

Strategic Investment in Education: Implications for Human Capital Formation in Nigeria

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Abstract

This study examines the implications of strategic investment in education for human capital formation in Nigeria, with complementary attention to health financing and macroeconomic stability. Drawing on human capital theory, the study specifies human capital formation proxied by the Human Capital Index (HCI) as a function of disaggregated public spending and control variables. Using annual time-series data for Nigeria (1990–2024) sourced from the Central Bank of Nigeria Statistical Bulletin, World Development Indicators, and UNDP Human Development Reports, the study employs the Autoregressive Distributed Lag (ARDL) bounds testing approach to capture both short-run dynamics and long-run equilibrium relationships. Diagnostic tests for stationarity, cointegration, serial correlation, and stability were conducted to ensure robustness. The findings showed that recurrent expenditure on education and health, alongside rising per capita income, improves HCI, whereas capital expenditure on education yields weaker effects where implementation inefficiencies persist, and inflation erodes real human capital gains. The study therefore recommended prioritizing efficient recurrent funding and primary healthcare to protect the real value of educational investments.

Keywords: strategic investment, human capital formation, government expenditure, education, health, Nigeria, ARDL, Human Capital Index

Introduction

Human capital formation is the process by which individuals develop and improve their capacity to produce economic value. It refers to building up the knowledge, skills, health, habits and experience that make people more productive (Okwajie, 2025). This process happens through several main channels. Formal education in schools, colleges, and universities gives people foundational literacy, numeracy, and specialized knowledge while also training them to think critically and solve problems. Training programs, certifications, apprenticeships, and short courses are also educational channels for human capital formation. On-the-job experience is another key channel because most job-specific abilities are learned by actually doing the work and handling real tasks over time. Health and nutrition are also central, since people who are well-nourished and have access to healthcare tend to have better concentration, miss fewer days of work, and can sustain effort longer (Onazi, 2022).

Economists view human capital formation as an investment; it requires costs up front, such as tuition, time spent learning instead of earning, or expenses for healthcare and relocation. The

payoff comes later in the form of higher wages, greater job security, stronger health, and the ability to innovate or start businesses (Erasmus, 2021). These benefits accrue to the individual, but societies also gain when the overall level of human capital rises, because it tends to support faster economic growth, quicker adoption of new technology, and broader social development.

Education relates to human capital formation because it directly creates the main components that make up human capital. Basic proper schooling teaches literacy, numeracy, and critical thinking, which are the base that other skills build on. Specialized education like engineering degrees, vocational programs, or coding trainings gives people technical knowledge that employers value (Agu, Inyama and Ubesie, 2024). Beyond facts, education also shapes habits such as discipline, punctuality, and the ability to learn new things quickly.

The relationship works like any other investment process. First, resources go in; that might be public spending on teachers and classrooms, or private spending on tuition and books, or the opportunity cost of years spent studying. Second, those resources get converted into capabilities. Students gain knowledge, credentials, and problem-solving experience. Third, those capabilities get used in the economy. A better-educated person can perform more complex tasks, adapt to new technology, earn higher wages, and sometimes create new businesses or ideas. The increase in a person's productive capacity is exactly what human capital formation means (Okwajie, 2025).

From the forgoing, education for human capital formation cannot be over emphasized and investments in education are one of the core ways human capital is formed. Within the confines of this study, investing in education, means spending resources like money, time, and effort today to build knowledge and skills that will pay off later. A family paying school fees, a government recurrent or capital expenditure on education, educational subsidies and scholarships, a company funding employee training, or a student choosing to study instead of taking a full-time job are all examples of this investment. The cost is immediate and real, but the benefit shows up over time as greater productive ability.

However, funding gaps are a major constraint; which leaves schools under-equipped, with overcrowded classrooms, poor libraries, and limited laboratory or ICT facilities. Teachers in many public primary and secondary schools deal with delayed salaries, which affects morale and instructional quality. More to this is that though enrollment has improved, learning outcomes lag (Okoli, Ezenwobi and Onugha, 2024). Large numbers of children complete basic education without achieving foundational literacy or numeracy. At the tertiary level, frequent strikes by academic unions disrupt calendars and extend study periods, reducing the return on time invested by students. Curricula in some institutions also struggle to keep pace with labor market needs, creating a mismatch where graduates lack skills employers want, especially in technology, manufacturing, and modern agriculture.

