

Bridging the productivity gap: The role of human capital development on national development in Nigeria

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ABSTRACT

This research investigates the impact of Human Capital Development (HCD) on Nigeria's national progress between 1996 and 2025, utilizing secondary data sourced from the World Bank and the Central Bank of Nigeria (CBN). Preliminary diagnostics via stationarity tests indicated a mixed order of integration among the variables, justifying the adoption of the Autoregressive Distributed Lag (ARDL) framework. The empirical results demonstrate that in the long run, government capital expenditure on education significantly drives economic development. Conversely, in the short run, recurrent educational spending serves as a primary catalyst for growth. Consequently, the study recommends a substantial increase in budgetary provisions for the education sector and advocates for the institutionalization of qualitative and affordable healthcare services

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1. INTRODUCTION

Sustainable development has evolved into a universal mandate, requiring modern states to harmonize workforce optimization with natural resource stewardship (Benjamin, 2025). In the Nigerian context, prioritizing human capital is essential for systemic economic advancement. Rather than peripheral investments, education and technical training function as critical drivers of innovation. By augmenting the skill set of the labor force, the nation can elevate its aggregate productivity and create a fertile environment for entrepreneurs to pioneer new sectors and drive structural economic change (Amadi & Alolote, 2019). During the late twentieth century, the synergy between scientific innovation, technology, and inclusive governance accelerated global socio-economic development and raised living standards (Yetunde and Ola, 2015). Post-WWII progress in nations like the USA, Japan, France, and China stems from aggressive human and institutional capacity building. The institutionalization of human capital—driven by universities, research centers, and government—is the foundation of sustainable growth (Aigbokhan, Imahe and Ailemen, 2007). Historically, countries like the UK and Japan utilized cross-border skill acquisition to drive domestic industrial innovation. Similarly, China's current technological dominance is a direct result of massive, continuous investment in a highly skilled workforce as the primary engine of economic expansion (Amadi & Alolote, 2019). Global disparities in development stem from the quality of a nation's human capital rather than its natural resource endowments. As Adelakun (2011) argues, humans are the ultimate "ends" of growth, not merely the "means"; therefore, economic success must be measured by the improvement of the human condition. While physical capital and resources are passive inputs, human beings are the active agents of production who mobilize capital and build the institutions necessary for national progress (Anyanwu et al., 2015). Okonjo (2025) reaffirms that human capital is the definitive basis of a nation's wealth. Consequently, a failure to develop intellectual competencies precludes progress in all other sectors. Strategic investment in the citizenry is, therefore, a prerequisite for global competitiveness and sustainable macroeconomic expansion.

Recognizing human capital as a catalyst for socio-economic progress, successive Nigerian administrations have increased fiscal allocations to the health and education sectors. While education spending fluctuated—rising from ₦185 million in 1970 to ₦3 billion by 2017—the health sector has seen a more dramatic recent expansion. Health allocations grew from ₦85 million in 1975 to over ₦1.3 trillion in 2024, reaching a record ₦1.51 trillion in the 2025 Budget of Resilience (World Bank, 2025). This sustained upward trajectory in nominal spending underscores an intensified strategic focus on human capital as the foundation for long-term economic stability. Despite the dramatic surge in nominal public spending on the social sector, the transmission mechanism between human capital investment and national growth appears dysfunctional. The expected correlation between increased health and education funding and overall economic prosperity has yet to

materialize in a statistically significant way. Given these prevailing conditions, it is essential to re-examine the nexus between human capital investment and national prosperity. This investigation is timely as it addresses the urgent need to understand why substantial social spending has not yet catalyzed the expected economic expansion

2. LITERATURE REVIEW

This section is dedicated to the conceptual clarification of human capital and economic development, alongside a review of the foundational theories and relevant empirical literature that underpin this study

