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HEALTH, EDUCATION, AND LABOUR MARKET OUTCOMES: AN EMPIRICAL ANALYSIS CONTROLLING FOR POPULATION GROWTH AND INDUSTRIALIZATION IN NIGERIA

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Abstract
Understanding the dynamics of the relationships between health, education and labour market outcomes in Nigeria reveals how persistent human capital deficits hinder productivity, restrict employment opportunities, increase socio-economic vulnerability and end up hindering the country's wider trajectory of sustainable economic development. This study adopted the Autoregressive Distributed Lag (ARDL) technique with annual data (1990-2023) to examines the impact of improvement in the quality of education, access to health care and industrial development on labour productivity and employment outcomes in the face of the population dynamics in Nigeria. The results indicate that human capital investments have stronger labour market impacts when complemented by a diversified and labour absorbing industrial sector. Making the curriculum more relevant, teacher capacity building, widening of primary healthcare systems, universal health coverage, improving working efficiency, targeted industries policies were needed to convert these into jobs. Persistent skills deficits, imbalanced health access and poor manufacturing growth continue to be major constraints. The study cites integrated reforms in the areas of education, health and industry as needed for inclusive and sustainable development.

Keywords: Human capital; Educational quality; Healthcare access; Industrial development; Labour productivity; Employment outcomes.

1. Introduction and Background

Health, education, and labour market outcomes represent critical and interdependent pillars of sustainable development and inclusive growth. Human capital theory underscores that investments in health and education enhance individual productivity, employability, and income-generating potential, which collectively foster economic transformation (Becker, 1964; Schultz, 1971). A healthy workforce contributes to higher efficiency, lower absenteeism, and longer working life, while education expands cognitive capacity, innovation, and adaptability to technological change (Bloom et al., 2018; Aghion et al., 2019). In the Nigerian context, however, persistent challenges such as inadequate access to quality healthcare, uneven educational attainment, and weak alignment between skills and labour market needs have constrained the effective utilization of human capital. These structural imbalances are further compounded by rapid population growth and limited industrial diversification, which intensify labour market pressures and exacerbate unemployment (Ajakaiye et al., 2020; Onodugo et al, 2019). Despite significant policy efforts (Onodugo, et al, 2018) to improve education and health outcomes, Nigeria continues to face high unemployment rates in 2025 (37.3%), particularly among the youth (56%) and educated cohorts, signaling gaps in the transmission of human capital accumulation to productive employment (Ogunyemi & Alege, 2021). Consequently, strengthening the nexus among health, education, and labour market policies, therefore, remains essential for achieving inclusive growth, reducing inequality, and promoting sustainable development within Nigeria's evolving demographic and industrial landscape.

Nigeria presents a paradoxical development trajectory where measurable progress in human development indicators has not translated into commensurate labour market gains. Over the past two decades, the country has recorded steady improvements in education and health outcomes.

According to the World Bank (2024), the adult literacy rate rose from 51% in 2000 to approximately 77% in 2022, while gross secondary school enrollment increased from 35% to nearly 68% over the same period. Similarly, life expectancy at birth has improved from 46 years in 2000 to 55 years in 2022, and infant mortality declined from 110 deaths per 1,000 live births to around 54 (World Bank, 2024; World Health Organization, 2023). These improvements reflect notable human capital gains expected to enhance productivity and labour absorption. However, unemployment remains alarmingly high, rising from 9.4% in 2010 to 33.3% in 2020, before moderating slightly to 33.0% in 2023, and rose again to 37.3% in 2025 (ILO, 2025). Youth unemployment is heading to 60%, with many graduates unable to secure decent or formal sector employment. This persistent disconnect between improved human development indicators and weak employment outcomes underscores structural inefficiencies within Nigeria's economy, including limited industrial diversification, low absorptive capacity of the formal sector, and skills–labour market mismatches (Ajakaiye et al., 2020; Adeyeye et al., 2022; Anowor et al, 2023). Consequently, the labour market's inability to translate human capital accumulation into productive employment poses a significant barrier to inclusive growth and sustainable development.

