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UNEMPLOYMENT AND ECONOMIC GROWTH IN NIGERIA: DOES HUMAN-CAPITAL-DEVELOPMENT MATTER?

Godwin Essang Esu[1] and Riches Godwin Esu[2]

[1]Department of Economics, Faculty of Social Sciences, Akwa Ibom State University, Obio Akpa, Oruk Anam LGA, Akwa Ibom State, Nigeria.
E-mail: godwinesu@aksu.edu.ng; esugodwin1@gmail.com
[2]Department of Economics, Faculty of Social Sciences, University of Uyo, Uyo, Akwa Ibom State, Nigeria. E-mail: Richesjames33@gmail.com

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Abstract: This study examines the relationship between unemployment and economic growth in Nigeria, with particular emphasis on the role of human capital development. Using annual time-series data spanning 1980–2024, the study employs the Dynamic Ordinary Least Squares (DOLS) technique to estimate three models that capture the interactions among unemployment, human capital development, and economic growth. Preliminary analyses, including unit root tests, indicate mixed orders of integration among the variables. The results indicate that human capital development tends to reduce unemployment, although the effect is not statistically significant, reflecting structural weaknesses and skill mismatches in Nigeria's labour market. Human capital development, however, significantly promotes economic growth by enhancing productivity. The findings also indicate jobless growth, as rising economic activity has not been accompanied by commensurate employment creation. The study concludes that the effectiveness of human capital development in stimulating economic growth depends largely on the economy's capacity to create adequate employment opportunities. Appropriate policy reforms are therefore required to improve labour market efficiency and job creation.

Keywords: Economic Growth; Human Capital Development; Unemployment; Jobless Growth; DOLS

JEL Classification: *E24, H51, J24*

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I. INTRODUCTION

Nigeria's development trajectory reflects a persistent paradox in which episodes of economic growth have not been accompanied by commensurate employment generation or improvements in human capital. Despite being Africa's most populous country and possessing vast natural resources, the Nigerian economy continues to struggle with high unemployment, low productivity, and weak human development outcomes. Recent assessments indicate that Nigeria still ranks relatively low on global human development indicators due to persistent deficiencies in the quality of education, healthcare delivery, labour market efficiency, and infrastructure (United Nations Development Programme [UNDP], 2024; World Bank, 2023a). These structural weaknesses have constrained the country's ability to transform economic growth into broad-based welfare improvements.

Unemployment—particularly youth unemployment—remains one of Nigeria's most pressing socioeconomic challenges. Although the country experienced periods of significant economic expansion during the 2000s and early 2010s, employment growth did not keep pace with output growth. Recent labour market statistics continue to highlight this disconnect. According to the National Bureau of Statistics (NBS, 2016, 2020, 2023, 2025; NBS & UNDP, 2022), unemployment and underemployment remain substantial concerns despite modest economic recovery following the COVID-19 pandemic and subsequent macroeconomic reforms. This phenomenon contradicts traditional economic expectations that economic growth should stimulate job creation through increased production and labour demand (Okun, 1962; IMF, 2024). In Nigeria's case, however, growth has often been driven by capital-intensive sectors such as oil and gas, which generate limited employment relative to the size of the labour force.

A major explanation for this paradox lies in weaknesses in human capital development. Human capital—defined as the stock of knowledge, skills, and health embodied in individuals—plays a crucial role in determining labour productivity and economic performance. Countries that invest substantially in education and health tend to experience stronger long-term growth and lower unemployment rates. However, Nigeria's investment in human capital has historically been inadequate. Public expenditure on education and health remains below internationally recommended benchmarks, limiting these

sectors' capacity to produce a skilled and healthy workforce (WHO, 2023a, b, c; UNESCO, 2023). As a result, the country continues to face persistent skill shortages alongside high graduate unemployment.

The quality of education and workforce preparedness remain major concerns. Studies have shown that many Nigerian graduates lack the technical and entrepreneurial skills required by modern labour markets, resulting in a significant mismatch between labour supply and demand (World Economic Forum, 2023; Adebayo & Ojo, 2022). Employers frequently report difficulty filling positions requiring specialised or digital skills, even while unemployment remains high. This structural mismatch reflects deficiencies in curriculum relevance, technological infrastructure, and practical training within the education system. Consequently, the labour market is characterised by both labour surplus and skill scarcity.

Regional disparities and the increasing phenomenon of brain drain further aggravate Nigeria's human capital challenge. Access to quality education, healthcare, and employment opportunities varies significantly across regions, reinforcing socioeconomic inequalities. At the same time, many highly skilled professionals—particularly in the health and technology sectors—continue to migrate abroad in search of better opportunities. This migration reduces the domestic stock of skilled labour and weakens the returns on national investments in education and training (World Bank, 2024).

Although successive governments have implemented policy initiatives aimed at strengthening human capital development—such as the Economic Recovery and Growth Plan (ERGP) and more recent human capital development strategies—their effectiveness has been constrained by funding limitations, governance challenges, and weak policy coordination (International Monetary Fund [IMF], 2024). Consequently, the expected synergy between human capital development, employment creation, and economic growth has not fully materialised.

Given these challenges, understanding the role of human capital development in shaping the relationship between unemployment and economic growth in Nigeria is critically important. This study, therefore, investigates whether improvements in human capital development can influence unemployment dynamics and enhance economic growth in Nigeria. Specifically, the study examines the impact of human capital development on

unemployment, evaluates its contribution to economic growth, and analyzes the combined effects of human capital development and unemployment on Nigeria's economic performance.

II. LITERATURE REVIEW

1. Conceptual Framework

1.1. Human Capital Development

Human capital refers to the stock of knowledge, skills, competencies, abilities, and attributes embodied in individuals that enhance their productive capacity. Classical definitions, popularised by Becker (1964) and Schultz (1961), emphasise education, health, and training as key inputs that improve labour productivity and economic performance. In Nigeria, human capital development is understood as the process of acquiring skills, knowledge, and experience essential to societal and economic progress (Olaniyan & Okemakinde, 2018). National frameworks such as NEEDS recognise human capital as a continuous process of developing a skilled and healthy workforce (National Planning Commission, 2004).

Education serves as both a consumption and an investment good (Adelayo et al., 2017). Its relevance and quality critically determine human capital outcomes, not merely enrolment (Adesina & Ogunsola, 2021). Nigeria has implemented several reforms—National Policy on Education, Universal Basic Education (UBE), and the Ministerial Strategic Plan—to improve outcomes (Federal Ministry of Education, 2020). Health capital also shapes productivity and longevity (Ajakaiye & Fakiyesi, 2021). However, disease burdens such as malaria, HIV/AIDS, and COVID-19 continue to impede Nigeria's human capital potential (Adenikinju & Oyeranti, 2021). Skills acquisition, especially vocational and entrepreneurial, promotes employability and reduces youth unemployment (Okolie et al., 2019).

