to improve education, healthcare, and living standards.

The findings lead to the following recommendations: Nigeria should gradually shift budget allocations toward capital expenditure to boost infrastructure, education, and healthcare, thereby improving long-term HDI outcomes. Recurrent spending should be made more efficient and transparent through audits and performance-based budgeting to ensure it supports, rather than limits, developmental investments.

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