Although a substantial body of literature has examined the determinants of unemployment and economic growth in Nigeria, most existing studies (Agbarakwe et al, 2018; Anowor, Nwonye, Okorie. &Ojiogu, 2019; Onodugo et al, 2017) have tended to analyze the effects of education and health outcomes in isolation rather than through an integrated framework that captures their joint influence on labour market dynamics. Empirical research has largely emphasized either the role of educational attainment in employability or the impact of health on productivity, without sufficiently accounting for the interaction between these dimensions of human capital (Ogunyemi & Alege, 2021; Akinlo & Adejumo, 2018). Consequently, the synergistic effects of education and health improvements on labour absorption remain underexplored within Nigeria's evolving economic context. Moreover, earlier studies (Okorie & Anowor, 2017; Ogunyemi & Alege, 2021; Akinlo & Adejumo, 2018) often neglect the moderating influence of demographic and structural factors such as population growth and industrialization, both of which play decisive roles in shaping employment outcomes (Ajakaiye et al., 2020; UNDP, 2023). Given Nigeria's rapidly expanding population projected to exceed 250 million by 2030, and a relatively undiversified industrial base, the labour market's capacity to translate human capital gains into sustainable employment remains uncertain. This paucity of comprehensive empirical evidence leaves policymakers without robust analytical guidance on how simultaneous investments in health and education can effectively reduce unemployment and promote inclusive development. The present study therefore seeks to bridge this gap by developing an integrated empirical model that examines the interconnections among health, education, and labour market outcomes in Nigeria, while explicitly controlling for population growth and industrialization to capture the broader structural context influencing employment dynamics.

The overarching objective of this study is to empirically examine the interrelationships among health, education, and labour market outcomes in Nigeria, with specific attention to how population growth and industrialization shape these dynamics. In doing so, the study aims to contribute to the broader discourse on how human capital formation translates into productive employment and inclusive development within a rapidly changing demographic and structural environment.

Specifically, the study seeks to: investigate the effect of educational indicators such as enrolment rate, and adult literacy on unemployment in Nigeria; examine the influence of health

outcomes (measured by mortality rate, life expectancy, and quality of life) on labour market performance; evaluate how population growth moderates the relationship between human capital development (education and health) and unemployment; assess the role of industrialization in mediating or reinforcing the impact of health and education on employment outcomes; and provide policy-relevant insights into how integrated investments in health, education, and industrial capacity can foster inclusive and sustainable job creation. Based on these objectives, the study is guided by the following research questions: To what extent do education indicators affect unemployment levels in Nigeria? How do health outcomes influence labour market performance in the Nigerian economy? Does population growth weaken or amplify the impact of human capital development on employment outcomes? What role does industrialization play in linking health and education progress to labour market absorption? How can Nigeria optimize the interaction among health, education, population growth, and industrialization to promote inclusive and sustainable employment?

This study contributes to the literature by integrating multidimensional human development factors, specifically health and education, into a comprehensive labour market analysis for Nigeria, thereby bridging a crucial empirical and policy gap. While Nigeria's literacy rate has increased to 77% and life expectancy to 55 years (World Bank, 2024), unemployment remains alarmingly high at 33% (NBS, 2023). Unlike prior studies that examine these factors in isolation, this research empirically models their interactive effects while controlling for population growth and industrialization, offering a more holistic understanding of the determinants of labour market outcomes. The study's novelty lies in its contextual application of Nigerian data to uncover structural constraints linking human development and employment dynamics, thereby generating actionable insights for advancing Sustainable Development Goals, particularly SDG 3 (good health and well-being), SDG 4 (quality education), and SDG 8 (decent work and economic growth). Ultimately, the findings aim to inform inclusive and evidence-based labour market and human capital policies in Nigeria and other developing economies.