1.2. Unemployment

The International Labour Organisation (ILO, 2022) defines unemployment as the condition of being without work, available for work, and actively seeking work. Nigeria adopts this definition but extends it to include underemployment—working fewer hours or in roles below one's skill level (NBS, 2021). Unemployment manifests as structural, frictional, cyclical, seasonal, or technological (Okafor,

2017). Institutional weaknesses may perpetuate an "unemployment trap" (Adelakun, 2021). Youth unemployment is particularly severe, driven by inadequate human capital, infrastructural challenges, corruption, and slow industrialisation (Aigbokhan, 2021; Fashina et al., 2018).

1.3. Economic Growth

Economic growth is commonly defined as an increase in real GDP or productive capacity (Solow, 1956; Kuznets, 1955). Recent perspectives highlight sustainability and inclusiveness (World Bank, 2021). Nigeria's growth trajectory is volatile owing to its dependence on oil (Ajakaiye et al., 2022). Policies such as Vision 20:2020, ERGP, and NDP 2021–2025 aim to diversify the economy (Ministry of Budget & National Planning, 2021). However, growth has not translated into improvements in welfare, indicating a disconnect between growth and development (Okonjo-Iweala, 2018).

1.4. Interconnections Between Human Capital, Unemployment, and Growth

Human capital development enhances productivity and innovation, stimulating economic growth (Lucas, 1988). Conversely, insufficient human capital can worsen unemployment, while high unemployment reduces output and perpetuates poverty (Okun, 1962). Aderemi (2014) conceptualises the relationship among these variables as triangular and mutually reinforcing. Nigeria's recurrent jobless growth reflects weak transmission of human capital into employment opportunities (Ogunleye, 2017). The country's demographic dynamics present both opportunities and risks depending on investments in education, health, and job creation (Bell & Blanchflower, 2023).

2. THEORETICAL REVIEW

Human Capital Theory posits that education, health, and training enhance human capital and productivity, thereby increasing income (Becker, 1964; Schultz, 1961). While this holds in theory, Nigeria's labour market exhibits poor alignment between qualifications and employment opportunities (Adeyemi & Ogunsola, 2016). Endogenous Growth Theory (Romer, 1986; Lucas, 1988) posits that human capital and innovation drive sustained economic growth. This highlights the need for robust innovation systems and university–industry linkages in Nigeria (Ogwumike & Adeyemi, 2022).

Labour Market Theories—including Segmented Labour Market Theory (Doeringer & Piore, 1971), Search and Matching Theory (Mortensen, 1970; Mortensen, 1982), and Efficiency Wage Theory (Shapiro & Stiglitz, 1984)—explain Nigeria's structural unemployment, search frictions, and wage rigidities. Okun's Law predicts an inverse relation between unemployment and output, but its effect in Nigeria is weak during oil-driven growth episodes (Osinubi, 2022). The Solow Model (Solow, 1956) shows that insufficient investment in human capital constrains productivity and growth.

3. EMPIRICAL REVIEW

3.1. Human Capital and Economic Growth

Empirical studies largely converge on the positive role of human capital in Nigeria's economic growth. Akintola et al (2018) found a significant long-run relationship between education expenditure and growth. Adeloye et al., (2017) showed mixed effects across educational levels, while Ajakaiye et al. (2016) demonstrated bidirectional causality between human capital and growth. Several recent studies emphasise quality over quantity (Adedeji & Campbell, 2021), with TVET programmes showing substantial economic returns (Adawo, 2021).

3.2. Unemployment and Economic Growth

Most studies confirm that unemployment hurts economic growth. Ogwumike & Adeyemi (2022) showed that a 1% rise in unemployment reduces Nigeria's GDP by 2.5%. Youth unemployment is especially damaging (Ogunmuyiwa & Okuneye, 2015), and skill mismatches account for a large share of joblessness (Afolabi, 2022).

3.3. Joint Interactions

Studies integrating all three variables indicate that unemployment diminishes the growth-promoting effects of human capital (Asaju et al., 2014). Nwachukwu and Ogwumike (2022) found that human capital reduces unemployment and stimulates growth. However, educational expansion without structural reforms may lead to increased educated unemployment (Ajakaiye et al., 2022).

4. IDENTIFIED GAPS

Many studies examine only 'pairwise' relationships — human-capital–growth or unemployment–growth — without fully integrating all three variables.

Also, limited research addresses whether 'human capital moderates' the unemployment–growth nexus. While most studies rely on single human capital proxies (e.g., enrolment) and ignore quality measures, evidence on heterogeneous regional effects remains insufficient. Moreso, few studies use advanced econometric techniques capable of capturing dynamic interdependencies. These gaps justify this study.

III. RESEARCH METHODOLOGY

This chapter outlines the study's research design and methodology. It describes the scientific approach/design for the study, examines the variables, their constructs/proxies, and the theoretical expectations, and describes the theoretical framework for modelling the problem, the mathematical presentation of the models for the study, the econometric counterparts, as well as the suitable techniques for estimating the econometric models.

1. Research Design

This study adopts a scientific approach, using secondary data to evaluate the research problem. It employs an econometrics approach to estimate and analyse the collected data, ensuring more precise and reliable research outcomes that will guide policy recommendations for this study, in line with the study objectives. The data are mainly from the official publications of the Central Bank of Nigeria (CBN)'s Statistical Bulletin, 2024, the World Bank's – World Development Indicators (WDI), 2024, various years, Penn World Table (PWT) various years, Federal Reserve Economic Data of the Federal Reserve Bank of St. Louis, 2023 (retrieved, May 7, 2025), International Labour Organisation Database, 2025 and UNDP's Human Development Reports, 2025. These data are carefully selected, based on basic criteria, to proxy the variables this study intends to test. The data will be simulated and estimated using basic mathematical, statistical, and econometric tools, while relying sufficiently on relevant economic theories to ensure reliable outcomes. Detailed description of these data, the construction, measurements, sources, as well as a priori expectations, are presented in Section 3.2

2. Modelling Framework

The relationship between human capital development, unemployment, and economic growth is a crucial subject in labour economics and development

economics. The central idea is that investment in human capital—through education, training, and health improvements—enhances individual productivity, reduces structural and frictional unemployment, and accelerates economic growth. In human capital theory, Schultz (1961) and Becker (1964) argue that expenditures on education, training, and health constitute investments in human capabilities, analogous to investments in physical capital. Higher human capital increases an individual's productivity and earning potential, thereby boosting the economy's aggregate output. From a macroeconomic standpoint, the development of human capital affects: first, the Labour market dynamics in that higher skills reduce structural unemployment by improving workers' adaptability to changing market conditions (Pissarides, 2000), and second, economic growth being that skills and education raise the technological absorption capacity of an economy (Lucas, 1988; Romer, 1990), leading to endogenous growth.