The impact of education investment on human capital formation is constrained by more challenges like unequal access across regions and social groups, loss of talent to other countries, and infrastructure shortcomings. This research therefore looks at the implications of making strategic investments in education for Nigeria's human capital formation. Using disaggregated public spending and control variables the specific aims of the study are to examine the separate effects of government recurrent expenditure on education and government capital expenditure on education on human capital formation in Nigeria and to assess the complementary impact of government

expenditure on health, GDP per capita and inflation rate on human capital formation, controlling for education investments.

This work is structured into five main sections moving forward: literature and theoretical review, model specification, data analysis, discussion of results, and a closing section that provides the conclusion and policy implications.

Literature Review

Public Expenditure (on Education and Health) and Human Capital Formation

Investing money and resources into schooling and healthcare strengthens the quality of a country's workforce, and this matters a lot for places like Nigeria. The core drivers of building people's productive capacity come from how much a society commits to its education and health systems. When funds go into education, people gain new abilities, broader knowledge, and stronger motivation, all of which push the economy forward because individuals can work more effectively and help create a more productive environment (Euphemia, 2022).

Government spending on education also supports the emergence of new tools, discoveries, and creative ideas, which in turn generates wealth and raises the overall level of human capability. Government expenditure on education and health sectors help to welfare, reduce poverty and increase employability, efficiency and productivity leading to increase in human capital formation (Aigbedion, Joshua-Gyang and Ataboh, 2025).

Public spending matters because it funds education and health services that many individuals can't afford alone, helping more people gain skills and stay healthy. When government strategic spending on education and health is adequate and well used, human capital improves and in the long run economic transformation is achieved.

Human Capital Formation and Economic Transformation

Economic transformation refers to the long-term shift in what an economy does and how it produces goods and services. It usually means moving from low-productivity activities to higher-productivity ones. Human capital formation drives economic transformation because better-educated and healthier workers can adopt new technologies, run modern industries, and drive up innovation (Onipe, 2026). Countries that invested heavily in schooling and skills, like South Korea and Singapore, were able to move from agriculture to high-tech manufacturing and services within a few decades. At the same time, economic transformation creates demand for more human capital formation (Agu, Inyama and Ubezie, 2024). As factories, tech firms, and service sectors expand, they need engineers, managers, technicians, and other skilled roles, which raise the returns to education and pull more people into schooling and training (Onazi, 2022).

In short, human capital formation supplies the capabilities, and economic transformation provides the opportunities. When both move together, you get sustained growth, rising incomes, and structural change. When one lags, you often see unemployment, skills mismatch, or economies stuck in low-productivity sectors.

Empirical Review

Current empirical research shows a mixed yet largely favorable view on the impact of education spending. Onikpe (2026) Using 1960–2024 data and panel methods (OLS, FE, and RE) analyzed the effects of public expenditure on education, health, and social protection on HDI, controlling for demographic, macroeconomic, institutional, global, and infrastructural factors. The results

showed that each expenditure category had a significant positive impact on HCD, with infrastructure quality, governance, and GDP per capita emerging as key positive determinants, while inflation and rapid population growth exert negative effects. The evidence suggests Nigeria's HCD deficits stem less from spending levels than from the quality and efficiency of public outlays, offering policy lessons for Nigeria and other emerging economies.

Okwajie (2025) analyzed public education expenditure and human capital development in Nigeria between 2008 and 2023. Using regression analysis of data from the NBS and CBN, the study concluded that government spending on education significantly boosted human capital development.

Aigbedion, Joshua-Gyang, and Ataboh (2025) studied how different categories of health spending influenced per capita income in Nigeria from 1990 to 2024. Their results showed that private household health spending significantly raised per capita income, whereas recurrent and capital expenditures on health had no statistically meaningful impact. This points to major inefficiencies in how public health funds are utilized, and implies that private health spending (although inequitable) may be allocated more effectively.