2.1 Human Capital Development

Adisa (2024) defines Human capital development as the strategic transition from basic literacy to digital fluency, where the primary goal is to equip the workforce with the ability to interface with artificial intelligence and automated systems. It is no longer merely about vocational skills but about cognitive agility—the capacity to rapidly unlearn and relearn technical competencies in a volatile labor market. Human capital development is a bio-social investment process. It is the integration of nutritional security, mental well-being, and specialized pedagogy. Without a baseline of physical health and cognitive stability, educational investments result in hollow capital—where degrees are obtained but the physiological capacity for high-intensity productivity is absent. Yusuf and Jimaza (2025) see human capital development as the dual process of skill acquisition and talent retention. It involves not only the formal schooling and training of citizens but also the creation of an institutional holding environment that prevents capital flight (Brain Drain). Under this view, development is unsuccessful if the produced capital cannot be utilized within the domestic macroeconomic framework. Human capital development according to Amadi and Alolote (2019) is the process of increasing human knowledge through improving skills by vocational and technical education, aimed at enhancing trainees' productivity and stimulating their resourcefulness. It is the human capability and productivity engendered through knowledge and skills acquired from vocational and technical education, training and experience and facilitated by a stimulating environment.

2.2 Economic Development

Krueger (2019) conceptualizes economic development as the structural metamorphosis of rudimentary, low-income nations into sophisticated industrial economies. While often conflated with economic growth, the term more accurately denotes a dual process of quantitative expansion and qualitative institutional advancement. This field emerged as a critical departure from classical economics, which focused exclusively on aggregate national product. In contrast, modern development theory emphasizes the enhancement of human entitlements and capabilities,

prioritizing metrics such as health, nutrition, literacy, and broader social welfare (Todaro and Smith, 2011). Sachs et al. (2023) redefine economic development as the achievement of Integrated Prosperity. In this view, development is the process of improving human well-being through health and education while simultaneously decoupling economic output from environmental degradation. They argue that any growth that compromises the ecological security of future generations cannot be classified as development.

2.3 Human Capital Theory

The Human Capital Theory, as articulated by Romer (1986), posits that education serves as a catalyst for worker productivity and efficiency by augmenting cognitive competencies. This conceptualization builds upon the work of Schultz (1961), who pioneered the idea that individuals accumulate a stock of human capital through deliberate investments. These investments—encompassing education, vocational training, healthcare, and nutrition—necessitate a trade-off where current consumption is sacrificed to enhance future productive capacity. Crucially, this stock only expands when gross investment outpaces the depreciation caused by time, obsolescence, or underutilization. Proponents of this theory argue that such human-centric investments are often as valuable, if not superior, to investments in physical capital

2.4 Empirical Review

While a vast body of global literature examines the nexus between human capital and economic development, this review prioritizes empirical evidence from the Nigerian context. Adeyemo (2025) investigated the long-run co-integration between primary education enrollment and GDP growth. The study found that for every 10% increase in quality-adjusted education spending, there was a corresponding 2.4% rise in industrial output, confirming that foundational education remains a primary driver of the Nigerian Vision 2030 goals. Nwaeze & Ireokwu (2024) focused on the healthcare-productivity nexus. Their findings indicate that government health expenditure has a more immediate impact on Real GDP than education spending, as a healthier workforce experiences lower absenteeism and higher immediate labor efficiency.

Balogun et al. (2023) argued that recurrent expenditure in the education sector (salaries and teacher training) significantly boosts the service sector, particularly in telecommunications and banking, which are Nigeria's fastest-growing sectors. Amadi and Alolote (2019) investigated the impact of human capital investment on Nigeria's economic performance between 1986 and 2017. Utilizing longitudinal data from the Central Bank of Nigeria (CBN) Statistical Bulletin and the National Bureau of Statistics (NBS), the authors employed Ordinary Least Squares (OLS) regression techniques. Their empirical results demonstrate a statistically positive correlation between public health expenditures and Real GDP. Furthermore, the model yielded an adjusted R^2 of 0.973, indicating that 97.3% of the variance in Nigeria's Real GDP is explained by the combination of government spending on education, health, and gross fixed capital formation. Olure-Bank and Usman (2018) investigates the impact of human capital (proxied by capital expenditures on education and health) on economic growth in Nigeria. In doing this, time series data from 1986 to 2016 were fitted into Cobb-Douglas production function and analyzed using ordinary least square multiple regression analytical method (OLS). Empirical results affirmed that expenditure on health has a significant and positive relationship on economic growth while expenditure on education has a negative and significant relationship on economic growth.

Ogunniyi (2018) explored the relative impact of human capital formation (school attainment) on economic growth in Nigeria from 1981 to 2014 using time series data of thirty-four (34) years. The empirical analysis begins with an investigation of the stationarity of the variables. Upon which the study used the ARDL bound estimation techniques to examine the existence of long run and short run dynamic relationship between human capital formation and economic growth in Nigeria. The results show that a long run positive relationship exists between human capital formation and economic growth in Nigeria.