Conversely, high unemployment (especially among educated individuals) signals inefficiencies in matching human capital to labour market needs, which hampers potential growth (Blanchard and Wolfers, 2000). According to Okun's Law (1962), there is a negative relationship between unemployment and output, implying that persistently high unemployment results from underutilization of human capital and, second, from lower aggregate demand, thereby reinforcing economic stagnation (Keynesian perspectives). Also, skill mismatches and skill depreciation over time occur when educational attainment does not meet labour market demands; in such cases, even highly educated individuals may experience unemployment, thereby worsening long-term growth prospects (Pissarides, 2000). Thus, the relationship can be summarised in a flow pattern such that human capital development reduces unemployment, supports higher economic growth, and higher growth further incentivises investment in human capital (feedback loop). There are three specific channels for this flow, viz: first, the matching efficiency where high skills improve the efficiency of job matching (Pissarides, 2000), second, innovation and diffusion where human capital fosters innovation and adoption of new technologies (Romer, 1990), and third, productivity where educated workers are more productive, raising the marginal productivity of capital and labour.

Based on the foregoing, we can formalise the relationship through an augmented Solow growth model combined with a matching function from the

search-and-matching literature (Mortensen and Pissarides, 1994). Thus, the economic growth model with human capital is:

Let output $Y(t)$ at time t be given by a Cobb-Douglas production function:

$$Y(t) = A(t)K(t)^{\lambda}[H(t)L(t)]^{1-\lambda} \quad \text{Equation 3.1}$$

Where: $A(t)$ = level of technology

$K(t)$ = physical capital

$H(t)$ = average human capital per worker

$L(t)$ = labour employed

$\lambda \in (0, 1)$ = output elasticity of capital

Moreover, human capital accumulation is marked by:

$$\dot{H}(t) = \theta(E(t))H(t) \quad \text{Equation 3.2}$$

Where $\theta(E(t))$ is an increasing function of education investment $E(t)$

To be more elaborate in the analysis, we consider the labour market condition of the matching function, where unemployment is determined through a Cobb-Douglas matching function:

$$M(u, v) = mu^{\eta} v^{1-\eta}$$

Equation 3.3

Where:

$M(u, v)$ = number of successful matches

u = unemployed workers

v = vacancies

$m > 0$, $\eta \in (0, 1)$ = parameters

The unemployment rate evolves as:

$$\acute{u}(t) = s\big(1 - u(t)\big) - M(u(t), v(t)) \quad \text{Equation 3.4}$$

Where:

s = job separation rate (exogenous)

Higher human capital $H(t)$ improves matching efficiency (i.e., increases m), reducing unemployment. In line with equations 3.2 to 3.4, the elaborate feedback loop is: Higher human capital → better matches → lower unemployment → higher labour input in production → higher output → more resources for education and training → further human capital accumulation.

Thus, the system dynamics are:

$$\begin{cases} \dot{K}(t) = s_K Y(t) - \delta_K K(t) \\ \dot{H}(t) = \theta\big(E(t)\big)H(t) \\ \dot{u}(t) = s\big(1-u(t)\big) - m\big(H(t)\big)u(t)^{\eta} v(t)^{1-\eta} \end{cases}$$

Where s_K is the savings rate and δ_K is the depreciation rate.

3. Econometric Specification

Gleaning from the model presented in Equation (1), the baseline econometrics model to be estimated is:

$$Y_i = \lambda_0 + \lambda_1 K_i + \lambda_2 H_i + \lambda' Z_i + \mu_{1i} \qquad \text{Equation 3.5}$$

Where Y_i represents economic growth over time *i*, K_i is physical capital in time? *i*, H_i Is human capital in time *i*, U_i is unemployment in time *i*, and Z_i is a vector of control variables, including total factor productivity (measuring technological progress). The control variables include inflation, interest rate, exchange rate, investment, tertiary enrollment and population growth rate. Investment in this case is captured by domestic credit to the private sector as a percentage of GDP. This is due to the unavailability of substantial time series on investment. *i* indexes year (in this case) and μ_i is the stochastic error term capturing the white noise in the model, while $\lambda_1, \ldots, \lambda_3, \lambda'$ are parameters to be estimated, and $\lambda' = 1, 2, 3, \ldots, n$ is the vector of the parameters for the control variables captured in *Z*. The a priori expectations for these parameters have been substantially elucidated in section 3.2 of this chapter.

Also, considering labour market conditions, we draw from the labour market matching function (Equations 3.3 and 3,4) the econometric expression;

$$u_t = \eta_0 + \eta_1 v_t + \eta_2 H_t + \eta' \mathrm{X}_t + \delta_t \qquad \text{Equation 3.6}$$

Where u_t is the number of unemployed folks in the market expected to be matched with the next available job vacancies, and v_t is the vacancies. X_t is the vector of control variables and are as earlier explained in this section, δ_t captures the error term and is expected to deem the white noise in the model, while *t* measures the periods. The vacancies (v_t), as a variable, will be proxied by a dummy variable, and this is due to paucity of data on this variable. However, the successful matches, as a result of increased vacancies and efficiency in matching, is expected to reduce unemployment, signalling increased job creation and employment level in Nigeria, *ceteris paribus*. η_1,

$\eta_2,\ldots,\eta'$ are parameters to be estimated, and $\eta' = 1, 2, 3, \ldots, n$ represents the parameters of the control variables captured in the vector, *X*, in Equation (3.6). A priori, high unemployment (*u*) and low job vacancies (*v*) levels will decrease matching efficiency (i.e., decrease m). On the other hand, high human capital (*H*) is expected to interact positively with matching efficiency (i.e., increase m) by reducing unemployment.

Another issue is that of joint impact. The study will assess the joint impact of unemployment and human capital development on economic growth. To achieve this objective, unemployment variable will be introduced into Equation 3.5, resulting in the following model:

$$Y_i = \lambda_0 + \lambda_1 K_i + \lambda_2 H_i + \lambda_3 U_i + \lambda' Z_i + \varepsilon_{1i} \qquad \text{Equation 3.7}$$

Where all the variables are as has been described earlier in the previous models.

4. Estimation Technique

In order to capture the causal linkages among human capital, unemployment and economic growth, taking the dynamic nature of most time series into consideration, we use the Stock & Watson (1993) Dynamic Ordinary Least Squares (DOLS) estimation technique to analyse models (Equations) 3.5, 3.6 and 3.7 respectively. Equation 3.5 serves as the impact evaluation model and is expected to suffice as the measurement of the interaction between unemployment, human capital development and economic growth. Application of a simple Ordinary Least Squares (OLS) in estimating equation 3.5 will produce a biased and inconsistent impact estimate, that is, $\widehat{\lambda_n}$ will be biased and inconsistent. This is because some of the variables in the model show dynamic trends and are not stationary at levels [I(0)] indicating possibility of endogeneity. To solve this problem, DOLS is applied to address possible asymmetric nuisance.

DOLS, which also corrects for possible simultaneity bias amongst the regressors, involves estimation of long-run equilibria. Stock and Watson (1993) proposed a parametric approach for estimating long-run equilibria in systems that may involve variables integrated of different orders yet remain cointegrated. The technique is designed to prevent simultaneity bias, endogeneity bias, and small-sample bias among the regressors by including lagged and lead values of

the change in the regressors. Though the procedure is similar to the estimators proposed by Phillips and Loretan (1991), it is more practical and convenient to apply and estimate.