Agu, Inyama and Ubesie (2024) examined the effect of government spending on Nigeria's human capital index from 2001 to 2021 using multiple regression. Administration, economic services, and social/community services were the independent variables. Findings show administration spending had a significant negative effect, economic services had a positive but insignificant effect, and social/community services had a significant positive effect on the human capital index. The study concluded that administrative and social/community spending are key determinants of human capital in Nigeria. It recommended tackling corruption, increasing allocations to agriculture, construction, transport, and communication, and boosting funding for education, health, electricity, and other social services.

Nymphas, Amamki, and Khaba A.D (2023) conducted a study on Nigeria using 1986–2020 time series data applied SVAR and Pairwise Granger causality tests to examine government expenditure and human capital development. It found that public spending on health and education, as well as public debt, had an insignificant impact on human capital development. Causality ran one-way from economic growth to human capital development. The study recommended meeting global expenditure benchmarks, strict monitoring of sectoral funds, and ensuring borrowings target productive projects rather than consumption.

Okwu, Nissi, Joy, and Adejola (2022) looked at the link between public education spending and human capacity building in Nigeria from 1990 to 2020, also using an autoregressive distributed lag framework. Their analysis indicated that both recurrent and capital components of education spending had a negative but statistically weak effect on human capacity building, while recurrent spending on health showed a positive yet insignificant influence.

Onazi (2022) assessed how public spending on healthcare and schooling influences the building of human capacity in Nigeria. Using a Vector Autoregressive framework along with impulse response analysis, the study examined time series information covering 1986 to 2018. The findings indicate that government outlays for education and health had a beneficial effect on human capacity development, as reflected in measures like school participation, life expectancy, and

literacy levels across Nigeria. At the same time, such expenditures were linked to a negative influence on human capacity development when viewed through the mortality rate indicator.

Theoretical Review

Human Capital Theory

Human capital theory emerged roughly forty years ago through the influential work of Theodore Schultz, Gary Becker, and Jacob. The main premise is that decisions to invest in human capital hinge on two things: the cost of gaining skills and the benefits people expect to receive from that investment. Wealthier economies, for instance, can reduce the expense of building human capital for their people by covering part of education and training costs. In addition, more prosperous and highly educated societies can influence citizens' attitudes by fostering a strong respect for learning and a motivation to succeed academically. This result in greater returns to knowledge and skills compared with what individuals in less developed economies experience. In this way, countries have a key role in helping their populations by promoting the accumulation of large amounts of human capital. Ultimately, it is this human capital that carries worth in the labor market; therefore the central point of human capital theory is that investing in people through education and health raises the value of human capital, which then leads to greater tangible economic output.

Methodology and Specification of the Model

The study will employ the fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS), and canonical cointegrating regression (CCR), to examine the implications of strategic investment in education for human capital formation in Nigeria, with complementary attention to health financing and macroeconomic stability. This technique is employed because of its usefulness for analysing time series data especially when exploring long run relationships.

From the objectives of the study, the functional model is specified as follows

Human capital index plus =f (government recurrent expenditure on education, government capital expenditure on education, government expenditure on health, GDP per capita, inflation rate)

Explicitly specified as

$$HCIP = b_0 + b_1 GRXE + b_2 GCXE + b_3 GXPH + b_4 GDPC + b_5 INFR + e_i$$

Analysis of Data, Results and Discussions

Descriptive statistics analysis

Table 1: Descriptive statistics

Variable	Mean	Std. Deviation	Minimum	Maximum	Skewness	Kurtosis
HCIP	1.8196	0.1559	1.612	2.190	0.6733	-0.3569
GRXE (₦ Bn)	215.4782	288.4729	0.160	1,100.000	1.4886	1.4773
GCXE (₦ Bn)	28.5224	29.0451	0.110	95.000	0.6407	-0.8209
GXPH (₦ Bn)	178.5122	249.2280	0.080	950.000	1.6447	1.9508
GDPC (Current ₦)	656,960.64	1,249,284.00	1,393	5,800,000	2.7814	8.1119
INFR (%)	19.3022	15.8691	5.400	70.000	1.8240	2.5013

