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# Impact of Human Capital Development on Economic Growth in Nigeria

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## ABSTRACT

Human capital development is considered as one of the key factors of sustainable economic growth, however, for Nigeria, the issue of the comparative impact of government spending on health and education in terms of current and capital expenditures remains poorly understood. The purpose of this study is to assess the impact of human capital development on economic growth in Nigeria. The methodological basis is the distributed lag autoregression model (ARDL), which makes it possible to evaluate the short- and long-term effects between variables with a mixed order of their integration. The empirical base covers annual data for Nigeria from 1970-2024 on GDP growth rate, government current health expenditure, Government capital expenditure on health, Government current education expenditure and Government capital expenditure on education. The results showed that the economic growth variable is stationary at the level, while the other variables are stationary in the first differences, which confirms the applicability of the ARDL approach. ARDL's long-term estimates showed that current education expenditures have a positive and statistically significant impact on economic growth ( $\beta = 0.039955$ ;  $p = 0.0067$ ), as do capital expenditures on education ( $\beta = 0.072462$ ;  $p = 0.0030$ ), while the impact of healthcare costs turned out to be statistically insignificant: for capital expenditures  $\beta = -0.03087$  ( $p = 0.6185$ ), for current expenditures  $\beta = -0.06336$  ( $p = 0.1414$ ). The results show that educational expenditures, especially capital investments in educational infrastructure, make the greatest contribution to Nigeria's economic growth.

**KEYWORDS:** Economy, Economic Growth, Healthcare, Education, Economics of Education, Government Spending, Human Capital, Public Strategy, Nigeria

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# Влияние развития человеческого капитала на экономический рост в Нигерии

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## АННОТАЦИЯ

Развитие человеческого капитала рассматривается как один из ключевых факторов устойчивого экономического роста, однако для Нигерии вопрос о сравнительном влиянии государственных расходов на здравоохранение и образование в разрезе текущих и капитальных затрат остается недостаточно изученным. Целью данного исследования является оценка влияния развития человеческого капитала на экономический рост в Нигерии. Методологическую основу составляет модель авторегрессии с распределенными лагами (ARDL), позволяющая оценить краткосрочные и долгосрочные эффекты между переменными при смешанном порядке их интеграции. Эмпирическая база охватывает годовые данные по Нигерии за 1970–2024 гг. по темпу роста ВВП, государственным текущим расходам на здравоохранение, государственным капитальным расходам на здравоохранение, государственным текущим расходам на образование и государственным капитальным расходам на образование. Результаты показали, что переменная экономического роста стационарна на уровне, тогда как остальные переменные стационарны в первых разностях, что подтверждает применимость ARDL-подхода. Долгосрочные оценки ARDL показали, что текущие расходы на образование оказывают положительное и статистически значимое влияние на экономический рост ( $\beta = 0,039955$ ;  $p = 0,0067$ ), как и капитальные расходы на образование ( $\beta = 0,072462$ ;  $p = 0,0030$ ), тогда как влияние расходов на здравоохранение оказалось статистически незначимым: для капитальных расходов  $\beta = -0,03087$  ( $p = 0,6185$ ), для текущих расходов  $\beta = -0,06336$  ( $p = 0,1414$ ). Полученные результаты показывают, что наибольший вклад в экономический рост Нигерии вносят именно образовательные расходы, особенно капитальные вложения в образовательную инфраструктуру.

**КЛЮЧЕВЫЕ СЛОВА:** экономика, экономический рост, здравоохранение, образование, экономика образования, государственные расходы, человеческий капитал, государственная стратегия, Нигерия

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## INTRODUCTION

The economic literature identifies several factors affecting economic growth (Suparman & Muzakir, 2023; Jemiluyi & Jeke, 2024; Opoku et al., 2024; Rajab & Zouheir, 2024; Chaabouni & Mbarek, 2024; Zhang et al., 2023; Dahmani & Mabrouki, 2025). Human capital development has been identified as a critical factor influencing growth (Acemoglu et al., 2014, Romer, 1994; Duan et al., 2022). Human capital development focuses on investing in people's knowledge, skills, and health to increase their productivity and value (Son, 2010; Acemoglu et al., 2014). Human capital development can also refer to the development of human capabilities through education and training as a means of human capital accumulation (Adelakun, 2011). This view is supported by the theory of endogenous growth, which argues that economic growth is driven by internal factors such as worker training, investment in human capital, and research and development (Romer, 1994). This has led several studies to investigate the effects of human capital development on economic growth across countries and regional contexts (Wirajing et al., 2023; Matousek & Tzeremes, 2021; Sultana et al., 2022; Sarwar et al., 2021; Fukao et al., 2021; Yormirzoev, 2023). However, most existing studies focus on developed countries, whereas studies on developing countries are scarce in the economic literature.