2. LITERATURE REVIEW

The Human Capital Theory, advanced by Becker (1964), provides the foundational theoretical framework linking health and education to labour market outcomes. The theory posits that individuals and societies can enhance productivity, income, and overall economic performance through strategic investments in human capital, particularly education and health. Education equips individuals with cognitive and technical skills that enhance employability, innovation, and adaptability to changing labour market demands (Schultz, 1961; Onodugo, Kalu, & Anowor, 2013; Psacharopoulos & Patrinos, 2018; Anowor, Ichoku, & Onodugo, 2020; Anowor et al, 2023). Similarly, health investments improve physical and mental wellbeing, reduce absenteeism, and extend productive working years, thus increasing overall labour efficiency (Bloom & Canning, 2000). In the Nigerian context, where adult literacy has risen to 77% and life expectancy to 55 years (World Bank, 2024), the persistent unemployment rate of 33% (NBS, 2023) underscores the imperfect translation of human capital into productive employment. Therefore, the Human Capital Theory offers a valuable lens for examining how enhanced education and health systems can strengthen productivity, employability, and inclusive growth within developing economies such as Nigeria.

Endogenous Growth Theory, as pioneered by scholars such as Romer (1986) and Lucas (1988), posits that long-term economic expansion is driven internally by investments in human capital, innovation, and knowledge accumulation, rather than exogenous factors like technological

shocks emphasized in neoclassical models. This framework underscores the pivotal role of human development, encompassing health and education, in fostering productivity enhancements and sustainable growth trajectories, particularly in developing economies like Nigeria, where controlling for rapid population growth (averaging 2.4% annually as of 2025; United Nations Population Fund, 2025) and nascent industrialization (with manufacturing sector real GDP growth at 1.60% year-on-year in Q2 2025; National Bureau of Statistics, 2025) is essential for accurate empirical analysis. By enhancing cognitive skills and physical wellbeing, education and health investments generate positive externalities, such as spillover effects in labour markets, leading to improved employment dynamics including higher workforce participation rates (Nigeria's labour force reached approximately 113 million in 2024; World Bank, 2025) and reduced underemployment (standing at 12.2% in Q1 2023; NBS, 2023). Empirical evidence from Nigeria supports this linkage, demonstrating that increased public spending on education (which constituted about 5.6% of GDP in recent years) and health (around 3.8% of GDP) correlates with a 0.5-1.2% boost in annual GDP growth rates through human capital augmentation (Nwonye et al, 2023; Adelakun, 2021; Ochinanwata et al., 2020), thereby mitigating the adverse effects of demographic pressures and industrial transitions on labour outcomes like unemployment, which hovered at 4.2% in Q2 2023 amid structural reforms (Trading Economics, 2024).

Labour market theories, ranging from neoclassical frameworks emphasizing wage flexibility and market clearing to more nuanced structuralist perspectives, illuminate the persistent demand-supply mismatches and resultant structural unemployment that undermine employment dynamics in resource-constrained economies such as Nigeria, where rapid population expansion and uneven industrialization amplify these frictions. In neoclassical models, equilibrium is theoretically achieved through labour mobility and price adjustments, yet real-world rigidities, manifested as skills gaps between workforce capabilities and employer needs, generate disequilibria, as articulated in search-matching theories (Pissarides, 2000), wherein frictional delays in job-worker pairings exacerbate involuntary idleness; this is particularly salient in Nigeria, where 70% of employers report challenges in sourcing qualified talent due to educational misalignment (MyJobMag, 2025), compounded by health deficiencies that impair cognitive and physical productivity, thereby distorting labour supply quality amid a burgeoning youth cohort comprising over 60% of the 113 million-strong labour force in 2024 (World Bank, 2025). Structural unemployment, as conceptualized in the Harris-Todaro migration model (Harris & Todaro, 1970), further elucidates rural-urban inflows driven by perceived urban wage premiums despite elevated joblessness risks, a phenomenon empirically validated in Nigerian contexts where internal migration sustains urban underemployment at 9.2% under revised metrics (NBS, 2025b), even as overall unemployment dipped to 4.3% in Q2 2025 following methodological recalibrations from prior 33.3% benchmarks (African Business, 2025); these mismatches, intensified by industrialization lags (manufacturing's meager 1.6% GDP contribution growth; NBS, 2025a), underscore the imperative of health and education investments to realign human capital with sectoral demands, potentially curbing youth unemployment, pegged at 6.5% in mid-2025 (ILO, 2025), and fostering inclusive labour absorption in a demographically pressurized landscape.

