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Examining the Influence of Human Capital Development Indicators on Economic Growth: Insights from Nigeria

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ABSTRACT

The study examines the effect of human capital development on economic growth in Nigeria using data from the Central Bank of Nigeria covering the period from 1981 to 2023. By applying a non-linear Autoregressive Distributed Lag (NARDL) model to capture the variables' behavioral patterns, the findings highlight several key points. Firstly, reduced government spending on education is negatively correlated with economic growth, while government expenditure on health shows a positive but insignificant impact. Additionally, a decline in infant mortality rate significantly enhances economic growth. In the short term, a decrease in life expectancy negatively and significantly affects economic growth; however, in the long term, an increase in life expectancy has a positive but insignificant effect. Furthermore, a rise in per capita income significantly promotes long-term economic growth. The study recommends prioritizing maternal and child health initiatives to improve healthcare for pregnant women and infants, alongside policies aimed at sustained increases in per capita income, including strategies to boost employment and entrepreneurship. These measures are essential for fostering sustainable economic growth in Nigeria.

KEYWORDS: Human Capital Development, Economic Growth

ARTICLE DETAILS

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1 INTRODUCTION

Improving human capital is essential for the advancement and prosperity of economies worldwide, significantly impacting the efficiency of other production elements. However, this viewpoint varies when analyzing Nigeria's economic trajectory (Chaku et al., 2023). Developing human capital is crucial for both established and emerging economies, as it helps leverage land and capital to produce goods and services, contributing significantly to wealth generation (Oluwatobi & Ogunrinola, 2011). Human capital includes the workforce's capabilities and expertise, with development focusing on enhancing skills, education, and experience essential for economic progress (Harbison, 1962). While theoretically, Human Capital Development (HCD) fosters economic growth, its effectiveness varies due to factors like education quality, government policies, and economic conditions.

Economists agree that developing human capacity is vital for a nation's political and socioeconomic progress (Zhang & Zhuang, 2021). Differences in development among countries stem not only from resources or capital but also from human capital development. Education is crucial for unlocking economic growth and national advancement, resonating with Todaro (1980) and Wilson (2017), who, referencing Harbison, argue that human capital is fundamental to prosperity. Physical capital and natural resources play passive roles, while human beings actively accumulate capital, exploit resources, innovate, and drive development. Endogenous growth models emphasize human capital as the primary driver of long-term economic growth. Kessier (2012) integrates local technology and human capital into growth models, diverging from the Neo-classical model. Harbison (1973) asserts that nations failing to nurture and utilize their people's skills and knowledge will struggle to advance in other areas.

Nigeria's abundant human capital and resources have not translated into satisfactory growth, largely due to increasing dependence on petroleum revenue since the 1970s and a rise in internally generated revenue. This shift resulted in higher budget allocations for education and health, with federal spending rising from N0.17 billion for education and N0.08 billion for health in 1981 to N325.19 billion and N341.88 billion by 2015 (CBN, 2017). However, despite this increased spending, human capital development saw little improvement. Enhanced education is crucial for better health, productivity, and job opportunities, as emphasized by Ejere (2011) and Euphemia (2022). Economic recovery, as highlighted by Kairo et al. (2017) and Euphemia (2022), depends on Human Capital

Development (HCD), with Oni (2014) arguing that human capital is the key driver of economic and social progress, not physical capital.

In Nigeria, insufficient funding and inconsistent government support for education and health have led to student unrest and strikes by educators and medical professionals, contributing to low productivity, reduced income, savings, and investment, all of which hinder capital formation. Challenges such as uneven skilled labor distribution, misemployment, and inadequate rewards further obstruct human capital development, while fluctuating government spending affects funding for education and health.

Most studies suggest a positive relationship between human capital development and economic growth in Nigeria (Adeyemi & Ogunsola, 2016; Eigbiremolen & Anaduaka, 2014; Cheren, 2013; Mba et al., 2013; Isola & Alani, 2012; Johnson, 2011; Adawo, 2011; Oluwatobi & Ogunrinola, 2011; Sankay et al., 2010; Owoeye & Adenuga, 2007), though some indicate a negative impact (Ndiyo, 2002; Adebiyi, 2005), possibly due to methodological issues.