This study revisits the relationship between human capital development and economic growth, with a focus on Nigeria. It investigates the effect of human capital development on Nigeria's economic growth. Nigeria has significant human capital development challenges that have lingered for many years. The nation faces significant underfunding in healthcare, skills acquisition and formal education (Agbai et al., 2021). The rate of out-of-school children is very high, reaching 18.3 million in 2025. Post-education employment levels are low, there is a high level of unskilled labour, and there is significant brain drain, as many skilled, young, and educated adults emigrate to seek employment abroad (Ogbu, 2019; Martin, 2023; Etete, 2026). These challenges are exacerbated by inadequate infrastructure, poor policy implementation, and high poverty rates. These issues, together with weak human capital development institutions, make it difficult to ascertain the contribution of human capital devel-

opment to Nigeria's economic growth. Therefore, it is important to determine the role of human capital development in driving growth in Nigeria.

Understanding how human capital influences economic growth in Nigeria is crucial because the development of human capital can increase the number of healthy, skilled, and educated workers, thereby raising productivity and innovation in the economy (Abdelgany & Saleh, 2022). This can lead to higher output, better wages, and increased competitiveness, especially for resource-poor countries. Human capital development can also transform labour into a high-value asset, driving long-term prosperity for countries (Manuelli & Seshadri, 2014).

Previous research has yielded mixed evidence on the influence of human capital development on economic growth (Sultana et al., 2022; Sarwar et al., 2021; Fukao et al., 2021; Yormirzoev, 2023; Adedeji & Bamidele, 2003). However, previous studies have not provided an in-depth analysis of the impact of human capital development on economic growth using extensive data from Nigeria. Also, previous studies utilise existing human development indicators to assess human capital development (Kraay, 2019). However, these studies did not consider 'government recurrent and capital expenditure on education and health' as proxies of human capital development. Previous studies also did not divide government expenditure data on education and health into capital expenditure and recurrent expenditure. Furthermore, previous studies used past sample periods without incorporating recent time periods into the dataset from 2020 to 2024.

In this paper, we explore the impact of human capital development, in terms of government recurrent and capital expenditure on education and health, on economic growth in Nigeria. The results suggest that government capital expenditure on education exerts a significant positive effect on economic growth in both the short run and long run. In contrast, recurrent health expenditure shows an insignificant impact. The results indicate that accelerating government capital and recurrent education spending can yield positive economic growth outcomes in Nigeria.

This study contributes to the literature in several ways. This study is the first study to use government expenditure on health and education as a proxy for human capital development and to disaggregate it into 'government recurrent expenditure on health

and education' and 'government capital expenditure on health and education' in Nigeria. Secondly, this study contributes to the literature by providing additional evidence on the potential influence of human capital development on economic growth in Nigeria using an extended and recent sample period. Thirdly, the study improves our understanding of the role of health on economic growth by showing that improvements in health outcomes, such as higher government capital and recurrent health expenditure, can positively impact economic growth, thereby highlighting the importance of investing in the health sector to promote economic growth. Lastly, the findings of the study contribute to a better understanding of the complex relationship between health, education expenditure, and economic growth.

The remaining section of this paper is divided into four sections. Section two focuses on conceptual background, theory and the empirical literature review. Section three presents the methodology, which comprises research design, model specification, data collection sources, and estimation techniques. Section four focuses on results. Finally, section five presents the article's conclusion.

## LITERATURE REVIEW

In Nigeria in the pre-1970s era, much of the national development planning was centred on the accumulation of physical capital for rapid economic growth and development, without recognition of the important role of human capital in the development process (Alenoghena et al., 2016). In the post-1970s era, the Nigerian government began to allocate substantial financial resources to human capital development. These can be seen in the increasing government budgetary expenditure on health and education. This led to an increasing number of schools being established in the country and to the establishment of many primary health centres across many states (Alenoghena et al., 2016). Several programs and policies have also been developed in the education and health care sectors that help increase skill acquisition and labour productivity, contributing to greater economic output and higher economic growth (Fofana, 2001). Despite this, several factors continue to weaken the contribution of human capital development to economic growth in Nigeria, including inefficient resource utilisation, poor governance, lack of government commitment, and

inadequate job training, thereby likely leading to a negative effect on economic growth. Given these two conflicting predictions, it remains unclear exactly how human capital development might affect economic growth in Nigeria.