Additionally, DOLS is particularly well-suited to estimating long-run relationships among cointegrated variables in time series. When variables share a stochastic trend (cointegrated), DOLS provides more accurate estimates of their long-run equilibrium relationships than methods that only consider short-term dynamics. By addressing endogeneity and serial correlation, DOLS generally yields more efficient estimators than OLS in cases involving cointegrated and potentially endogenous variables. In essence, DOLS is a valuable tool when analysing time series data where standard OLS assumptions might be violated, particularly when dealing with cointegration and potential endogeneity issues.

According to Stock and Watson (1993), the DOLS technique is useful for estimation, as its estimators are more robust in small samples than those of alternative approaches. They argue that the presence of leads and lags of different variables with integrating vectors eliminates simultaneity bias within a sample and that DOLS estimates have better small sample properties and provide a superior approximation to the normal distribution. The Stock-Watson's DOLS model is captured as:

$$D_t = \alpha_0 + \alpha' F_t + \sum_{j=-q}^{\rho} \pi' \Delta F_{t-j} + \delta_t \tag{3.8}$$

Where D_t represents the dependent variables, F_t is the matrix of regressors, α' is the parameters to be estimated, while π' is a cointegrating vector, that is, representing the long-run cumulative multipliers or the long-run effect of a change in F on D. ρ is lag length, and q is lead length. The inclusion of lag and lead terms in the regression is to ensure that the error term is independent of past innovations in the stochastic regressors found in the equation. Thus, the model in Equations 3.5, 3.6, and 3.7 will be estimated using DOLS as follows:

$$Y_i = \lambda_0 + \lambda_1 K_i + \lambda_2 H_i + \lambda' Z_i + \mu_{1i} +$$

$$\sum_{i=-j}^{l=J} \alpha_i K_{t-i} + \sum_{i=-k}^{l=K} \rho_i H_{t=i} + \sum_{i=-m}^{l=M} \tau' Z_{t=i} + \omega_t \tag{3.9}$$

$$u_t = \eta_0 + \eta_1 v_t + \eta_2 H_t + \eta' X_t + \sum_{j=-a}^{j=A} \varphi_i \, v_{t=i} + \sum_{j=-b}^{j=B} \gamma_i \, H_{t=i} + \sum_{j=-c}^{j=C} \delta' \, X_{t=i} + \varepsilon_t \quad (3.10)$$

$$Y_i = \lambda_0 + \lambda_1 K_i + \lambda_2 H_i + \lambda' Z_i + \mu_{1i} + \sum_{i=-j}^{l=J} \alpha_i \, K_{t-i} + \sum_{i=-k}^{l=K} \rho_i \, H_{t=i} + \sum_{i=-l}^{l=L} \partial_i \, U_{t=i} + \sum_{i=-m}^{l=M} \tau' \, Z_{t=i} + \omega_t \quad (3.11)$$

The variables in the models are all in rates and are as were earlier described. However, l represents the lead and lag values in the model. The optimal lag structure can be determined using information criteria such as Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC). However, Stock and Watson (1993) recommended that the value of $T^{\frac{1}{3}}$ can be used exclusively for the DOLS approach. The dataset covers 34 years, 1990 to 2024.

5. DATA CONSTRUCTION, SOURCES, AND A PRIORI EXPECTATION

This study utilises macroeconomic time-series data to examine the relationship between economic growth, human capital development, and unemployment. The principal dependent variable is economic growth, proxied by the real Gross Domestic Product (GDP) growth rate. The explanatory variables include unemployment rate as a proxy for labour input within a Cobb–Douglas production framework, Human Development Index (HDI) as a proxy for human capital development, and capital stock (as a percentage of GDP) as an indicator of physical capital available for investment. Additional control variables include the inflation rate, Total Factor Productivity (TFP), the exchange rate, the interest rate, and the population growth rate.

The theoretical framework combines an augmented Solow growth model with elements of the search-and-matching framework proposed by Dale T. Mortensen and Christopher A. Pissarides in the Mortensen–Pissarides matching model (1994). Within the model specification, economic growth is the response variable, while human capital development and unemployment constitute the

lead explanatory variables. Other macroeconomic factors affecting growth are incorporated as a vector of control variables (Z), although they are explicitly introduced in the subsequent model expressions. The data for the variables are sourced primarily from the Central Bank of Nigeria Statistical Bulletin (2024 edition) and the World Bank World Development Indicators (2024). These sources provide reliable and consistent macroeconomic indicators widely used in empirical growth studies.

Economic growth is measured by the real GDP growth rate, which captures the rate of expansion of economic activities over time. A priori, economic growth is expected to respond positively to improvements in human capital development, since a more educated and healthier workforce enhances productivity and innovation. Conversely, unemployment is expected to interact negatively with economic growth, although the sign may depend on the quality of human capital formation and the efficiency of labour market matching. Human capital development is proxied by the Human Development Index (HDI), which is a composite indicator reflecting three key dimensions of human development: health, education, and standard of living. Health is measured through life expectancy at birth, education through mean years of schooling and expected years of schooling, while living standards are captured through Gross National Income (GNI) per capita in purchasing power parity (PPP) terms. These components collectively provide a comprehensive measure of the productive capabilities of the population. An improvement in HDI is therefore expected to promote economic growth and reduce unemployment, all else being equal.

Several macroeconomic variables are included as control variables to capture broader economic conditions. The inflation rate serves as an indicator of macroeconomic stability and price dynamics. In theory, high inflation may negatively affect economic growth in the short run by increasing uncertainty and reducing purchasing power. However, the long-run relationship may vary depending on prevailing macroeconomic conditions. In some cases, inflation and unemployment may rise simultaneously, a situation discussed in studies such as those by Esu and Atan (2017). Exchange rate and interest rate are also incorporated because they influence investment decisions and the general performance of the economy. Exchange rate movements affect the cost of imported inputs such as machinery, equipment, and raw materials.

A depreciation of the domestic currency may increase production costs and discourage investment, thereby slowing economic growth and potentially increasing unemployment. Similarly, high interest rates can reduce borrowing and investment in productive activities, leading to slower growth. Consequently, both variables are expected to exhibit negative relationships with economic growth in the short run.

Finally, the population growth rate is included to account for demographic pressures on the labour market. Rapid population growth may increase the labour supply faster than job creation, thereby raising unemployment levels. Its relationship with economic growth, however, may be either positive or negative depending on the economy's ability to absorb the expanding labour force into productive employment. Overall, these variables jointly capture the structural and macroeconomic determinants of economic growth within the study framework. Their inclusion allows for a comprehensive assessment of how human capital development and labour market conditions interact with broader macroeconomic factors in influencing economic growth.

6. Data Diagnostics

Like the linear version (OLS), DOLS follows some basic rules, such as recourse to the order of stationarity of the series. The rule requires that the stationarity of the series should be between levels I(0) and first difference I(1) for it to be amendable for the application of DOLS, implying that any other level of integration may exclude DOLS as a viable method. Thus, it is pertinent to examine the data to ascertain if the series meets the foregoing primary requirement.