Most existing research assumes a linear relationship between human capital development and economic growth, implying that any increase in human capital development leads to a proportional rise in economic growth. However, given the fluctuating nature of human capital development in Nigeria, assuming a symmetric relationship is inaccurate. This study, therefore, explores the asymmetric impact of human capital development on economic growth using the Nonlinear Autoregressive Distributed Lag (NARDL) model proposed by Shin et al. (2014). It aims to fill this gap and offer a comprehensive framework for understanding the impact of human capital development on Nigeria's economic growth. Following the introduction, the study is organized as follows: Section 2 reviews relevant literature, Section 3 details the methodology, Section 4 presents empirical findings and discussions, and Section 5 provides a summary and policy recommendations.

2 LITERATURE REVIEW

Characteristics of Human Capital and Economic Growth in Nigeria

critical investment in human capital, is frequently analyzed for its influence on economic growth. Ramirez and Stewart (1998) highlight the strong connection between advanced human resource development and economic progress, pointing out education's role in utilizing resources for growth, including technological innovation. Research in Indonesia, such as Akita and Alisjahbana's (2002) study, underscores the importance of skilled human resources in overcoming economic crises. Wibisono's (2001) work confirms education's significant positive impact on economic growth, a finding echoed by Mansur et al. (2009), who link education to higher employment opportunities and individual income. Despite Nigeria's economic growth since 1999, unemployment and poverty remain prevalent. Previous fiscal crises led to a neglect of human resource development, underscoring the need for renewed focus in government policies, like the National Economic Empowerment and Development Strategy (NEEDS), which prioritizes education and healthcare for all citizens.

The Modernization Theory (Walt Rostow 1960)

Walt Rostow's Modernization Theory (1960) connects human capital development with economic growth, emphasizing the transformative role of education in shaping attitudes and skills. Rostow argues that exposure to modern institutions, such as educational systems, promotes values and behaviors crucial for economic progress. Therefore, investments in education and human capital development are vital for modernization. Education not only provides technical skills but also fosters attitudes like openness to innovation, critical thinking, and adaptability, which are essential for effective participation in modern economies.

According to Rostow's theory, increasing investment in education and human capital development enhances individual modernity, which in turn accelerates economic development. This underscores the importance of human capital comprising knowledge, skills, and attitudes as a key driver of economic growth and societal advancement. Both Modernization Theory and human capital development stress the significance of investing in people's capabilities to propel economic progress and societal development.

Empirical studies

Several empirical studies have explored the link between human capital development and economic growth in Nigeria. Chaku et al. (2023) analyzed the impact of human capital development on economic growth from 1986 to 2020, using GDP and other variables within the ARDL bound testing model. Their findings recommended practice-oriented training and increased budget allocations to better align education with market demands. Similarly, Olufunnso et al. (2023) studied this relationship over a forty-year span using data from the CBN statistical bulletin, finding a strong correlation between human capital development and economic growth, particularly in certain sectors.

Euphemia (2022) examined the period from 1981 to 2020, identifying cointegration between economic growth and human capital development indicators. Ubaka et al. (2022) also assessed this relationship from 1986 to 2019, highlighting the significant effects of life expectancy and government health expenditure on economic growth. Brita and Taran (2021) investigated the role of human capital in driving structural change and productivity growth in open economies. Michele et al. (2021) and Raymond et al. (2021) further examined the importance of human capital in structural changes and economic development through empirical testing. Prodi (2019) and Maku et al. (2019) used panel data and the ARDL approach, respectively, confirming the positive influence of human

capital on economic growth. Akaakohol and Ijirshar (2018) also found a long-term relationship between government spending on education, health, and economic growth.

Lastly, Ogunleye et al. (2017) used OLS to study this relationship, emphasizing the positive impacts of government expenditure on education and health on economic growth. Collectively, these studies highlight the critical role of human capital development in promoting economic growth and structural transformation in Nigeria.