3. METHODOLOGY

This research adopts an ex-post facto design, utilizing a combination of descriptive and quantitative analytical techniques. Initial descriptive statistics were employed to characterize the dataset's properties, while secondary data were subjected to rigorous econometric analysis. Specifically, the study utilizes the Augmented Dickey-Fuller (ADF) unit root test to evaluate the time-series properties and stationarity of the variables. Subsequently, the Autoregressive Distributed Lag (ARDL) framework was

applied to investigate the long-term relationship between human capital development and economic growth in Nigeria

Drawing from the established theoretical frameworks of human capital and the synthesis of existing empirical literature, several critical determinants of development have been identified. Key variables include public expenditure on health and education, school enrollment rates, gross fixed capital formation, and life expectancy, alongside core economic indicators such as GDP and GDP per capita. Synthesizing these theoretical postulates and empirical insights, the econometric model for this study is specified as follows

$$HDI = f(GCEE, GREE, GCEH, GREH) \text{ -----(1)}$$

Where,

HDI = Human development Index (proxy for economic development), GCEE = Government capital expenditure on education, GREE = Government recurrent expenditure on education, GCEH = Government Capital Expenditure on Health, GREH = Government recurrent Expenditure on Health, Re-specifying the above model by taking the natural logarithm for uniformity of the data, we have

$$HDI = \ln GCEE + \ln GREE + GCEH + GREH \text{ ----- (2)}$$

The stochastic form of the above equation is expressed as;

$$HDI = B_1 \ln GCEE + B_2 \ln GREE + B_3 GCEH + B_4 GREH + u \text{ ----- (3)}$$

Where

B_0 = Intercept, B_1 = coefficient of GCEE, B_2 = coefficient of GREE, B_3 = coefficient of GCEH, B_4 = coefficient of GREH, U = stochastic error term.

This study used both descriptive and econometric techniques. The descriptive tools employed include the use of tables and trends, while the econometrics techniques include; The Unit Root test, the Correlation test, ARDL and diagnostic test.

4. RESULTS AND DISCUSSION

Before any meaningful time series estimation is carried out, it is essential to test the existence of unit roots in the variables and hence to establish their order of integration. The test result of the Augmented Dickey-Fuller statistic for the time series variables used in the estimation are presented in the Table 1.

Table 1: Result of Unit Root Test (ADF)

Variables	At level	First Difference	1%Critical Level	5%Critical Level	10%Critical Level	Order of Integration
HDI	-0.414865	-5.217860	-3.857386	-3.040391	-2.660551	I(1)
Prob	0.8887	0.0006***				
LNGCEE	4.155485	-5.184630	-3.831511	-3.029970	-2.655194	I(0)
Prob	0.0000***					
LNGREE	-0.481068	-5.142806	-3.886751	-3.052169	-2.666593	I(1)
Prob	0.8758	0.0008***				
GCEH	-2.813271	-5.842898	-3.831511	-3.029970	-2.655194	I(1)
Prob	0.0742	0.0002***				
GREH	-2.173182	-4.330845	-3.831511	-3.029970	-2.655194	I(1)
Prob	0.2210	0.0035***				

Source: Computed from the Unit Root Test (ADF)

From the results of unit root above, human development index, government recurrent expenditure on education, government capital expenditure on health, and government recurrent expenditure on health are integrated at the first difference, that is I(1). This is because their probabilities values are less than 0.05 critical values at first difference. In the same vein, the data for government capital expenditure on education is integrated at level, that is I(0). This is because their probability values are less than 0.05 critical values at level. This shows that all the variables in the model have no unit root problem after first difference.

4.1 Correlation Test Analysis

The results of correlation test among the variables are presented in Table 2. The assessment of the correlation test was to detect the problem of high multicollinearity that could lead to single equation matrix. This is because, highly correlated variables result in impossibility in obtaining reliable estimates.