There is also a need to control the nuisance associated with time series data, ranging from issues of multicollinearity and autocorrelation to issues of heteroskedasticity. By this, it is meant that to ensure the viability of the model, diagnostic and stability tests are to be conducted to examine models for serial correlation, functional form, non-normality, and so on, aside from the ones mentioned earlier. Pesaran and Pesaran (1997) suggest using the Brown, Durbin and Evans (1975) stability tests known as cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ). The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the breakpoints (Jalil and Feridun, 2011). The null hypothesis: all the coefficients in the model are stable,

and cannot be rejected if the plots of the CUSUM and CUSUMSQ statistics stay within the critical bounds of a 5% level of significance.

6.1. Unit Root Test

Primarily, one of the requirements in time series econometrics is to first examine the stationarity properties of the variables to avoid spurious estimation. A series is said to be (weakly or covariance) stationary if the mean and autocovariance of the series do not depend on time (Greene, 2003). Any series that is not stationary is said to be nonstationary and the non-stationarity of a series would imply that the normal statistical approach to coefficient evaluation will not hold grounds in such circumstances. It is evident in the literature that most time series are often not stationary at levels but at first differencing (Kirchgassner and Wolters, 2007; Esu, 2017). In other words, a difference stationary series is usually said to be integrated and is denoted as I(d), where d is the order of integration. The order of integration is the number of unit roots contained in the series or the number of differencing operations it takes to make the series stationary (Akpan, 2012; Esu, 2017).

A variety of tools exists for testing a series for the presence of unit root. For our present purpose, we applied the standard Augmented Dickey-Fuller (ADF) test. The ADF test is based on running the following regression:

$$\Delta y_t = a_0 + a_1 t + \vartheta y_{t-1} + \sum_{i=1}^{q} \gamma_i \Delta y_{t-i} + \delta_t \qquad (3.12)$$

Where Δ represents the first difference operator, y_t represents the relevant variable under consideration and δ_t stochastic error term. The ADF test statistic is a one-sided test whose null hypothesis is $\vartheta = 0$ against the alternate that $\vartheta < 0$. Under the null, y_t must be differenced at least once to achieve stationarity; under the alternate, y_t is already stationary and no differencing is required.

It is important to note that unit roots test types like the Dickey-Fuller and Augmented Dickey-Fuller (to some extent) are structural-break sensitive. Such tests confuse structural breaks with non-stationarity (Geda, Ndung'u and Zerfu, 2012). This means that a truly stationary variable with structural breaks may be identified as non-stationary. Scholars in recent times have developed tests to check these distortions (for example, Clemente, Montanes and Reyes,

1998), but we adopt the Phillip-Perron (PP) tests developed by Phillip (1987), Phillip and Perron (1988) and sharpened by Perron (1997) for its properties that enhance its capacity to handle these shocks. Herzer, Nowark-Lehmann and Silverstone (2004) and Esu (2017) also noted that the test examines the time series properties in the presence of structural changes at random (unknown) points in time, thereby internalising the structural breaks. The specification is thus as presented in Equation 3.13:

$$t_{\pi}^{*} = t_{\pi}\left[\frac{\gamma_o}{f_o}\right]^{\frac{1}{2}} - \frac{K(f^{\circ} - \gamma^{\circ})\,[se(\hat{\pi})]}{2f_o\frac{1}{2}s} \tag{3.13}$$

Where $\hat{\pi}$ is the estimate, and t_{π} is the t-ratio of π, $se(\hat{\pi})$ is the coefficient standard error, and s is the standard error of the regression equation. Also, γ_o is a consistent estimate of the error variance, while f_o is the residual spectrum at frequency zero.

6.2. Preliminaries

Before the actual empirical investigations, we shall take a preliminary assessment of the structure of our data set. Before the unit root analysis, first of all, the summary statistics of all the variables included in the models would be examined. Second, the correlation matrix as well as the covariance matrix shall be assessed to ascertain the actual structure of interactions among the data sets. Also, we shall use scatter plots to preview the relationship among the key variables in the model. It is hoped that these preliminaries will further shed light on the real nature of the relationship among the key variables.

6.3. Robustness Check

To verify if the results from the estimated models could be useful for meaningful policy analysis and decision-making, several diagnostic tests for each of the estimated models would be applied where necessary. These include the standard (Adjusted) R-squared statistic for the goodness of fit test, the F-test for the significance of the overall results, and the RESET test for the correctness of model specification, amongst others. Equally, the estimation of the extended specification would provide a sensitivity check on the basic specification for robust policy conclusions.

IV. PRESENTATION OF RESULTS, ANALYSIS, AND DISCUSSION OF FINDINGS

1. Preliminary Results

To understand the characteristics of the variables used in the study, preliminary analyses were conducted using summary statistics and correlation analysis. These results are presented in Table 4.1. The statistics reveal that the variables generally exhibit moderate dispersion around their mean values, indicating reasonable variability within the dataset.

Economic growth (EGR) recorded a mean value of 2.35 and a median value of 2.10, with a maximum of 6.05 and a minimum of –1.94. The standard deviation of 1.78 indicates relatively moderate fluctuations in the growth rate over the study period. The distribution of economic growth was slightly negatively skewed (–0.03) and leptokurtic, implying a concentration of observations around the mean with relatively heavier tails. Similarly, the key variables of interest—human capital development (H) and unemployment (U)—displayed comparable statistical characteristics. Both variables were negatively skewed and leptokurtic. Human capital development recorded a mean of 0.45 with relatively small dispersion, suggesting gradual changes in the level of human capital over time. Unemployment recorded a mean value of 3.66 and a standard deviation of 1.35, indicating moderate variability in unemployment trends within the Nigerian economy.

Table 4.1: Summary Statistics and Correlation Matrix

Summary Statistics											
	EGR	*K*	*H*	*U*	*INF*	*PGR*	*V*	*INV*	*TFP*	*TR*	*INT*
Mean	2.35	1.72	0.45	3.66	19.19	0.70	0.64	9.66	0.83	7.76	147.64
Median	2.10	4.89	0.45	3.73	13.00	0.59	1.00	8.43	0.79	8.68	101.45
Max	6.05	7.36	0.58	6.30	72.83	1.31	1.00	19.62	1.10	13.20	536.90
Min	-1.94	3.18	0.33	-0.12	5.39	0.28	0.00	4.95	0.64	1.87	49.77
Std Dev.	1.78	2.21	0.07	1.35	16.10	0.31	0.48	3.51	0.14	3.55	113.24
Sk.	-0.03	1.15	-0.01	-0.67	1.83	0.67	-0.60	0.80	0.40	-0.10	1.91
Kur.	2.75	3.06	1.53	3.88	5.41	2.25	1.36	3.22	1.86	1.51	6.00
J-B	0.13	9.93	4.02	4.86	36.02	4.44	7.74	4.99	3.65	4.19	44.35
Prob.	0.00*	0.00*	0.01*	0.08**	0.00*	0.10**	0.02**	0.08**	0.16	0.12	0.00*
Obs.	45	45	45	45	45	45	45	45	45	45	45