However, none of the reviewed studies have investigated the asymmetric impact of human capital development on economic growth in Nigeria. Only Adeyemi and Ogunsola (2016) and Law-Biaduo Ifeyinwa and Euphemia (2022) employed the ARDL model to assess the effect of human capital variables on economic growth, without considering asymmetry. Therefore, this study seeks to address this gap by examining the nonlinear impact of human capital development on economic growth in Nigeria, taking into account potential asymmetries and the differing effects of increases and decreases in human capital development.

3. METHODOLOGY

Model Specification

The study will collect data from secondary sources, mainly from publications like the Central Bank of Nigeria (CBN) Statistical Bulletin, spanning the period from 1981 to 2023. To address the fluctuations in human capital development indices in Nigeria and effectively capture both the positive and negative impacts on economic growth, we will utilize the NARDL model developed by Shin et al. (2014). This model is an asymmetric extension of the linear ARDL model introduced by Pesaran, Shin, and Smith (2001). The functional form of the model can be expressed as follows:

$$GDP = F(EDEXP, HEXP, INFMR, PCI, LIEXP) \quad (3.1)$$

The econometric form of the two equations in the linear form is specified:

$$GDP = \alpha_0 + \alpha_1 EDEXP + \alpha_2 HEXP\ \alpha_3 + INFMR\ \alpha_4 + PCI\ \alpha_5 + \alpha_6 LIEXP + u_1 \quad (3.2)$$

The log-linear specifications of the econometric equations above are expressed as:

$$LogGDP_t = \alpha_0 + \alpha_1 \log EDEXP_t + \alpha_2 logHEXP_t + \alpha_3 logINFMR_t + \alpha_4 logPCI_t + \alpha_5 LIEXPt + U_{1t} \quad (3.3)$$

Where: GDP = gross domestic Product, EDEXP = government expenditure on education, HEXP = government expenditure on health, INFMR = infant mortality rate, PCI= per capita income, LIEXP= life expectancy rate.

The models discussed reveal that gross domestic product (GDP) is influenced by several factors, including human capital development, which is indicated by government spending on education and health, infant mortality rate, per capita income, and life expectancy. It is expected that GDP will rise with increased human capital development, as evidenced by higher government expenditure on education and health. Additionally, per capita income is anticipated to have a positive relationship with GDP. Conversely, a higher infant mortality rate is expected to reduce GDP, while an increase in life expectancy is likely to have a positive impact on GDP or show an upward trend in the examined economy.

Analytical Framework of the Model

The Nonlinear Autoregressive Distributed Lag (NARDL) model builds on the Autoregressive Distributed Lag (ARDL) model to identify potential nonlinear relationships among variables in time series analysis. While the ARDL model is often used to investigate long-term relationships between variables, especially in cointegration analysis, the NARDL model adds the ability to account for different effects that independent variables may have on the dependent variable at different levels. This allows the NARDL model to capture asymmetries in how explanatory variables influence the dependent variable, addressing scenarios where the relationship varies during periods of increase or decrease in the variables. The structure of the NARDL model is as follows:

$$\Delta Yt = \alpha 0 + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \sum_{j=0}^{q} \beta_j \Delta X_{t-j} + \gamma \Delta Y_{t-1} \times \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \delta \Delta Y_{t-1} \times \sum_{j=0}^{q} \beta_j \Delta X_{t-j} + \dot{o}_t \quad (3.4)$$

In this context: ΔYt represents the first difference of the dependent variable at time t, ΔXt is the first difference of the independent variable at time t, α0 is the constant term, and αi and βj are the coefficients. The terms p and q refer to the lag orders of the dependent and independent variables, respectively, while γ and δ capture potential asymmetric effects.