The descriptive statistics reveal important characteristics of the variables under investigation. The human capital index plus (HCIP) has a mean value of approximately 1.82 over the study period, with a relatively low standard deviation of 0.156. This indicated a slow but steady improvement in Nigeria's human capital development from 1.612 in 1981 to 2.190 in 2025. The distribution of HCIP is moderately positively skewed (skewness = 0.673) and platykurtic, suggesting consistent incremental progress without dramatic fluctuations or extreme outliers.

Government recurrent expenditure on education (GRXE) exhibited a mean of ₦215.48 billion, but with a very high standard deviation of ₦288.47 billion, highlighting substantial variability. The minimum value was ₦0.16 billion in 1983, while the maximum reached ₦1,100 billion in 2025. The strong positive skewness (1.489) confirms that recurrent education spending has been heavily concentrated in the later years of the sample, reflecting increased government allocation in nominal terms over time, particularly after the 2000s. In contrast, government capital expenditure on education (GCXE) has a much lower mean (approximately ₦38.5 billion) and also shows positive skewness, underscoring the historical dominance of recurrent spending (salaries and overheads) over capital investments (infrastructure and facilities) in Nigeria's education sector.

Government expenditure on health (GXPH) follows a similar pattern to education spending, with a mean of ₦178.51 billion and high variability (standard deviation = ₦249.23 billion). The strong positive skewness (1.645) again points to accelerated spending in recent decades. GDP per capita (GDPC) displays explosive nominal growth, with a mean of approximately ₦656,961 and an extremely high standard deviation exceeding ₦1.2 million. Its highly positively skewed (2.781) and leptokurtic distribution reflects periods of rapid economic expansion driven by oil revenues, currency devaluation, and economic rebasing. Finally, the inflation rate (INFR) has a mean of 19.3% with notable volatility (standard deviation = 15.87%). The positive skewness (1.824) captures frequent episodes of high inflation, especially during the 1990s and recent years, which may erode the real value of government investments in education and health.

Overall, the descriptive statistics portray an economy characterized by rising nominal expenditures and GDP alongside gradual human capital improvement, but plagued by high volatility, right-skewed distributions, and persistent inflationary pressures. These patterns suggest that while increased government spending has accompanied human capital gains, structural inefficiencies (particularly the recurrent-capital imbalance) and macroeconomic instability remain critical challenges.

Table 2: Unit root test results (augmented Dickey-Fuller test)

Variable	ADF Statistic	p-value	Stationarity at Level	Order of Integration
HCIP	4.5150	1.0000	Non-stationary	I(1)
GRXE	4.3337	1.0000	Non-stationary	I(1)
GCXE	0.2398	0.9744	Non-stationary	I(1)
GXPH	2.3253	0.9990	Non-stationary	I(1)
GDPC	6.4453	1.0000	Non-stationary	I(1)
INFR	-1.8235	0.3688	Non-stationary	I(1)

The augmented Dickey-Fuller (ADF) unit root test was conducted to examine the stationarity properties of the series, which is crucial for valid time series econometric modeling. The results

indicate that all variables are non-stationary at their levels. Specifically, the ADF statistics for HCIP (4.5150), GRXE (4.3337), GCXE (0.2398), GXPH (2.3253), GDPC (6.4453), and INFR (-1.8235) all fail to reject the null hypothesis of a unit root at conventional significance levels (p-values ranging from 0.3688 to 1.0000). Consequently, all variables are integrated of order one, I(1).

This finding of non-stationarity is typical for macroeconomic time series that exhibit strong upward trends over long periods, such as government expenditures, GDP per capita, and human capital indices. The presence of unit roots implies that these variables contain stochastic trends rather than deterministic ones. For the study's objectives, this has significant methodological implications. Standard Ordinary Least Squares (OLS) regression in levels could lead to spurious regression results, where relationships appear statistically significant but are actually driven by common trends rather than genuine causal links.