Table 2: Correlation Test Result

	HDI	LNGCEE	LNGREE	GCEH	GREH
HDI	1	0.93	0.89	-0.097	0.12
LNGCEE	0.93	1	0.98	0.072	0.27
LNGREE	0.89	0.98	1	0.056	0.25
GCEH	-0.097	0.072	0.056	1	0.712
GREH	0.12	0.27	0.25	0.712	1

Source: E-views 11 output

The result in Table 2 indicate that the correlation coefficients among the variables are not high that could result to multicollinearity among the variables incorporated for the study. This is because there is moderate correlation between the variables of the model except for the correlation between human development index and government expenditure on education (capital and recurrent). However, the incidence of correlation between these variables cannot lead to single equation matrix (problem of high multicollinearity).

4.2 Presentation and Analysis of Econometric Data

The analysis of econometric data is presented in terms of granger causality test, ARDL bound test, ARDL error correction test and residual test

To examine the potential long-run relationship between human capital development and economic development in Nigeria, the ARDL Bounds testing approach was employed. The corresponding results are detailed in Table 3.

Table 3: ARDL Bounds test

Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	13.10381	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
Finite Sample: n=30				
Actual Sample Size	20	10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

Source: Extraction from E-views 11 Output

Result in Table 3 revealed that there is a long-run relationship among variables incorporated in the model. This is because; the F-statistic Value of 13.10381 is greater than the Pesaran Upper Bound critical value of 3.49 for actual sample size and 4.223 for finite sample size at 5% level of significance. This finding agrees with that of Ogunniyi (2018) who established the existence of a long-run relationship between human capital development and economic development. The ARDL long-run coefficients were estimated to determine the human capital development and economic development. The results are presented in Table 4

Table 4: Long-run Impact of corruption

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGCEE	0.042796	0.015929	2.686656	0.0177
LNGREE	-0.012230	0.019829	-0.616779	0.5473
GCEH	-0.010470	0.008892	-1.177426	0.2587
GREH	0.093456	0.003784	0.246778	0.0087
C	-0.344822	0.101855	-3.385426	0.0044

Source: Extraction from E-views 11 Output

Long-run estimates (Table 4.4) show that government capital expenditure on education (0.043) and recurrent expenditure on health significantly drive Nigeria's economic development, corroborating Ogunleye et al. (2017). Conversely, recurrent education spending and capital health expenditure exert negative long-run pressure. This suggests that further increases in these specific areas could inadvertently contract economic growth, likely due to fund misappropriation, inefficiencies, or crowding-out effects.

The short-run estimate of the impact of human capital development on national development in Nigeria is presented in Table 5.

Table 5: Short-run Impact of Human Capital Development

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HDI(-1))	-0.623530	0.094309	-6.611593	0.0002
D(LNGREE)	0.012795	0.004677	2.735450	0.0256
D(LNGREE(-1))	0.020087	0.004651	4.319188	0.0025
D(GCEH)	-0.019896	0.002655	-7.494309	0.0001
D(GREH)	0.004523	0.001281	3.529734	0.0077
CointEq(-1)*	-0.284723	0.038657	-7.365331	0.0001

Source: Extraction from E-views 11 Output.

The short-run estimates in Table 5 demonstrate that government recurrent expenditure on education exerts a positive and statistically significant influence on Nigeria's economic development at both the first and second lags. This suggests that immediate investments in educational operations yield prompt economic benefits. Similarly, recurrent health expenditure shows a significant positive correlation with development in the short term. Conversely, capital expenditure on health appears to negatively impact economic growth during this period, suggesting that such investments may impede development in the short-run—potentially due to long gestation periods or initial implementation costs. Notably, the ARDL procedure automatically excluded certain non-significant variables to optimize the model's performance. The coefficient of the error correction term (-0.284723) is negative. The coefficient is also statistically significant at 5% level of significance. The implication is that in case of any initial distortions, the system converges significantly towards long-run equilibrium at 28% yearly

4.3 ARDL Residuals Test

The residuals diagnostic criteria adopted for this research to test the significance of the relationship include serial Correlation LM test, heteroskedasticity test and normality tests.

Table 4.6: Breusch-Godfrey Serial Correlation LM Test Results

F-statistic	1.535780	Prob. F(2,6)	0.2893
Obs*R-squared	6.433252	Prob. Chi-Square(2)	0.1401

Source: Extracts from E-views 11 Output

The result from the Breusch-Godfrey Serial Correlation LM Test reveals that there is absence of serial correlation given that the probability values of the F-statistic and Observed R-squared are greater than the critical value of 0.05. This implies that there is absence of serial correlation in the model.