The NARDL model provides valuable insights into economic phenomena that may exhibit nonlinear responses to changes or fluctuations in variables over time. Compared to traditional linear models, it offers a more flexible approach by accommodating different impacts during periods of increase and decrease in the variables. To ensure the robustness of our findings, we estimate an alternative model that accounts for the asymmetric effects of human capital development on economic growth, using GDP as a proxy.

$$LogGDP_t = \sum LogGDP_{t-1} + \sum \alpha_1 \log(EDEXP^+_{t-1}) + \sum \alpha_1 \log(EDEXP^-_{t-1}) + \sum \alpha_2 log(HEXP^+_{t-1}) + \sum \alpha_2 log(HEXP^-_{t-1}) + \sum \alpha_3 log(INFMR^+_{t-1}) + \sum \alpha_3 log(INFMR^-_{t-1}) + \sum \alpha_4 log(PCI^+_{t-1}) + \sum \alpha_4 log(PCI^-_{t-1}) + \sum \alpha_5 log(LIEXP^+_{t-1}) + \sum \alpha_5 log(LIEXP^-_{t-1}) + U_t \quad (3.5)$$

Estimation Procedures

Suppose we define a basic static model illustrating the correlation between gross domestic product (Y) and human capital development (X):

$$y_t = \phi_t + \phi_1 X_{1t} + \mu_{1t} \quad (3.6)$$

The elasticities of gross domestic product (GDP) in relation to human capital development are expected to be positive, as anticipated. These equations indicate that increases or decreases in human capital development will lead to corresponding rises or declines in GDP. In a symmetric and linear framework, the response of GDP to periods of increasing human capital development is expected to mirror its response during periods of decreasing human capital development. However, given the trends and fluctuations in human capital development in Nigeria, we utilize a nonlinear ARDL model, which extends the conventional ARDL approach to simultaneously capture both positive and negative long-run and short-run effects (asymmetries) in the transmission mechanism. According to Shin et al. (2013), the asymmetric cointegration relationship in the NARDL framework begins by dividing the exogenous variables in the equations into a partial sum process, as shown below:

$$y_t = \phi_t + \phi_1^+ X_{1t}^+ + \phi_1^- X_{1t}^- + \mu_{1t} \quad (3.7)$$

In this context, Yt is a k x 1 vector representing gross domestic product at time t, while Xt is a k x 1 vector of multiple regressors, specifically including the natural logarithm of human capital development. The parameters α0, α1, and α2 are asymmetric cointegrating parameters, indicating that GDP responds asymmetrically to fluctuations in human capital development. εt represents the stochastic error terms. On the other hand, δ(+) and δ(-) denote the partial sum processes of positive and negative innovations in εc, respectively, defined as follows:

$$X_t^+ = \sum_{i=1}^{t} \Delta X_i^+; \;\; X_t^- = \sum_{i=1}^{t} \Delta X_i^- \quad (3.8)$$

and

$$\Delta X_i^+ = \sum_{i=1}^{t} Max(\Delta X_i, 0), \;\; X_t^- = \sum_{i=1}^{t} Min(\Delta X_i, 0) \quad (3.9)$$

Where ΔX_i represents variations in the regressors *X*t, The (+) and (-) are superscripts showing the negative and positive reactions circulating a zero threshold, which defines and sets boundaries for the regressors, implying that the first difference of the series is assumed to be normally distributed with zero mean. A nonlinear model which exhibits both long run and short run asymmetries can be modeled as follows:

$$y_t = \sum_{i=0}^{q} \psi_t y_{t-1} + \sum_{i=0}^{r} (\partial_i^{+1} X_{t-i}^{+1} + \partial_i^{-1} X_{t-i}^{-1}) + \mu_t \quad (3.10)$$

We proceed to specify the conditional error correction model for equation (3.10) which contain the negative and positive partial sums as:

$$Y_t = \pi y_{t-1} + \lambda^+ X_{t-1}^+ + \lambda^- X_{t-1}^- + \sum_{i=1}^{q-1} \gamma_i \Delta y_{t-1} + \sum_{i=1}^{r-1} (\sigma_i^+ X_{t-1}^+ + \sigma_i^- X_{t-1}^-) + \mu_t \quad (3.11)$$

Shin et al. (2013) noted that Equation (3.11) effectively addresses potential issues related to the weak endogeneity of non-stationary explanatory variables within a nonlinear ARDL model. The relationship between ΔYt and ΔXt is used to determine the long-run coefficients. The null hypothesis, which suggests no long-run relationship between the levels of ΔYt and ΔXt, is tested using the bound testing technique proposed by Pesaran et al. (2001). This method remains valid regardless of the time series properties of ΔYt. The Wald test is then applied to assess the absence of asymmetry in both the long-run and short-run coefficients of the model. If the test results indicate otherwise, the null hypothesis is rejected.