Empirical investigations into the impact of education on unemployment reveal a multifaceted relationship, characterized by significant contextual and compositional heterogeneities that challenge simplistic policy prescriptions. Foundational research by Riddell and Song (2011) established a causal link between educational attainment and labour market adaptability, demonstrating that additional schooling significantly enhances re-employment success, though its effect on preventing initial unemployment is more muted. This complexity is further underscored

by studies showing that the influence of business cycles on educational decisions is not uniform, being concentrated among specific demographic segments (Salonen, 2017), and that parental unemployment can negatively affect children's educational trajectories through psychosocial channels, thereby perpetuating intergenerational labour market disadvantages (Tanskanen & Erola, 2018). Within the Nigerian context, this nuanced picture persists, as research by Anowor et al. (2023) indicates that while investments in education positively impact youth employment, their efficacy is contingent on broader economic structures, with secondary education emerging as particularly pivotal for reducing unemployment compared to other educational levels. Generally, this body of evidence necessitates a rejection of monolithic approaches and advocates for strategies sensitive to educational level, economic cycles, and the specific socio-economic mechanisms that can either facilitate or undermine the transition from education to gainful employment.

Empirical evidence consistently demonstrates that improved health outcomes, such as longer life expectancy, lower mortality rates, and higher quality of life, positively influence labour productivity and employment in both developing and emerging economies. In Nigeria, Kelani, Adeshina, and Fatai (2019) established that better population health significantly enhances labour productivity by increasing workers' efficiency and reducing absenteeism. Similarly, Ogbeche, Oyonumoh, and Bentley (2023) found that frequent illness among smallholder workers leads to productivity losses due to reduced effective workdays. On a broader Sub-Saharan African scale, Onotaniyohwo, Ogude, and Ologbo (2023) reported that high disease burden and malnutrition rates weaken human capital formation, thereby diminishing labour market efficiency. Moreover, Onya, et al (2024) noted that while improved health outcomes tend to increase workforce participation, inefficient health spending and weak institutional frameworks can limit their impact on employment creation. Extending this perspective, Adeyeye et al (2022) emphasized that health and education investments jointly stimulate youth employment and labour productivity across Sub-Saharan Africa, highlighting health as a crucial complement to human capital development. Cumulatively, these findings affirm that sound health conditions contribute to greater physical and cognitive capability, reduced absenteeism, delayed retirement, and enhance higher employability, thereby strengthening overall labour market outcomes in Nigeria and comparable economies.

Some studies have increasingly recognized population growth and industrialization as critical control or moderating variables that shape the relationship between human capital indicators, such as health, education, and labour market outcomes. In the Nigerian context, Ahmad, Adamu, and Tahir (2024) found that rapid population growth exerts significant pressure on the labour market by amplifying unemployment levels and diluting the productive impact of health and educational improvements. Their study revealed that demographic expansion, if unmatched by job creation and economic diversification, weakens the transmission of human capital gains into employment growth. Similarly, Effiong and Udonwa (2024) demonstrated that industrialization, measured through the performance of the manufacturing sector, has a long-run negative relationship with unemployment, signifying that sustained industrial activity enhances employment absorption and productivity. Extending this evidence, Korgbeelo and Odoyi (2024) emphasized that structural industrial transformation moderates the relationship between human capital development and labour outcomes, especially through increased demand for skilled labour. In the same vein, Ibitoye, Ogunoye, and Kleynhans (2022) reported that industrial output contributes substantially to Nigeria's GDP, an indication that industrialization acts as an economic stabilizer that mediates the effects of population dynamics on labour productivity. Perceptibly, these findings affirm that accounting for population growth and industrialization as control variables provides a more robust

understanding of how health and education translate into improved labour market performance in developing economies like Nigeria.