Several theories explain the relationship between human capital and economic growth. For instance, the endogenous growth theory posits that economic growth, or prosperity, is driven by internal factors rather than external ones (Romer, 1994). The theory further states that internal factors influencing economic growth include worker training, skills acquisition, investment in research and development, and innovation (Romer, 1994). Modernisation theory describes the role of education in shaping individuals' values, beliefs, and behaviour (Alayande et al., 2001). It posits that education could be used as a tool to modernise institutions that shape modern values and attitudes. As more people are exposed to modernised institutions, they will be transformed, thereby increasing the number of modernised individuals in society. Once a large segment of the population changes in this way, it can accelerate the pace of modernisation and economic development in society (Alayande et al., 2001). Human capital theory describes the role of education in increasing workers' efficiency and productivity by enhancing their cognitive skills (Mincer, 1958). The theory considers human capital to be the stock of useful human capabilities that produce innate abilities in workers. Human capital theorists further argue that basic literacy is crucial to increase the productivity of workers in low-skill occupations (Bellew & King, 1991). There is also the Harrods theory of economic growth, which posits that a higher level of savings and investment contributes significantly to economic growth because investment will ultimately increase people's income (demand) and a firm's capital stock (supply) (Orlando et al., 2021). The classical theory of economic growth, proposed by Adam Smith, David Ricardo, and Thomas Malthus, posits that economic growth is driven by capital accumulation, an increase in the labour force, and technological progress. However, such economic growth is limited by scarce resources and population growth.

Previous empirical studies examining the relationship between human capital development and economic growth have shown conflicting evidence. For example, Wirajing et al. (2023) analysed how

human capital might influence economic growth in 48 African countries from 2000 to 2019. They were interested in determining whether human capital development stimulates growth. In their analysis, they employ the system GMM regression method and find evidence that human capital development influences economic growth in Africa. They also find that internet penetration and foreign direct investment jointly lead to higher economic growth. Their analyses reinforce the urgent need for policymakers in African countries to commit additional fiscal resources to the education and health sectors to accelerate human capital development toward sustainable economic growth across the continent. In a cross-country study, Matousek and Tzeremes (2021) examined how human capital affects economic growth across 100 countries from 1970 to 2014. They find that human capital positively and statistically significantly affects countries' economic growth rates. Duan et al. (2022) sought to understand the relationships among human capital, governance performance, economic freedom, and economic growth. They also investigate whether institutional factors, such as governance performance and economic freedom, mediate the association between human capital and economic growth. They use panel data regression to analyse data for China, India, Russia, Brazil, and South Africa (BRICS) from 2000 to 2018 and find that the influence of human capital on economic growth is not linear but inverted U-shaped. They also find that human capital has a positive effect on economic growth only for a limited period, and that governance quality increases the influence of human capital on economic growth in BRICS.

Sultana et al. (2022) examined the relationship between human capital and economic growth across 141 countries, divided into 93 developing and 48 developed countries. They analyse the data using the System Generalized Methods of Moments (SGMM) for the period 1980–2008. They find that human capital positively impacts economic growth in developing countries. Sarwar et al. (2021) examined how economic growth is impacted by financial development and human capital. They analysed 83 emerging countries from 2002 to 2017. They analyse the data using the two-step system, generalised method of moments, and find that economic growth is positively impacted by both financial development and human capital in emerging economies. Fukao et al. (2021) examined the impact of human

capital on economic growth in Japan for 130 years from 1885 to 2015. They find that over the 130-year period, Japan's labour productivity rose 46-fold, with increases in the capital-labour ratio accounting for 40%, improvements in labour quality accounting for 35%, and total factor productivity (TFP) growth accounting for 36%. They further find that labour productivity growth accelerated substantially in the postwar period and was twice that of the prewar period. Yormirzoev (2023) examined the long-term economic performance of the former Soviet republics of Central Asia over the last three decades. They examine sources of economic growth based on the extended neoclassical growth model, and the author aims to determine whether human capital, in the form of education and health inputs, affects growth rates in the Central Asian region. They find that the growth rates of total factor productivity (TFP) were notably higher in Tajikistan than in Kazakhstan and the Kyrgyz Republic. However, a reduction in TFP in Tajikistan in the 1990s is attributed to the country's dire civil war.

Other studies, such as Zhang et al. (2023), have described how economic growth in China is affected by high-quality human capital, using provincial-level macro data and individual labourers' micro data from 2008 to 2017. They find that the rate of economic growth in China is elevated by an improvement in high-quality human capital. Suparman and Muzakir (2023) analysed the association between human capital, the open unemployment rate, and economic growth across 32 Indonesian provinces from 2010 to 2020, using data from these provinces. They find that Indonesia's economic growth is affected by human capital development. Jemiluyi and Jeke (2024) examined the moderating effect of human capital development on the relationship between urbanisation and economic growth in Nigeria from 1991 to 2022. They adopt the autoregressive distributed lag error-correction model and analyse their data using the dynamic ordinary least squares estimator. They find that, on its own, urbanisation does not promote economic growth, but its interaction with human capital development does, producing a positive effect on Nigeria's economic growth. Opoku et al. (2024) examined how economic growth in Africa is affected by financial inclusion and the moderating role of human capital development, using a sample of 40 African countries from 2005 to 2018. They analyse the data using the GMM