Following this, we evaluate the time series properties of the data using the Phillips-Perron unit root test, along with descriptive statistics to establish the basic statistical characteristics of the data. The NARDL model is then estimated. To ensure the reliability of the NARDL estimates, post-estimation diagnostic tests—such as tests for normality, linearity, serial correlation, and heteroskedasticity—are conducted. The critical Wald test for asymmetry, in both the short run and long run, is then performed. This test evaluates the null hypothesis that positive and negative changes in human capital development have a direct influence on gross domestic product in Nigeria. According to the decision rule, if the probability of the Wald test exceeds the conventional significance levels of 1% or 5%, the null hypothesis is accepted, indicating no asymmetric relationship. However, if the probability is below the 1% or 5% significance level, the null hypothesis is rejected, confirming an asymmetric effect of human capital development on GDP in Nigeria.

4. DATA ANALYSIS AND RESULTS DISCUSSION

Unit Root Test

Table 4.1. Unit Root Test Results

Philip-Perron statistic						
Variables	**Level**	**1st Difference**	**Critical Values**	**Order of Integration**	**Prop Value**	**Decision**
LNGDP	-1.043439	-3.207085*	1% -3.60559 5% -2.93694* 10% -2.60686	*I*(1)	0.0269	Reject H_0
LNEDEXP	-3.722049*		1% -4.19850 5% -3.52362* 10% -3.19290	*I*(0)	0.0319	Reject H_0
LNHEXP	-0.780046	-6.295321*	1% -4.20500 5% -3.52661* 10% -3.19461	*I*(1)	0.0000	Reject H_0
LNINFMR	3.090164	-3.614135*	1% -3.60559 5% -2.93694* 10% -2.60686	*I*(1)	0.0098	Reject H_0
LNLIEXP	2.260708	-4.513975*	1% -4.20500 5% -3.52661* 10% -3.19461	*I*(1)	0.0045	Reject H_0
LNPCI	-2.959918	-5.928260*	1% -4.20500 5% -3.52661* 10% -3.19461	*I*(1)	0.0001	Reject H_0

*Source: Author's computation (*shows the variable is stationary at 5% level of significant)*

Table 4.1 presents the results of the unit root stationarity test, showing that all variables are stationary at different integration orders (i.e., I(0) and I(1)). Specifically, the logarithms of health expenditure (LnHEXP), infant mortality rate (LnINFMR), life expectancy (LnLIEXP), per capita income (LnPCI), and education expenditure (LnEDEXP) were found to be stationary at level I(0), as their Phillips-Perron (PP) values were lower than the critical values at a 5% significance level. The null hypothesis of no unit root was accepted for LnHEXP, LnINFMR, LnLIEXP, LnPCI, and LnGDP at the level, but it was rejected after the first difference. However, the null hypothesis of no unit root was rejected for LnEDEXP at the level. Therefore, the variables under investigation are concluded to be integrated at both level I(0) and after the first difference (I(1)), indicating a mix of integration orders.

Co-integration Result of Bound Test

Subsequently, we conducted a cointegration test among the variables using the NARDL bound test for the model, as illustrated in Table 4.2 below;

Table 4.2. NARDL Model Bounds Test for LnGDP, LnCAPF, INTR and INFR

Test Statistic	**Values**	**K**	**Lower bound(**I0)	**Upper bound(**I1)	**Significant level**
F-statistic	5.505048	5	2.62	3.79	5%

Source: Author's computation

From Table4.2, the result obtained indicated that although the variables were found to be integrated of mixed order, there exist long run relationship between log of gross domestic product, human capital development variables because the calculated F-statistc

value (5.505048) is above the upper bound critical value (3.79) at 5% level of significance. The Akaike Information Criterion (AIC) automatically selected the optimal lag length of the model as (1, 1, 2, 1, 2, 1, 0, 2, 2, 2, 0).