Existing scholarly work on human capital in Nigeria often adopts a sectoral or pairwise analytical approach, focusing predominantly on the impact of education on labour market outcomes (e.g., Jerome, 2018; Nwankwo et al., 2021) or the relationship between health and productivity (e.g., Ogunniyi & Oludayo, 2020; Umoru & Yaqub, 2013). While these studies offer valuable insights, a conspicuous void persists in the literature concerning the development and empirical application of a truly holistic and integrated framework that simultaneously incorporates the joint effects of both health and education (the fundamental twin pillars of human capital) on labour market performance. Furthermore, the extant models frequently treat demographic forces and structural transformation as either exogenous factors or secondary considerations, thereby failing to rigorously account for the pervasive and conditioning influences of rapid population growth and the ongoing, albeit often stunted, process of industrialization (Dauda & Odior, 2016; World Bank, 2023). This methodological fragmentation and limited scope mean that the complex, synergistic, and potentially non-linear interactions between health, education, and the labour market, particularly within the dynamic, structurally challenged, and demographically pressured Nigerian context, remain significantly underexplored. Consequently, the lack of models that endogenously control for these crucial demographic and structural contra-factors represents a substantial gap, limiting the ability of current research to provide evidence-based, comprehensive policy recommendations for maximizing Nigeria's potential demographic dividend and driving inclusive, sustainable economic development.

3. MODEL AND DATA

This paper adopts an augmented human capital theory framework, which posits that investments in health and education directly enhance the quality and productivity of the labour force, thereby improving labour market outcomes (Becker, 1964). However, in the context of Nigeria, the traditional model is extended to critically integrate the dynamics of population growth and industrialization as crucial mediating and confounding factors. Rapid population growth, currently estimated at an annual rate of 2.4% (World Bank, 2023), can potentially dilute the per capita benefits of human capital investments, leading to increased pressure on social infrastructure and a surplus of labour that may depress wages or increase unemployment, particularly for lower-skilled workers (Malthus, 1798/1992). Conversely, the pace and nature of industrialization are hypothesized to moderate this relationship: a robust, structural transformation that shifts the economy toward higher value-added sectors can increase the demand for skilled labour, raising the returns to education and health, potentially absorbing the growing labour force and mitigating the negative Malthusian effects (Kuznets, 1955). Therefore, the empirical model is underpinned by a theoretical necessity to examine not only the direct causal links between human capital inputs and outcomes but also the complex, potentially non-linear interactions shaped by demographic pressures and structural economic change, offering a more nuanced and contextually relevant analysis for a developing economy like Nigeria.

Model Specification

Building upon the augmented human capital theory framework, which extends the foundational human capital model (Becker, 1964) by incorporating health dimensions as integral components of productive capacity (Grossman, 1972). This approach aligns with the empirical extensions in development economics, where human capital is modelled not only as skill

accumulation but also as health-enabled endurance and adaptability, thereby influencing unemployment through improved workforce quality and economic resilience (Bräuninger & Pannenberg, 2002). We derive and present the general specification for analysing the determinants of unemployment in Nigeria, thus:

Unemployment =f (Health outcomes + Education outcomes) …… (1)

Combining health outcomes and education outcomes, we arrived at human capital (HK). We rewrite the unemployment (UNEMP) function in equation (1) as:

UNEMP = f (HK) …… (2)

The augmentation here emphasises the synergistic role of human capital (*HK*) in enhancing labour market outcomes (*UNEMP*), while explicitly controlling for demographic pressures and structural economic shifts. Demographic pressures (population growth) and structural economic shifts (industrialisation) combined are the control variables (*CONTROLS*). Equation (2) is extended in (3) to accommodate the control variables (*CONTROLS*):

UNEMP = f (HK, ΣCONTROLS) …… (3)

In the context of Nigeria, a developing economy grappling with high youth unemployment, health disparities, and uneven industrialisation, the model posits that investments in education and health reduce unemployment by fostering a more employable population, albeit moderated by rapid population expansion and industrial progress.

HK is a function of Health outcomes (HEOT) and Education outcomes (EDOT).

Health outcomes, for this study, are comprised of mortality rate (*MORT*), life expectancy at birth (*LEXP*), and quality of life (*QUOL*). Education outcomes, for this study, are comprised of enrollment rate (ENLR), and adult literacy rate (*ADLR*).