estimation technique and find that a non-linear U-shaped relationship between financial inclusion and economic growth, and between financial inclusion and human capital development, strengthens the positive influence of financial inclusion on economic growth in African countries. Their findings suggest that the growth-enhancing benefits of financial inclusion are transmitted through human development. Rajab and Zouheir (2024) analysed the mediating effect of human capital on the relationship between foreign direct investment and economic growth across 15 least developed African countries from 2000 to 2019. They find that economic growth is not significantly influenced by foreign direct investment and human capital. Chaabouni & Mbarek (2024) examine how economic growth is affected by human capital in 17 European countries during the COVID-19 pandemic (2019 to 2022) and find no significant causal effect of human capital development on economic growth. Dahmani and Mabrouki (2025) explained the influence of human capital, innovation, governance, and economic growth in the Middle East and North Africa region from 1996 to 2020. They find that economic growth is positively impacted by human capital in the short run, while its long-term effect is complex.

Previous Nigerian studies also analysed how the level of human capital development impacts economic growth. Adedeji and Bamidele (2023) assessed the extent to which Nigeria's economic growth was affected by the level of human capital development from 1990 to 2023. Using OLS, the authors find that economic growth is affected by human capital development, implying that economic growth can be accelerated in Nigeria through human capital development. Odusola (2021) also analysed the impact of human capital development on economic growth in Nigeria. Using ordinary least squares regression, the author finds that economic growth is positively affected by human capital development. Adamu (2021) explored how economic growth in Nigeria can be accelerated through human capital formation from 1990 to 2023. The result indicates that economic growth in Nigeria can be accelerated through investment in human capital, specifically education and training. Chete and Adeoye (2019) explored the association between human capital investment and economic growth in Nigeria over the 1986-2022 period, using an impulse-response regression method. They find a mismatch be-

tween the country's manpower needs and the skills produced by the educational system.

Although previous studies examined the relationship between human capital development and economic growth, they did not account for the heterogeneity of government spending, which can affect investment in human capital. Previous Nigerian studies, such as Adedeji and Bamidele (2003), Chete and Adeoye (2019), Adamu (2021), examined the effects of human capital on economic growth. However, they did not disaggregate government expenditure on education and health into capital and recurrent expenditure when investigating the impact of human capital development on economic growth in Nigeria. This omission creates a gap in the literature. Also, Assane (2024) used the school enrollment rate as a proxy for human capital but did not control for government education expenditure. Assane (2024) also failed to control for crucial factors affecting economic growth in Nigeria, such as the poverty rate, employment levels, and capacity utilisation. This omission creates a gap in the literature. Furthermore, few studies used the actual monetary value of gross domestic product as a proxy for economic growth, which can bias the results due to skewness in gross domestic product values.

The gap we aim to fill in the literature is to disaggregate government expenditure on education and health into capital and recurrent expenditure and examine their effect on economic growth in Nigeria. Two, we control for crucial factors affecting economic growth in Nigeria that previous studies did not account for, such as the poverty rate, employment level, and capacity utilisation. Third, we use an extended 55-year sample period from 1970 to 2024, which accommodates three full economic cycles. Fourth, the inclusion of the years 2020 to 2024 in the recent data helps capture the recent evolution in human capital development and economic growth in Nigeria. Finally, we use the annual change in gross domestic product as a better measure of economic growth, rather than the actual monetary value.

## RESEARCH DESIGN

The section reveals the logic of empirical research and describes how the verification of the hypothesis regarding the impact of human capital development on economic growth in Nigeria was organised. This section consistently presents the

characteristics of the data used, the study's time scope, the composition of variables, and the rationale for choosing econometric tools. This approach makes it possible to ensure the transparency of the research procedure and show how the chosen methodology aligns with the purpose of the work. The empirical part of the study is based on annual time

series for Nigeria, 1970-2024, drawn from official secondary sources. The rate of economic growth is used as the dependent variable, and the key explanatory variables are indicators of government spending on education and healthcare, divided into capital and current spending. The data is a time series with an annual trend.

**Table 1.** Description of variables

No.	Variable	Variable symbol	A priori expectations	Source
1	Economic growth rate	EGR	Positive	CBN
2	Government recurrent expenditure on health	GRH	Positive	NBS
3	Government capital expenditure on health	GCH	Positive	NBS
4	Government recurrent expenditure on education	GRE	Positive	NBS
5	Government capital expenditure on education	GCE	Positive	CBN

Note: compiled by the authors

Regarding the model specification, we develop a model that estimates the extent to which human capital development impacts economic growth in Nigeria. The adopted model is a modified form of the ARDL model, which was used in Qamruzzaman et al. (2021), with the addition of government recurrent expenditure on health and government recurrent expenditure on education as part of the independent variables. The ARDL model is specified by formula (1):

$$\begin{aligned} \Delta EGR_t = & \beta_0 + \beta_1 \Delta EGR_{t-1} + \\ & + \beta_2 \Delta EGR_{t-2} + \beta_3 \Delta EGR_{t-3} + \\ & + \beta_4 \Delta GCH_t + \beta_5 \Delta GRH_t + \beta_6 \Delta GRE_t \\ & + \beta_7 \Delta GCE_{t-1} + \beta_8 \Delta GCE_{t-2} + \mu_t \end{aligned} \quad (1)$$

where:

$\beta_1, \beta_2, \dots, \beta_n$  – estimated coefficients of the explanatory variables;

$\beta_0$  – intercept;

EGR – economic growth rate;

GRH – government recurrent expenditure on health;

GCH – government capital expenditure on health;

GRE – government recurrent expenditure on education;

GCE – government capital expenditure on education;

ECM – error correction term;

$\mu$  – stochastic error term.