NARDL RESULTS

Table 4.3 displays the NARDL estimation results for the model involving the logarithm of gross domestic product (GDP) and human capital development. The analysis indicates that, in the short term, a reduction in government spending on education (LnEDEXP_NEG) is negatively associated with GDP, and this relationship is statistically significant. Similarly, in the long term, a decrease in education spending has a negative and significant impact on Nigeria's economic growth. On the other hand, an increase in government spending on education (LnEDEXP_POS) has a positive but statistically insignificant effect on economic growth in the short term. However, in the long term, this increase leads to a positive and significant impact on economic growth in Nigeria. Government spending on health shows a negative but insignificant effect on economic growth in both the short and long term.

Table 4.3. Estimated NARDL short and long run results (1, 1, 2, 1, 2, 1, 0, 2, 2, 2, 0)

SHORT RUN				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LNEDEXP_NEG)	-0.101394	0.050942	-1.990399	0.0364
D(LNEDEXP_POS)	0.040001	0.028248	1.416060	0.1786
D(LNEDEXP_POS(-1))	-0.031021	0.025142	-1.233859	0.2376
D(LNHEXP_NEG)	0.014910	0.043454	0.343130	0.7366
D(LNHEXP_POS)	-0.063256	0.037205	-1.700199	0.1112
D(LNHEXP_POS(-1))	-0.022563	0.020387	-1.106738	0.2871
D(LNIMFMR_NEG)	6.596347	3.042354	2.168172	0.0479
D(LNIMFMR_POS)	-14.791455	34.587745	-0.427650	0.6754
D(LNLIEXP_NEG)	-81.438070	34.037978	-2.392565	0.0313
D(LNLIEXP_NEG(-1))	-54.950287	30.681558	-1.790987	0.0949
D(LNLIEXP_POS)	22.122074	10.249284	2.158402	0.0447
D(LNLIEXP_POS(-1))	12.341378	7.885429	1.565086	0.1399
D(LNPCI_NEG)	0.214943	0.156775	1.371035	0.1919
D(LNPCI_NEG(-1))	0.188949	0.108086	1.748123	0.1023
D(LNPCI_POS)	0.224444	0.093838	2.391837	0.0314
CointEq(-1)	-0.801888	0.118530	-6.765254	0.0000
LONG RUN				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LNEDEXP_NEG	-0.328376	0.096745	-3.394257	0.0044
LNEDEXP_POS	0.152196	0.058763	2.589989	0.0214
LNHEXP_NEG	-0.060427	0.073036	-0.827360	0.4219
LNHEXP_POS	0.026752	0.060071	0.445337	0.6629
LNIMFMR_NEG	-0.855758	1.807835	-0.473360	0.6433
LNIMFMR_POS	-18.445784	42.326649	-0.435796	0.6696
LNLIEXP_NEG	-35.784701	48.832671	-0.732802	0.4758
LNLIEXP_POS	1.296873	9.376822	0.138306	0.8920
LNPCI_NEG	-0.167293	0.293279	-0.570422	0.5774
LNPCI_POS	0.279894	0.106254	2.634196	0.0196
C	5.014731	0.174351	28.762224	0.0000

Source: Author's computation

Decreases in the infant mortality rate (LnIMFMR_NEG) have a significant positive effect on economic growth, while increases in the infant mortality rate (LnIMFMR_POS) negatively impact the economy's growth rate in both the short and long term. This suggests that lower infant mortality rates drive higher production of goods and services, thereby promoting economic growth. In the short term, a drop in life expectancy (LnLIEXP_NEG) significantly impedes economic growth, whereas an increase in life expectancy (LnLIEXP_POS) boosts the country's growth rate. Similarly, in the long term, a decline in life expectancy (LnLIEXP_NEG) has a negative but insignificant effect on economic growth, while an increase (LnLIEXP_POS) positively but insignificantly influences the country's economic growth rate. In the short term, both rises and falls in per capita income (LnPCI_NEG) have positive but insignificant effects on economic growth. However, in the long run, an increase in per capita

income (LnPCI_POS) significantly enhances economic growth, highlighting its strong impact. The error correction term is correctly signed and statistically significant, indicating that around 80% of the disequilibrium is expected to be corrected within a year.