Correlation Matrix											
	EGR	*K*	*H*	*U*	*INF*	*PGR*	*V*	*INV*	*TFP*	*TR*	*INT*
EGR	1.00										
K	0.34	1.00									
H	0.41	0.88	1.00								
U	-0.04	0.79	-0.21	1.00							
INF	0.12	-0.14	0.24	0.49	1.00						
PGR	0.45	0.53	0.74	0.05	0.19	1.00					
V	0.40	0.63	0.74	0.03	0.32	0.70	1.00				
INV	0.42	0.62	0.74	0.12	0.28	0.76	0.77	1.00			
TFP	0.43	0.69	0.78	0.02	0.27	0.77	0.79	0.72	1.00		
TR	0.40	0.84	0.99	0.22	0.24	0.71	0.69	0.71	0.75	1.00	
INT	0.45	-0.27	-0.49	-0.59	-0.15	-0.46	0.24	-0.30	-0.35	-0.51	1.00

Source: Author's computation using E-views 12; Note: *p<0.01, **p<0.1

The correlation matrix further provides insight into the relationships among the variables. Human capital development shows a positive correlation with economic growth, indicating that improvements in human capital may contribute to higher economic output. Conversely, unemployment exhibits a negative relationship with economic growth, consistent with theoretical expectations that rising unemployment undermines productive capacity in an economy.

Other variables also display notable relationships. Investment, population growth, technological innovation, and physical capital show positive associations with economic growth, suggesting their importance as potential drivers of economic performance. Interest rate, however, displays a negative relationship with human capital development and unemployment, indicating possible macroeconomic interactions affecting labour market outcomes. Overall, the correlation matrix suggests meaningful interactions among the variables without evidence of perfect multicollinearity.

2. Unit Root Tests

To determine the stationarity properties of the time series data, Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests were conducted. Establishing the order of integration of the variables is important for selecting an appropriate estimation technique and avoiding spurious regression results. The results of unit roots test are presented in Table 4.2.

Table 4.2: Augmented Dickey-Fuller and Phillip-Perron Unit Roots Test Results

Augmented Dickey-Fuller Test (ADF)					*Phillip-Perron Test (PP)*				
	Level		*First Difference*		*Level*		*First Difference*		*Integration*
Variables	*T-Stat*	*P-Value*	*T-Stat*	*P-Value*	*T-Stat*	*P-Value*	*T-Stat*	*P-Value*	*Order*
EGR	-4.15	0.00*	-7.69	0.00*	-4.21	0.00*	-12.23	0.00*	(0,I), (0, I)
K	3.73	1.00	-3.73	0.03**	2.92	1.00	-3.56	0.04**	(-, I), (-, I)
H	-1.61	0.77	-3.79	0.02**	-1.64	0.76	-3.79	0.02**	(-, I), (-, I)
U	-2.66	0.26	-5.21	0.00*	-2.65	0.26	-5.21	0.00*	(-, I), (-, I)
INF	-3.72	0.03**	-6.07	0.00*	-2.99	0.14	-11.56	0.00*	(0,I), (-, I)
PGR	-3.85	0.02**	-2.96	0.15	-1.98	0.59	-3.87	0.02**	(0,-), (-, I)
V	-1.22	0.89	-6.45	0.00*	-1.33	0.87	-6.45	0.00*	(-, I), (-, I)
INV	-3.68	0.03**	-5.88	0.00*	-3.95	0.01**	-14.21	0.00*	(0,I), (0, I)
TFP	-2.36	0.39	-5.48	0.00*	-2.60	0.27	-5.53	0.00*	(-, I), (-, I)
TR	-3.30	0.07**	-3.47	0.05**	-2.04	0.56	-3.61	0.04**	(0,I), (-, I)
INT	-2.15	0.51	-4.51	0.00*	-2.44	0.35	-4.62	0.00*	(-, I), (-, I)

Source: Author's computation using E-views 12; Note: *p<0.01, **p<0.1

The results indicate that the variables exhibit mixed orders of integration. Using the ADF test, economic growth (EGR), inflation (INF), investment (INV), and trade (TR) were stationary at both level and first difference, while population growth rate (PGR) was stationary at level only. Other variables, including capital stock, unemployment, human capital development, technological innovation, and interest rate, were stationary only after first differencing.

The Phillips–Perron test produced somewhat different results. Apart from economic growth and investment, which were stationary at both level and first difference, most other variables were stationary only at first difference. Although the outcomes from the two tests differ slightly, the general conclusion remains that the variables possess mixed stationarity properties. The presence of both I(0) and I(1) variables justified the adoption of the Dynamic Ordinary Least Squares (DOLS) estimation technique. DOLS is particularly suitable for handling endogeneity, serial correlation, and simultaneity problems that often arise in time series models with mixed integration orders.

3. Main Results and Analysis of Findings

This study was guided by three primary objectives. The first objective was to examine the impact of human capital development on unemployment in Nigeria. The second objective was to assess the effect of human capital development on economic growth. The third objective was to evaluate the

simultaneous impact of human capital development and unemployment on economic growth. The results corresponding to these objectives are presented in Tables 4.3, 4.4, and 4.5 respectively.

3.1. Effect of Human Capital Development on Unemployment in Nigeria

The first model examined the relationship between human capital development and unemployment. Theoretically, improvements in human capital are expected to reduce unemployment by increasing the productivity and employability of the labour force. The results in Table 4.3 show that human capital development has a negative relationship with unemployment, indicating that improvements in human capital may reduce unemployment. Specifically, a one percent increase in human capital development reduces unemployment by approximately 3 percent. However, the relationship was statistically insignificant, suggesting that improvements in human capital have not translated into meaningful reductions in unemployment in Nigeria.

Table 4.3: DOLS Estimates on the Effect of Human Capital Development on Unemployment

Dependent Variable: Unemployment		
Regressors	*Coefficient*	*P-Value*
Human Capital Development (H)	-0.03	0.23
Vacancy (V)	-0.30	0.01***
Economic Growth (EGR)	0.10	0.25
Inflation Rate (INF)	0.06	0.00**
Interest Rate (INT)	-0.01	0.00**
Technological Innovations (TFP)	0.10	0.00**
Investment (INV)	0.15	0.28
Population Growth Rate (PGR)	0.03	0.00**
Tertiary Enrollment	-0.01	0.97
Adjusted R-squares	0.90	
Wald test/J-B statistic	69.23 (0.00)*	25.04 (0.37)

Source: Author's computation using E-views 12; Note: **p<0.05, ***p<0.1

Several factors may explain this outcome. One major issue is the declining quality of education and inadequate investment in the education sector. These challenges limit the development of relevant skills required in the labour market. Consequently, many graduates remain unemployed or underemployed despite possessing formal educational qualifications.