The dependent variable is the economic growth rate, while the independent variables include government recurrent expenditure on health, government capital expenditure on health, government recurrent expenditure on education, and government capital expenditure on education. These variables are measured in billion naira. With respect to a priori expectations, the estimated coefficients on the explanatory variables are expected to be positive and related to economic growth, as presented in Table 1. This implies that an increase in each independent variable is expected to lead to a corresponding increase in the economic growth rate. The error term is assumed to have a zero mean and constant variance.

The autoregressive distributed lag (ARDL) technique is employed in this study because it can be applied to variables integrated of order I(0) and I(1), provided that none of the variables is integrated of order I(2) (Kripfganz & Schneider, 2023). The ARDL approach is also suitable for relatively small sample sizes and allows the simultaneous estimation of short- and long-run relationships. In addition, it provides a flexible framework for incorporating lag structures and deriving an error-correction representation from a single reduced-form equation, making it particularly useful for analysing dynamic economic relationships (Kripfganz & Schneider, 2023).

The dependent variable, EGR, is measured by the gross domestic product growth rate. Previous studies have used the gross domestic product

growth rate as a proxy for economic growth (Henderson et al., 2011). The explanatory variable GRH is an indicator of human capital development and measures government recurrent health expenditure. Prior studies suggest that public spending on health-care can reduce disease burdens, improve human capital, and enhance labour productivity. These improvements may, in turn, stimulate economic output and promote higher economic growth (Yang, 2020). Accordingly, the predicted relationship is that economic growth will be positively impacted by government recurrent health expenditure (GRH).

The explanatory variable GCH is another indicator of human capital development and is measured by government health capital expenditure. The literature shows that government capital spending on health-care can create supportive health infrastructure, thereby increasing access to healthcare, improving human capital, increasing labour productivity, and leading to higher economic growth (Yang, 2020). This suggests a positive effect of government capital health expenditure (GCH) on economic growth (EGR).

The explanatory variable GCE is also used as an indicator of human capital development and is measured by government capital expenditure on education. The literature shows that government capital spending on education creates supportive educational infrastructure, thereby increasing labour quality, improving human capital, increasing labour productivity, and leading to higher economic growth (Paudel, 2023). This suggests a positive effect of government capital education expenditure (GCE) on economic growth (EGR).

The explanatory variable, GRE, is another indicator of human capital development and is measured

by government recurrent expenditure on education. The literature shows that government recurrent spending on education leads to higher training and skill acquisition, thereby improving human capital, increasing labour productivity, and promoting economic growth (Paudel, 2023). Hence, a positive relationship is expected between government capital expenditure on education (GCE) and economic growth (EGR).

## RESULTS

The descriptive statistics present summaries of the individual variables. Each variable of interest has 55 observations. It can be observed that government recurrent expenditure on education (GRE) has the highest mean score, closely followed by government recurrent expenditure on health (GRH). Next is the mean score for government capital expenditure on education (GCE), followed closely by the mean score for government capital expenditure on health (GCH). The economic growth rate (EGR) recorded the lowest mean score during the period under review. Similarly, the median values showed that government recurrent expenditure on education (GRE) had the highest median score, closely followed by government recurrent expenditure on health (GRH). Next is the median score for government capital expenditure on education (GCE), followed closely by the median score for government capital expenditure on health (GCH). Economic growth rate (EGR) recorded the lowest median score during the period under review. Each variable consists of 55 observations (Table 2).

**Table 2.** Descriptive statistics of all variables for 1970-2024

Statistic	EGR	GCH	GRH	GRE	GCE
Mean	2.963451	28.79388	111.2046	163.8615	38.05962
Median	3.258541	6.484600	9.980000	24.73000	10.05000
Maximum	15.32916	111.7000	667.2500	882.8100	118.6000
Minimum	-13.12790	0.001000	0.020000	0.100000	0.010000
Std. Dev.	5.041257	38.98793	175.5652	242.1535	42.92918
Skewness	-1.124654	1.098449	1.637117	1.491592	0.495429
Kurtosis	5.973899	2.586537	4.605950	4.084014	1.477399
Observation	55	55	55	55	55

EGR = Economic growth rate. GRH = Government recurrent expenditure on health.  
 GCH = Government capital expenditure on health. GRE = Government recurrent expenditure on education.  
 GCE = Government capital expenditure on education.