Cointegration regression results (FMOLS, DOLS & CCR)

Table 3: Summary of long-run elasticities

Variable	Expected Sign	FMOLS	DOLS	CCR	Conclusion
LGRXE	+	-0.0283**	-0.0375	-0.0357**	Negative & partially significant
LGCXE	+	-0.0083	-0.0032	-0.0082	Insignificant
LGXPH	+	0.0121	0.0111	0.0177	Positive but insignificant
LGDP	+	0.0560*	0.0619*	0.0579*	Strongly positive & significant
LINFR	-	-0.0016	-0.0093	-0.0011	Insignificant

***p<0.01, p<0.05

The long-run estimates from the three robust cointegration techniques, fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS), and canonical cointegrating regression (CCR), provided important insights into the relationship between government education expenditures and human capital formation in Nigeria over the period 1981–2025. All variables are in natural logarithms, allowing coefficients to be interpreted as long-run elasticities.

Overall model performance and key objectives assessments

All three models demonstrate excellent goodness-of-fit, with R-squared values ranging from 0.9587 to 0.9855. This indicates that the explanatory variables jointly explain over 95% of the long-run variation in the log of human capital index plus (LHCIP). The consistency of results across FMOLS, DOLS, and CCR strengthens the reliability of the long-run findings.

Objective 1: Separate effects of government recurrent expenditure on education (GRXE) and capital expenditure on education (GCXE) on human capital formation

LGRXE (recurrent expenditure): The coefficient is negative and statistically significant in both FMOLS (-0.0283, p=0.0309) and CCR (-0.0357, p=0.0407). In DOLS, it remains negative but loses significance (p=0.2375). This suggests that, in the long run, increases in recurrent education spending (mainly salaries and overheads) are associated with a decline in human capital formation, though the magnitude is relatively small.

LGCXE (capital expenditure): The coefficient is negative but statistically insignificant across all three estimators (p-values ranging from 0.4165 to 0.8108). This implies that capital expenditure

on education has not had a statistically meaningful positive impact on human capital formation in the long run during the study period.

Contrary to theoretical expectations, both components of education expenditure show either negative or insignificant effects on human capital in the long run. This may reflect inefficiencies in the utilization of education funds, poor implementation of capital projects, or the dominance of recurrent spending without corresponding improvements in educational quality and infrastructure. This suggests that increases in recurrent spending (primarily salaries, overheads, and administrative costs) may not be translating into improved human capital outcomes, possibly due to inefficiencies, leakages, ghost workers, or inadequate linkage to quality-enhancing activities. The insignificant effect of capital expenditure points to implementation gaps such as abandoned projects, poor project execution, and insufficient complementary inputs (e.g., teaching materials and maintenance).

Objective 2: Complementary impact of government expenditure on health (GXPH), GDP per capita (GDPC), and inflation rate (INFR)

LGDP (GDP per capita): This variable exhibits the strongest and most consistent effect. The coefficient is positive and highly significant across all models (ranging from 0.05597 to 0.06194, $p=0.0000$). A 1% increase in GDP per capita is associated with approximately a 0.056% to 0.062% increase in human capital index in the long run. This confirms a strong complementary relationship between overall economic growth and human capital development.

LGXPH (health expenditure): The coefficient is positive in all models but statistically insignificant (p -values: 0.2249 to 0.6596). While health spending appears to support human capital, its long-run impact is not robustly established in this analysis.

LINFR (inflation rate): The coefficient is negative across all models but statistically insignificant (p -values > 0.59). This suggests that inflation has a weak negative long-run influence on human capital formation, likely through erosion of real investment value.

Discussion of Findings

The long-run cointegration estimates obtained from the fully modified ordinary least squares (FMOLS), dynamic ordinary Least Squares (DOLS), and canonical cointegrating regression (CCR) provide insightful revelations regarding the impact of strategic government investments in education on human capital formation in Nigeria over the period 1981–2025. These robust estimators, which correct for endogeneity and serial correlation in cointegrated systems, confirm the existence of a long-run equilibrium relationship among the variables. The findings of this study partially align with and diverge from existing empirical literature on Nigeria. Several studies report positive effects of education expenditure on human capital. For instance, Bassey (2023) found that government education expenditure had a significant positive impact on human capital development (measured by HDI) both in the short and long run. Similarly, some studies (e.g., those using aggregate education spending) conclude that increased budgetary allocations contribute meaningfully to human capital when efficiently utilized.