Table 6: Breusch-Pagan-Godfrey Heteroskedasticity Test

F-statistic	0.342997	Prob. F(10,8)	0.9420
Obs*R-squared	5.701629	Prob. Chi-Square(10)	0.8397
Scaled explained SS	1.399743	Prob. Chi-Square(10)	0.9992

Source: Extracts from E-views 11 Output

The result of the Breusch-Pagan-Godfrey Heteroskedasticity test reveals that there is absence of heteroskedasticity in the model implying that the variables are homoscedastic. This is because the probability values of the respective F-statistic and observed R-Square are greater than the critical value of 0.05. Therefore, the null hypothesis is accepted which implies that there is no co-variance of the error term with the explanatory variables.

5. DISCUSSION OF FINDINGS

To ensure reliability and avoid spurious regressions, the variables were tested for stationarity using the Augmented Dickey-Fuller (ADF) test. Results showed a mixed order of integration: HDI, recurrent education expenditure, and both health expenditures were stationary at first difference I(1), while capital education expenditure was stationary at level I(0). This mixed integration justified the use of the ARDL model. The ARDL bounds test confirmed a long-run cointegrating relationship, validating Ogunniyi (2018). Specifically, capital expenditure on education and recurrent health expenditure emerged as significant positive predictors of economic progress. These findings align with Adisa & Okeke (2024), underscoring that infrastructure in education and consistent healthcare funding are indispensable for Nigeria's long-term development. In the short run, recurrent expenditures on education (at first and second lags) and health exert a positive, significant impact on Nigeria's development, acting as immediate catalysts for growth. Conversely, capital health expenditure shows a negative coefficient, likely due to the long gestation periods inherent in large-scale infrastructure projects. To maintain statistical parsimony, non-significant variables were excluded from the final model. Diagnostic residual tests confirm the model's dynamic accuracy and reliability for statistical inference. The Breusch-Godfrey LM test indicates an absence of serial correlation, while the Breusch-Pagan-Godfrey test confirms the variables are homoscedastic. These results validate the estimates as stable and robust for policy formulation

5.1 Conclusion and Policy Recommendations

The study concludes that human capital development and economic development in Nigeria are cointegrated in the long run. Specifically, capital

investments in education and recurrent spending on health exert a positive and significant long-term influence on the economy. Short-run dynamics further reveal that recurrent expenditures in both sectors provide immediate support to economic growth. Based on these insights, the study offers the following recommendations;

To capitalize on the positive impact of capital education spending on Nigeria's development, the government should significantly increase its budgetary allocations to the sector. Specifically, policy-makers should adopt the UNESCO funding guidelines to ensure adequate financing for school infrastructure. Such a strategic shift would address the current infrastructural deficit and enhance the long-term productivity of the educational system.

To mitigate the long-run negative impact of recurrent education expenditure identified in this study, the government must prioritize enhancing the efficiency and productivity of the educational workforce. This can be achieved through a strategic upward review of salaries and wages for teachers, lecturers, and administrative staff. By providing competitive compensation, the government can foster greater motivation and professional commitment, ensuring that recurrent spending translates into high-quality educational outcomes and optimal performance.

The government should prioritize the delivery of qualitative and cost-effective healthcare to the populace. Enhancing the health status of the nation serves as a strategic investment in human capital; it guarantees a physically fit population capable of contributing at maximum capacity to the country's economic activities.

To catalyze economic progress, the government and private sector must collaborate to improve the quality and reach of the health and education sectors. Strategic partnerships among these stakeholders are necessary to bridge existing infrastructure gaps and service deficiencies. Recognizing that these sectors are primary engines of national development, their enhancement remains a critical priority for Nigeria's economic trajectory.

Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of this manuscript.

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Author Contributions

All authors made substantial contributions to the conception and design of the study, data collection, data analysis and interpretation, and manuscript preparation. All authors critically reviewed the manuscript, approved the final version, and agree to be accountable for all aspects of the work.

Informed Consent

Informed consent was obtained from all participants involved in this study prior to data collection.

Use of Generative AI

The authors confirm that generative artificial intelligence (AI) tools were used solely for minor language editing and grammatical refinement. These tools did not contribute to the study design, data collection, data analysis, interpretation of results, or the intellectual content and conclusions of the manuscript. The authors take full responsibility for the accuracy, originality, and integrity of the work.

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