Note: compiled by the authors

The results of the Augmented Dickey–Fuller (ADF) unit root test were conducted to examine the stationarity properties of the variables and to guide the choice of an appropriate estimation technique, thereby avoiding spurious regression results. The findings show that the economic growth rate variable (EGR) is stationary at the level, whereas government recurrent expenditure on education

(GRE), government recurrent expenditure on health (GRH), government capital expenditure on education (GCE), and government capital expenditure on health (GCH) become stationary after first differencing. These results suggest that the variables are integrated of mixed orders, thereby justifying the use of the ARDL approach (Table 3).

**Table 3.** ADF unit root test results

Variable	ADF-Statistic	Critical value 1%	Critical value 5%	Critical value 10%	Order of integration	Interpretation
EGR	-3.656499	-3.557472	2.916566	-2.596116	I(0)	Stationary at Level
GRH	3.446237	-3.584743	-2.928142	-2.602225	I(1)	Stationary at 1 <sup>st</sup> difference
GCH	-6.600829	-3.562669	-2.918778	-2.597285	I(1)	Stationary at 1 <sup>st</sup> difference
GRE	4.238247	-3.562669	-2.918778	2.597285	I(1)	Stationary at 1 <sup>st</sup> difference
GCE	-6.008856	-3.577723	-2.925169	2.600658	I(1)	Stationary at 1 <sup>st</sup> difference

EGR = Economic growth rate. GRH = Government recurrent expenditure on health.  
 GCH = Government capital expenditure on health. GRE = Government recurrent expenditure on education.  
 GCE = Government capital expenditure on education.

Note: compiled by the authors

The ARDL short-run result in Table 4 shows that the government recurrent expenditure on health variable (GRH) has an insignificant short-run impact on economic growth in Nigeria. The insignificant result is inconsistent with Yang (2020), who argues that government recurrent spending on healthcare can reduce disease burden, improve human capital, and increase labour productivity, leading to healthier, more productive workers, higher economic output, and higher economic growth. Also, the government capital expenditure on health variable (GCH) has an insignificant short-run impact on economic growth in Nigeria. The insignificant result is also inconsistent with Yang (2020), who shows that fiscal health spending lowers disease risk, increases labour force productivity, and increases economic output and growth.

Furthermore, the government recurrent expenditure on education variable (GRE) has a positive coefficient of 0.33 and is statistically significant at the 5% level, indicating that GRE has a significant positive impact on Nigeria's economic growth in the short run. The economic significance of the result is that a one percent increase in government recurrent expenditure on education will increase GDP growth by 0.33 percent in the short term. This suggests that the fiscal authorities in Nigeria should increase and sustain government recurrent spending on educa-

tion to stimulate short-term economic growth. The significant positive result is consistent with Paudel (2023), who argues that government recurrent spending on education leads to higher training and skill acquisition, which improves human capital, increases labour productivity, and leads to higher economic growth.

The government capital expenditure on education variable (GCE) has a positive coefficient of 0.23 and is statistically significant at the 5% level, indicating a positive impact of GCE on Nigeria's economic growth in the short run. The economic significance of the result is that a one percent increase in government capital expenditure on education will increase GDP growth by 0.23 percent in the short term. This suggests that the fiscal authorities in Nigeria should increase and sustain government capital spending on education to stimulate short-term economic growth. The significant positive result is consistent with Paudel (2023), who argues that government capital spending on education creates supportive educational infrastructure, thereby increasing labour quality, improving human capital, increasing labour productivity, and resulting in higher economic growth.

Table 4 further revealed that the coefficient of determination is about 0.60.

**Table 4.** ARDL short-run regression analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
EGR <sub>t-1</sub>	0.46	0.16	2.93	0.01
EGR <sub>t-2</sub>	0.14	0.18	0.75	0.46
EGR <sub>t-3</sub>	-0.31	0.17	-1.89	0.07
GCH	-0.02	0.04	-0.49	0.63
GRH	-0.05	0.03	-1.59	0.12
GRE	0.33	0.14	2.31	0.01
GCE	0.23	0.08	2.89	0.01
GCE <sub>t-1</sub>	-0.16	0.10	-1.50	0.14
$\beta_0$	0.70	0.94	0.74	0.46
R-squared	0.60242			
Adjusted R-squared	0.57661			
S.E. of regression	4.13906			
F-statistic	3.19869			
Prob(F-statistic)	0.00712			
Selected model: ARDL (3, 0, 0, 0, 1)				

Note: compiled by the authors

This suggests that 60 percent of the fluctuation in economic growth is accounted for by variations in all the independent variables, while the remaining 40 percent unaccounted for is captured by the error term. It implies the estimated model has a good fit. The F-statistic p-value (F=0.0071) is also significant, suggesting that all independent variables are

jointly statistically significant. Finally, the DW statistic (D-W=2.1), approximately two (2), shows an absence of autocorrelation in the model.