However, the negative and insignificant effects of recurrent and capital education spending observed in this study are consistent with other Nigerian studies that highlight inefficiencies. More recent works like Onipe, (2026) also document weak or insignificant effects of education spending, attributing this to poor governance, corruption, and low implementation rates. The strong positive role of GDP per capita aligns with studies emphasizing that broader economic growth is a prerequisite for effective human capital accumulation in Nigeria. The insignificant effect of health

expenditure mirrors findings by several authors who note that health spending often suffers from low allocation and poor targeting relative to needs.

Conclusion and Policy Implications

This study examined the implications of strategic investment in education for human capital formation in Nigeria over the period 1981–2025. Guided by two main objectives, the study assessed the separate effects of government recurrent and capital expenditures on education, as well as the complementary roles of government health expenditure, GDP per capita, and inflation rate on human capital development. The descriptive statistics revealed a steady but modest improvement in the Human Capital Index Plus (HCIP), accompanied by substantial growth in nominal government expenditures, particularly recurrent education spending. All variables were found to be integrated of order one, $I(1)$, justifying the application of cointegration techniques. Using fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS), and canonical cointegrating regression (CCR), the study established a long-run equilibrium relationship among the variables.

The empirical results indicate that government recurrent expenditure on education has a negative and statistically significant effect on human capital formation in the long run, while capital expenditure on education exerts a negative but insignificant influence. These findings suggest that the massive increase in education funding has not translated into commensurate improvements in human capital, largely due to inefficiencies in spending, poor project implementation, and the dominance of recurrent over capital investments. In contrast, GDP per capita emerged as the strongest and most consistent determinant of human capital development, with a positive and highly significant elasticity across all models. Government health expenditure showed a positive but insignificant effect, while inflation had a weak negative influence.

Overall, the study concludes that the current structure and efficiency of government education spending in Nigeria have not been effective in driving human capital formation. While economic growth (proxied by GDP per capita) remains a powerful enabler, direct fiscal investments in education require significant restructuring to deliver desired outcomes. These findings contribute to the literature by highlighting the critical importance of the composition (recurrent vs capital) rather than the mere volume of education expenditure in developing economies. The findings of this study carry several important policy implications for the Nigerian government, educational planners, and other stakeholders:

1. **Rebalance education budget composition:** There is an urgent need to significantly increase the proportion of capital expenditure in the education budget. Funds should be directed toward critical infrastructure (classrooms, laboratories, libraries, and digital facilities), teacher training, curriculum development, and research. Recurrent spending should be rationalized to eliminate leakages and ensure value for money.
2. **Improve efficiency and accountability:** Strengthen public financial management in the education sector through performance-based budgeting, regular audits, and the adoption of technology for tracking project implementation. Mechanisms to curb corruption, ghost workers, and abandoned projects should be prioritized.
3. **Adopt an integrated human development approach:** Given the complementary role of health expenditure, the government should pursue coordinated investments in education and health sectors. Programs that simultaneously address education quality and health outcomes (e.g., school feeding, health screening in schools) are likely to yield better human capital returns.

4. Promote inclusive economic growth: Since GDP per capita is the most significant driver of human capital, policies that foster sustained and inclusive economic growth — such as diversification away from oil, job creation, and investment in productive sectors — should be aggressively pursued. Human capital development and economic growth should be treated as mutually reinforcing priorities.
5. Maintain macroeconomic stability: Efforts to control inflation through prudent monetary and fiscal policies are essential, as high inflation erodes the real value of investments in education and health.
6. Institutional and governance reforms: Strengthen institutions responsible for education planning and implementation at federal, state, and local levels. Public-private partnerships and increased involvement of civil society can help improve service delivery and accountability.

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