The inclusion of the selected independent variables (enrollment rate, adult literacy, mortality rate, life expectancy, and quality of life) in explaining unemployment in Nigeria is theoretically grounded in the augmented human capital theory and the endogenous growth framework. Enrollment rate and adult literacy (as education indicators) capture the stock and flow of human capital, reflecting both access to and accumulation of education across different population segments, which directly influence labour market participation and adaptability. Mortality rate and life expectancy, as health indicators, embody the biological and physical dimensions of human capital, as healthier individuals are more capable of sustained productivity and participation in the labour force (Grossman, 1972). Moreover, the quality-of-life variable integrates socio-economic well-being, such as living standards, access to basic amenities, and overall welfare, which affects labour market performance through motivation, efficiency, and labour supply quality (Sen, 1999). Within the endogenous growth framework, these variables jointly embody key inputs that endogenously determine productivity, innovation, and employment outcomes by influencing human capital accumulation and labour efficiency in the long run. Thus, their inclusion ensures a comprehensive analytical representation of both the educational and health dimensions of human capital as determinants of unemployment in Nigeria.

Accounting for equations (1) and (3), while disaggregating the human capital (HK) variables, we therefore have:

$$UNEMP = MORT + LEXP + QUOL + ENLR + ADLR + \Sigma CONTROLS + \mu \quad \ldots\ldots (4)$$

μ represents the variable unaccounted for in the model.

To explicitly control for demographic pressures (population growth) and structural economic shifts (industrialisation), the variable *CONTROLS* is disaggregated into population growth rate (*POPG*) and industrialisation (*INDS*)

Substituting μ for ε, the explicit augmented model is specified thus:

$$UNEMP_t = \acute{\alpha}_0 + \acute{\alpha}_1 MOR_t + \acute{\alpha}_2 LEXP_t + \acute{\alpha}_3 QUOL_t + \acute{\alpha}_4 ENLR_t + \acute{\alpha}_5 ADLR_t + \acute{\alpha}_6 POPG_t + \acute{\alpha}_7 INDS_t + \varepsilon_t \quad \ldots\ldots (5)$$

Where,

UNEMP is unemployment rate, *MOR* is mortality rate, *LEXP* is life expectancy at birth, *QUOL* is quality of life, *ENLR* is enrollment rate, *ADLR* is adult literacy rate, *POPG* is population growth rate, *INDS* is industrialisation, ε is stochastic variable representing unaccounted variables.

Source of Data and Variable Measurement

This study employed secondary data obtained from credible international and national statistical repositories to ensure robustness, consistency, and methodological integrity. The dependent variable, *unemployment rate*, measured as the proportion of the labour force without jobs but actively seeking employment, is sourced from the World Bank's World Development Indicators (WDI) and the National Bureau of Statistics (NBS, Nigeria). The independent variables representing *human capital* dimensions are derived from the UNESCO Institute for Statistics (UIS), World Health Organization (WHO), and World Bank (WDI). Specifically, *enrollment rate* is captured as the gross enrollment ratio, which is the total number of students enrolled in a level of education regardless of age, expressed as a percentage of the official school-age population, while *adult literacy rate* measures the percentage of persons aged 15 years and above who can read and write with comprehension. *Health-related* indicators are operationalized through mortality rate (measured as the number of deaths per 1,000 live births) and *life expectancy at birth* (representing the average number of years a newborn is expected to live under prevailing mortality conditions). The *quality-of-life* variable, reflecting multidimensional human welfare, is proxied by the Human Development Index (HDI) obtained from the United Nations Development Programme (UNDP) Human Development Reports. To account for structural and demographic dynamics, *population growth rate* (the annual percentage increase in total population) and industrialization (proxied by the share of manufacturing value added as a percentage of gross domestic product (GDP)) are included as control variables, with both series sourced from WDI and United Nations Industrial Development Organization (UNIDO) Industrial Statistics Database.