The ARDL long-run result in Table 5 shows that the government recurrent expenditure on health variable (GRH) has an insignificant long-run impact on economic growth in Nigeria.

**Table 5.** ARDL long-run regression estimation (cointegrating and long-run form)

Variable	Coefficient	Std. Error	T-statistic	Prob.
D(EGR <sub>t-1</sub> )	0.175504	0.19075	0.920074	0.3633
D(EGR <sub>t-2</sub> )	0.312527	0.16555	1.887834	0.0667
D(GCH)	-0.02216	0.045	-0.49248	0.6252
D(GRH)	-0.04549	0.02867	-1.58686	0.1208
D(GRE)	0.028686	0.02193	1.308152	0.1987
D(GCE)	0.207489	0.1095	1.894958	0.0657
CointEq <sub>t-1</sub>	-0.71796	0.20126	-3.5673	0.001
Cointeq = EGR - (-0.0309*GCH - 0.0634*GRH + 0.0400*GRE + 0.0725*GCE + 0.9726)				
Long Run Coefficients				
GCH	-0.03087	0.06147	-0.50214	0.6185
GRH	-0.06336	0.04219	-1.5019	0.1414
GRE	0.039955	0.01793	2.228823	0.0067
GCE	0.072462	0.0299	2.42269	0.003
Selected model: ARDL (3, 0, 0, 0, 1).				

Note: compiled by the authors

The insignificant result is inconsistent with Yang (2020), who argues that government recurrent spending on healthcare can reduce disease burden, improve human capital, and increase labour productivity, leading to healthier, more productive work-

ers, higher economic output, and higher economic growth in the long run. Also, the government capital expenditure on health variable (GCH) has an insignificant long-run impact on economic growth in Nigeria. The insignificant result is inconsistent with

Yang (2020), who shows that fiscal health spending lowers disease risk, increases labour force productivity, and increases economic output and growth.

The government recurrent expenditure on education variable (GRE) has a positive coefficient of 0.039 and is statistically significant at the 1% level, indicating that GRE positively influence economic growth in Nigeria in the long run. However, the coefficient is not economically significant because a one percent increase in government recurrent expenditure on education will increase GDP growth by 0.039 percent (which is equivalent to zero) in the long term. Notwithstanding, the significant positive result is consistent with Paudel (2023), who argues that government recurrent spending on education leads to greater training, which improves human capital, increases labour productivity, and results in higher economic growth in the long run.

The government capital expenditure on education variable (GCE) has a positive coefficient of 0.072 and is statistically significant at the 1% level, indicating that GCE positively influence economic growth in Nigeria in the long run. The GCE coefficient is also economically significant because a one percent increase in government capital expenditure on education will increase GDP growth by 0.072 percent (which is equivalent to 0.1 percent) in the long term. The significant positive result is consistent with Paudel (2023), who argues that government capital spending on education creates supportive educational infrastructure, which increases the quality of the labour force and stimulates long-run growth.

The reliability of the regression results from our dynamic model was assessed using various diagnostic checks, with the results presented in Table 6.

**Table 6.** Diagnostic Analysis

Type	Diagnostic Test	F-statistic	Probability
Breusch-Godfrey LM Test	Serial correlation	0.189909	0.8279
Breusch-Pagan-Godfrey Test (BPG)	Heteroskedasticity	0.479718	0.8628
Ramsey RESET Test	Specification	2.385095	0.1310
Jarque-Bera Test	Normality	30.75867	0.0000

Note: compiled by the authors

The specific tests carried out are as follows. The first test is the Breusch-Godfrey test, which checks for serial correlation. The second test is the Breusch-Pagan-Godfrey test, which checks for heteroskedasticity. The third test is the Ramsey Reset Test, which checks for the validity of the model specification. The fourth test is the Jarque-Bera test, which evaluates the normality of the variables. These tests were conducted to ensure the robustness of the regression results. The F-statistic and probabilities obtained indicate positivity, as they all suggest rejecting the null hypothesis for each diagnostic test

category. Also, the serial correlation test result shows the absence of serial correlation as an econometric problem. BPG test shows that the model is not characterised by homoskedasticity. Ramsey RESET test result justifies the model specification's goodness of fit as previously established, and, given that the probability values for each variable are greater than 0.05, the Jarque-Bera test indicates that the variables are normally distributed, with their probability values less than 0.05.

Table 7 presents the Granger causality test result.