4.5 Post Estimation Test

In this research, the post-estimation examinations conducted in this section encompass the Breusch-Godfrey Serial Correlation LM test, White Heteroskedasticity test, Wald test, and other diagnostic assessments to ascertain the absence of mis-specification errors. The outcomes are presented in the following table.

Table 4.4. Test of Asymmetry of gross domestic product and Diagnostic test

Variable	Coefficient	Prob.
$\phi_1^+ = \phi_1^-$	33.11757	0.0000
$\psi_1^+ = \psi_1^-$	366.7909	0.0000
Jarque-Bera normality test	2.029464	0.0000
Breusch-Godfrey serial correlation LM test	1.525327	0.2569
Breush-Pagan-Godfrey heteroscedasticity test	0.617007	0.8555

Source: Author's computation

Table 4.4 presents the results of the Wald test along with additional post-estimation diagnostic tests. The Wald test, which evaluates whether human capital development has an asymmetric impact on gross domestic product, does not reject the null hypothesis at the conventional 5% significance level in both the short run (p =) and the long run (p =). The diagnostic tests reveal that the model residuals do not follow a normal distribution, as indicated by the Jarque-Bera statistic (p = 0.000). However, there is no evidence of autocorrelation (p = 0.2569) or heteroscedasticity (p = 0.8555) in the model.

4.6 Discussion of Results

The analysis shows that reductions in government spending on education (LNEDEXP_NEG) are negatively associated with economic growth in both the short and long term. This suggests that lower investment in education leads to a decrease in the development of skilled labor, which in turn impedes productivity and economic growth. This finding is consistent with previous research by Ogunleye, Sanyaolu, and Lawal (2017) and Akaakohol and Ijirshar (2018), which underscores the need for increased government spending in education and health to support economic growth. Euphemia (2022) also supports this view, noting the positive but insignificant effect of government health expenditure on economic growth, which aligns with the present study's results. Additionally, a decrease in the infant mortality rate (LNIMFMR_NEG) has a positive effect on economic growth, while an increase (LNIMFMR_POS) impedes growth in both the short and long terms. Lower infant mortality rates are associated with greater production of goods and services, contributing to economic expansion.

In the short term, a decline in life expectancy (LNLIEXP_NEG) significantly hampers economic growth, while an increase (LNLIEXP_POS) boosts growth. In contrast, reduced life expectancy has an insignificant negative effect on economic growth in the long term, whereas increased life expectancy positively affects growth. This is consistent with the findings of Imandojemu and Babatunde (2020) and Adeyemi and Ogunsola (2016), which underscore the positive link between government spending on education and health, life expectancy, and human capital development. These studies suggest that higher life expectancy supports long-term economic growth.

For per capita income (LNPCI), short-term fluctuations (LNPCI_NEG) have positive but insignificant effects on economic growth. However, long-term increases in per capita income (LNPCI_POS) significantly enhance economic growth. This highlights the important role of rising per capita income in driving economic growth over time, consistent with traditional views. The observed asymmetry in the impact of per capita income on economic growth underscores the importance of sustained income growth for long-term economic prosperity.

5.1 CONCLUSION AND POLICY RECOMMENDATION

Human capital development plays a vital role in economic growth by enhancing individual capabilities, boosting productivity, driving innovation, and strengthening national resilience and competitiveness. Policymakers often focus on human capital initiatives to achieve sustainable and inclusive economic growth. The findings of this study underscore the importance of strategies that maintain per capita income growth and take into account both short-term and long-term effects of economic variables on growth.

Based on the research, the following policy recommendations are proposed: The government should increase investment in education to enhance workforce quality, skills, and innovation. It should also review and boost health expenditure to improve public

health and economic productivity. Emphasis should be placed on maternal and child health to support sustainable growth. Additionally, addressing factors that negatively impact life expectancy through better healthcare, improved sanitation, and lifestyle changes is crucial. To sustain per capita income growth, efforts should be made to increase employment, encourage entrepreneurship, and create a supportive environment for economic success.

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