This observation aligns with the World Bank (2023a), which reported that Nigeria has one of the lowest human capital development levels in Africa, ranking below countries such as Ghana and Kenya. Weak human capital outcomes are also linked to poor health conditions. According to WHO (2023), investments in universal health coverage significantly improve workforce productivity and economic resilience. However, Nigeria continues to face serious health challenges, including high maternal mortality rates and widespread child malnutrition. For instance, maternal mortality stands at 512 deaths per 100,000 live births, while stunting affects about 37 percent of children under five (NBS & UNICEF, 2021; WHO, 2023). These health deficits weaken cognitive development and labour productivity, thereby limiting the employment potential of the workforce.

Job vacancies, on the other hand, show a significant negative relationship with unemployment. A one percent increase in job vacancies reduces unemployment by about 30 percent, highlighting the importance of job creation and labour market matching efficiency. This result suggests that expanding employment opportunities across the formal and informal sectors remains a key strategy for addressing unemployment in Nigeria.

Interestingly, economic growth exhibited a positive relationship with unemployment. Although statistically insignificant, the result suggests that economic growth in Nigeria may not be sufficiently employment-generating. This phenomenon reflects what has often been described as "jobless growth," where economic expansion does not translate into increased employment opportunities. Such patterns have been discussed in classical and endogenous growth theories (Solow, 1956; Okun, 1962; Romer, 1986).

Inflation shows a positive and statistically significant effect on unemployment. Rising inflation increases production costs and reduces the purchasing power of consumers, which may lead firms to scale down operations or close production lines, thereby increasing unemployment.

Technological innovation also exhibited a positive relationship with unemployment. The findings suggest that technological advancement may displace labour through automation and process innovation. This result supports the findings of Oyegoke and Wasiu (2021), who argued that technological innovations can increase unemployment when they replace labour-intensive processes.

Interest rate shows a negative relationship with unemployment, implying that favourable lending conditions may stimulate investment and job creation. Conversely, investment measured by domestic credit to the private sector shows a positive relationship with unemployment, although the result is statistically insignificant. This anomaly may reflect inefficiencies in the utilisation of investment funds, including diversion of funds and investments that do not generate significant employment.

Overall, the model exhibits strong explanatory power, with an adjusted R-square of 90 percent, indicating that the explanatory variables account for most of the variations in unemployment. Diagnostic tests confirm the stability and reliability of the model.

3.2. Effect of Human Capital Development on Economic Growth in Nigeria

The second model examined the influence of human capital development on economic growth in Nigeria. The estimate, and that of other variables are presented in Table 4.4. The results indicate that human capital development has a positive and statistically significant effect on economic growth. Specifically, a one percent improvement in human capital increases economic growth by about 2 percent. This result supports the theoretical view that human capital plays a critical role in enhancing productivity and economic performance. The finding is consistent with Otu and Adenuga (2006), who emphasized the importance of human capital investment in promoting economic development.

Table 4.4: DOLS Estimates on the Effect of Human Capital Development on Economic Growth

Dependent Variable: Economic Growth		
Regressors	*Coefficient*	*P-Value*
Human Capital Development (H)	0.02	0.02**
Physical Capital Stock (K)	-0.01	0.00*
Inflation Rate (INF)	0.16	0.00*
Interest Rate (INT)	0.02	0.00*
Technological Innovations (TFP)	0.18	0.04**
Investment (INV)	-0.06	0.01**
Population Growth Rate (PGR)	-0.07	0.09**
Tertiary Enrollment	-0.03	0.09**
Adjusted R-squares	0.56	
Wald test/J-B statistic	8.24 (0.00)*	1.77 (0.41)

Source: Author's computation using E-views 12; Note: *p<0.05, **p<0.1

However, physical capital stock displayed a negative relationship with economic growth, contrary to theoretical expectations. This may reflect inefficiencies in capital allocation, corruption, or inadequate infrastructure development, which limit the productive use of physical capital in the economy. Inflation and interest rate both show positive and statistically significant relationships with economic growth. In the short run, rising prices may stimulate investment activities as firms attempt to take advantage of profit opportunities. Similarly, higher interest rates may encourage the mobilisation of savings and investment funds, thereby stimulating economic activity.

Technological innovation also contributes positively to economic growth. A one percent improvement in technology increases output growth by about 18 percent. This finding aligns with Romer's (1990) endogenous growth theory, which highlights the role of technological progress as a major driver of economic growth. Investment and population growth, however, exhibit negative relationships with economic growth. The negative impact of investment may reflect misallocation or diversion of investment funds, while rapid population growth may strain available resources and reduce per capita productivity.

Tertiary enrolment also shows a negative relationship with economic growth. This finding reflects concerns about the declining quality of higher education and the mismatch between university training and labour market requirements. Frequent disruptions in academic calendars, inadequate funding, and weak institutional capacity undermine the ability of the education system to produce skilled labour capable of supporting economic growth. The model explains about 56 percent of the variations in economic growth, while diagnostic tests confirm the robustness and stability of the estimation.

3.3. Effect of Human Capital Development and Unemployment on Economic Growth in Nigeria

The third model examined the combined effect of human capital development and unemployment on economic growth. The results in Table 4.5 reveal that both variables negatively affect economic growth. Human capital development shows a negative and statistically significant relationship with economic growth when unemployment is included in the model.

Table 4.5: DOLS Estimates on the Effect of Human Capital Development and Unemployment on Economic Growth

Dependent Variable: Economic Growth		
Regressors	*Coefficient*	*P-Value*
Human Capital Development (H)	-0.04	0.02***
Physical Capital Stock (K)	0.22	0.07***
Unemployment (U)	-0.04	0.00**
Inflation Rate (INF)	-0.13	0.05**
Interest Rate (INT)	0.02	0.00*
Technological Innovations (TFP)	0.18	0.07***
Investment (INV)	0.07	0.06***
Population Growth Rate (PGR)	0.12	0.02***
Tertiary Enrollment	0.05	0.03***
Adjusted R-squares	0.79	
Wald test/J-B statistic	22.59 (0.00)**	0.90 (0.64)

Source: Author's computation using E-views 12; Note: *p<0.01, **p<0.05, ***p<0.1

A one percent increase in human capital development leads to a 4-percent decline in economic growth. This outcome suggests that improvements in human capital may not translate into economic growth when unemployment remains high. Unemployment also negatively affects economic growth. A one percent increase in unemployment reduces economic growth by approximately 4 percent. These results indicate that rising unemployment undermines the productive utilisation of human capital.

The findings highlight the presence of significant labour market inefficiencies in Nigeria. Skill mismatches between job seekers and employers reduce the effectiveness of human capital development efforts. In addition, employment opportunities are often influenced by political patronage and social connections rather than merit and competence. This situation weakens the link between human capital development and economic productivity (Banos, Rodriguez-Alvarez & Suarez-Cano, 2019; Oguchi & Oriaku, 2020).

Physical capital stock, however, shows a strong positive effect on economic growth. Improvements in infrastructure and capital investment can significantly stimulate economic expansion. Inflation negatively affects growth, reflecting the damaging effects of rising prices on economic stability. Interest rate and technological innovation contribute positively to economic growth. Higher interest rates can encourage investment flows, while technological progress enhances productivity and efficiency.