**Table 7.** Granger causality test

Null hypothesis	Observation	F-Statistic	Prob.
GCH does not Granger-cause EGR	53	0.34049	0.7131
EGR does not Granger-cause GCH		0.38208	0.0045
GRH does not Granger-cause EGR	53	0.16457	0.8487
EGR does not Granger-cause GRH		0.44592	0.6429
GRE does not Granger-cause EGR	50	0.13811	0.8714
EGR does not Granger-cause GRE		0.20338	0.8167
GCE does not Granger-cause EGR	47	0.17356	0.8413
EGR does not Granger-cause GCE		0.19424	0.8242

GRH does not Granger-cause GCH	53	6.13032	0.0043
GCH does not Granger-cause GRH		0.42904	0.6536
GRE does not Granger-cause GCH	50	5.07538	0.0103
GCH does not Granger-cause GRE		1.68195	0.1975
GCE does not Granger-cause GCH	47	3.39817	0.0429
GCH does not Granger-cause GCE		7.23286	0.002
GRE does not Granger-cause GRH	50	0.01355	0.9865
GRH does not Granger-cause GRE		8.44250	0.0008
GCE does not Granger-cause GRH	47	0.69807	0.5032
GRH does not Granger-cause GCE		0.32796	0.7222
GCE does not Granger-cause GRE	44	1.18693	0.3159
GRE does not Granger-cause GCE		0.82121	0.4474

Note: compiled by the authors

The paper attempts to establish the causal relationship among the variables and the direction of the causality, if any. The results report a unidirectional causality between the government's health capital expenditure and economic growth in Nigeria. This implies that the unidirectional causality runs from the government's health capital expenditure to economic growth. In contrast, there is no bidirectional or unidirectional causality between economic growth and the following independent variables: government recurrent expenditure on health, government recurrent expenditure on education and government capital expenditure on education.

In other words, past values of economic growth do not forecast future government recurrent health expenditure (GRH). Also, past values of government recurrent health expenditure (GRH) do not forecast future economic growth rates. Furthermore, past values of economic growth do not forecast future government recurrent expenditure on education. Past values of government recurrent expenditure on education also do not forecast future economic growth rates. Economic growth does not Granger-cause government capital expenditure on education, and government capital expenditure on education does not Granger-cause economic growth. This is evidenced by the p-values of the variables as shown in Table 7 above.

## CONCLUSION

In this paper, the extent to which economic growth is impacted by human capital was examined for the period of 1970 to 2024. The major findings are the following. The unit root test indicated that the economic growth rate was stationary in levels. In contrast, the explanatory variables were stationary in first differences.

The ARDL short-run results consistently indicated that fiscal capital and recurrent health spending do not significantly affect economic growth in Nigeria. In contrast, government recurrent and capital expenditure on education had a significant positive effect on economic growth in Nigeria during the period examined. Similarly, the ARDL long-run result indicates that government recurrent expenditure on health and government capital expenditure on health had no significant impact on economic growth in Nigeria, whereas government recurrent expenditure on education and government capital expenditure on education had a positive and significant impact on economic growth in Nigeria.

Lastly, the Granger causality test results showed a unidirectional relationship running from government capital expenditure on health to economic growth in Nigeria, while there is no causality between economic growth and the following independent variables: government recurrent expenditure on health, government recurrent expenditure on education, and government capital expenditure on education.

The implication of the findings is that government capital expenditure on education and health matters for economic growth in Nigeria, and the government should increase its spending on these indicators to improve human capital development and boost economic growth. It is therefore recommended that the government at all levels in Nigeria should formulate policies aimed at boosting capital expenditure on education and healthcare. Policymakers and relevant stakeholders should also initiate measures to strengthen public-private partnerships to increase education and health sector financing and enhance human capital development in Nigeria. Furthermore, policymakers should adopt appropriate fiscal policy measures to address the challenges

of insufficient health and education expenditures in Nigeria. They should also increase budgetary capital allocation to the health and education sectors in order to increase spending on human capital development and stimulate economic growth in Nigeria.

This study is not without limitations. The lack of available quarterly and monthly data for the crucial variables was a limitation. Another limitation is the lack of available data for developing a human capital development index. Another limitation of the study is that it did not compare Nigeria with other developing countries.

Some suggestions for future research are offered. One, future studies can use qualitative research methods, such as interviews and case studies, to provide a more nuanced understanding of how economic growth is impacted by human capital development in Nigeria. Two, future studies can undertake comparative analyses of Nigeria with other countries or regions to gain valuable insights into cross-country differences in how economic growth is impacted by human capital development. Three, it would be interesting for future studies to evaluate how economic growth is affected by specific health interventions, such as vaccination programs, maternal and child health initiatives, and disease prevention strategies. Understanding the effectiveness of these interventions can provide valuable insights to policymakers.

#### AUTHOR CONTRIBUTIONS

Conceptualization and theory: IAM; research design: SA and PO; data collection: IAM and SA; analysis and interpretation: IAM, SA and PO; writing draft preparation: IAM, SA and PO; supervision: SA; correction of article: IAM, SA and PO; proofread and final approval of article: SA and PO. All authors have read and agreed to the published version of the manuscript.

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