Investment, population growth, and tertiary enrolment also show positive effects on economic growth in this model, suggesting that these variables can support long-term economic expansion when effectively managed. The model demonstrates strong explanatory power with an adjusted R-square of 79 percent, indicating that the explanatory variables account for most variations in economic growth. Diagnostic tests confirm the reliability and normal distribution of the residuals.

4. Summary of Empirical Findings

The empirical results from the three estimated models address the study's core objectives. The first model indicates that human capital development can reduce unemployment, although the effect is not statistically significant in the Nigerian context. The second model demonstrates that human capital development contributes positively to economic growth. However, the third model reveals that the positive effect of human capital development on economic growth is undermined when unemployment remains high. Overall, the findings suggest that while human capital development is essential for economic growth, its effectiveness depends largely on the capacity of the economy to generate employment opportunities. Without adequate job creation and efficient labour market matching, improvements in human capital may fail to translate into meaningful economic growth in Nigeria.

V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

1. Summary

This study examined the relationship between unemployment and economic growth in Nigeria with particular emphasis on the role of human capital development. The analysis incorporated key macroeconomic variables, including physical capital stock, inflation rate, interest rate, investment, technological innovation, population growth rate, and tertiary enrollment as channels through which human capital development may influence unemployment and economic growth. Annual time-series data covering the period 1980–2024 were utilised for the empirical analysis.

Preliminary analyses were conducted using descriptive statistics and correlation analysis to examine the distributional properties of the variables and their initial relationships. In addition, the Augmented Dickey–Fuller

(ADF) and Phillips–Perron (PP) unit root tests were applied to determine the stationarity properties of the variables. The results indicated mixed orders of integration, with some variables stationary at level and others at first difference. Based on these results, the Dynamic Ordinary Least Squares (DOLS) estimation technique was adopted as the most suitable method for estimating the long-run relationships among the variables.

Three models were estimated using DOLS, in line with the study's research objectives. Although a few coefficients exhibited unexpected signs or were statistically insignificant, the overall results largely conformed to theoretical expectations. Diagnostic tests further confirmed the reliability of the estimated models. The Jarque–Bera statistics indicated that the variables were normally distributed, while the Wald tests confirmed the joint significance of the explanatory variables. The adjusted R-squared values also showed that the regressors accounted for a substantial proportion of the variation in the dependent variables.

The findings from the first model indicated that human capital development tends to reduce unemployment in Nigeria, although the relationship was not statistically significant. This outcome reflects structural weaknesses in Nigeria's human capital development framework, particularly declining education quality and insufficient funding for both education and healthcare. These limitations reduce the effectiveness of skill acquisition and contribute to persistent mismatches between the skills job seekers possess and those employers require. Consequently, labour-market matching inefficiencies remain a major factor sustaining unemployment in the country.

The study also revealed that declining job vacancies across both public and private sectors influence unemployment in Nigeria. The positive relationship observed between economic growth and unemployment suggests the existence of jobless growth in the Nigerian economy. In other words, economic expansion has not been accompanied by proportional increases in employment opportunities. Technological innovation was also found to increase unemployment significantly. This result reflects the growing adoption of labour-saving technologies across sectors of the economy. While technological advancement improves productivity and efficiency, it may simultaneously displace labour and contribute to rising unemployment.

The second major finding showed that human capital development promotes economic growth in Nigeria. This supports the theoretical proposition

that human capital is a critical driver of productivity and economic performance. However, physical capital stock was found to exert a negative influence on economic growth, suggesting that capital resources may often be diverted to less productive activities or allocated inefficiently. Inflation and interest rates were also observed to influence economic growth. Rising prices may sometimes attract investment by increasing expected returns, while higher interest rates may encourage the mobilisation of savings into productive investments in the short run. Technological innovation was also found to significantly promote economic growth despite its potential to increase unemployment, highlighting the important role of technology in enhancing productivity.

The third key finding indicated that human capital development cannot effectively stimulate economic growth when unemployment continues to rise. Persistent unemployment reflects insufficient job opportunities and prevents the productive utilisation of skilled labour. As a result, even when improvements occur in education and human capital formation, their potential benefits cannot be fully realised if skilled individuals remain unemployed or underemployed. The findings therefore underscore the importance of labour-market efficiency in transmitting the benefits of human capital development to economic growth.

Finally, the study revealed that while inflation may reduce economic growth during periods of persistent price instability, efficient allocation and utilisation of physical capital can positively influence economic growth. Overall, the results demonstrate that although human capital development is essential for economic growth, its effectiveness depends largely on the capacity of the economy to generate adequate employment opportunities.

2. Conclusion

Both theoretical reasoning and empirical evidence suggest that improvements in human capital development should enhance economic growth and reduce unemployment. However, the interaction among these variables is complex and requires empirical examination, particularly in developing economies such as Nigeria. Using annual time-series data and the Dynamic Ordinary Least Squares (DOLS) technique, this study examined the impact of human capital development on unemployment and economic growth while controlling for other key macroeconomic factors such as physical capital, inflation,

technological innovation, interest rates, population growth, and tertiary enrollment.

The findings lead to three major conclusions. First, improvements in human capital development have the potential to reduce unemployment in Nigeria, although the effect is not statistically significant due to structural weaknesses in the labour market. Second, human capital development contributes positively to economic growth by improving productivity and expanding output. Third, the positive impact of human capital development on economic growth becomes limited when unemployment remains persistently high.

These results reveal a critical structural challenge in the Nigerian economy: the disconnect between human capital development and employment generation. Investments in education and skill development may improve labour quality, but their economic benefits cannot be fully realised unless sufficient employment opportunities exist to absorb skilled workers. Consequently, human capital development alone cannot guarantee sustainable economic growth in the presence of persistent unemployment. Effective growth strategies must therefore integrate human capital development with policies that promote job creation and improve labour-market efficiency.

3. Recommendations

Based on the findings of this study, the following policy recommendations are proposed.

- First, policymakers should prioritise industry-oriented human capital development strategies that align education and training systems with labour-market demands. Reforming Nigeria's education system to emphasise practical, technical, and vocational skills will improve labour-market matching and reduce unemployment.
- Second, comprehensive reforms are required in the education sector to establish a quality-driven and demand-responsive educational system capable of producing skilled and adaptable manpower. Increased investments in education, skills development, research, and innovation will strengthen the capacity of the labour force to respond to changing technological and industrial demands.
- Third, since the study established that human capital development cannot significantly promote economic growth in the presence of rising

unemployment, deliberate policies must be implemented to expand employment opportunities. The government should create an enabling environment that encourages both domestic and foreign investment by improving infrastructure, ensuring regulatory stability, and fostering effective public-private partnerships. Expanding investment opportunities across sectors will stimulate industrial growth, generate employment, and improve the utilisation of human capital.

If effectively implemented with clear timelines and strategic planning, these measures will significantly reduce unemployment and strengthen the contribution of human capital development to sustainable economic growth in Nigeria.

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