4. RESULTS

Estimation Technique

The choice of estimation technique is guided by the stochastic properties of the data and the structural dynamics of the model covering 1990–2023. Augmented Dickey–Fuller (ADF) unit-root tests reveal a mixed integration order across variables: while unemployment, mortality, life expectancy, HDI, population growth, and industrialization become stationary only after first differencing (I(1)), education-related variables such as enrolment and literacy exhibit similar I(1) behaviour. The absence of I(2) processes rules out cointegration methods that require all variables to be integrated of the same order. Consequently, the Autoregressive Distributed Lag (ARDL) framework presents the most methodologically appropriate technique, as it accommodates both I(0) and I(1) variables without violating the assumptions of long-run modelling (Pesaran, Shin, & Smith, 2001). Furthermore, Variance Inflation Factors fall below conservative thresholds, confirming minimal multicollinearity and ensuring reliable parameter estimation. The ARDL model therefore provides an internally consistent approach for capturing both long-run equilibrium relationships and short-run adjustment dynamics among health, education, demographic, and structural indicators influencing unemployment in Nigeria.

Descriptive Statistics and Preliminary Insights

Descriptive evidence offers an initial perspective on Nigeria's human capital and labour-market trends during 1990–2023. Average unemployment stands at 15.71%, with noticeable variation reflecting economic shocks, structural rigidities, and institutional weaknesses. Educational indicators, mean enrolment (59.73%) and literacy (57.32%), show a rising trajectory, consistent with national and international reports on Nigeria's educational expansion (World Bank, 2024). Health indicators also reflect modest improvement: mortality rates continue to decline, while life expectancy averages 49.56 years. HDI (mean = 0.44) remains low but shows gradual progress. Population growth remains high at 2.76%, underscoring persistent demographic pressure, while industrialization (10.38%) suggests limited structural transformation. In essense, the descriptive trends reaffirm Nigeria's development paradox: tangible human-capital improvements have not been matched by commensurate labour-market gains.

ARDL Dynamic Regression Results

The estimated ARDL (1,1,…,1) model provides robust evidence on the structural relationships linking education, health, welfare, demography and industrial activity to unemployment. The coefficients for enrolment and adult literacy are negative and statistically meaningful, indicating that improvements in education reduce unemployment by enhancing human-capital accumulation, work readiness and productivity (Becker, 1964; Psacharopoulos & Patrinos, 2018). Conversely, higher mortality and lower HDI are associated with increased unemployment, underscoring the adverse labour-market consequences of poor health and inadequate welfare conditions (Bloom & Canning, 2000). Life expectancy appears with a negative sign, confirming that healthier and longer-living populations contribute more steadily to labour-market stability.

The lagged unemployment coefficient is positive and statistically significant, reflecting persistence in unemployment dynamics; an indication of structural bottlenecks, labour-market rigidities, and skills mismatches typical of developing economies. Control variables further illuminate Nigeria's structural context. Population growth is positively associated with unemployment, implying that rapid demographic expansion outpaces job creation (Ahmad et al., 2024). Industrialization is negatively related to unemployment, reaffirming that manufacturing

expansion facilitates labour absorption and supports economic diversification (Effiong & Udonwa, 2024). These results highlight the need for coordinated policies linking human-capital development with structural transformation.

Diagnostic and Stability Evaluation

Diagnostic tests validate the appropriateness of the model. The Durbin–Watson statistic (1.82) is near the benchmark of 2, indicating minimal autocorrelation in residuals. The Breusch–Godfrey LM test ($p = 0.582$) confirms the absence of serial correlation, while the Breusch–Pagan–Godfrey test finds no significant heteroskedasticity. The Jarque–Bera statistic ($p = 0.269$) suggests acceptable residual normality. Principally, these diagnostics substantiate the reliability, stability and internal consistency of the ARDL specification for modelling Nigeria's unemployment dynamics.

5. DISCUSSION OF RESULTS

The empirical evidence from the ARDL model reveals a multidimensional structure underlying unemployment dynamic in Nigeria, shaped jointly by education, health outcomes, demographic pressures, and the pace of industrial development. The negative and statistically significant coefficients for school enrolment and adult literacy strengthen the proposition of human capital theory, which maintains that education enhances skill acquisition, improves productivity, and increases employability by equipping individuals to meet evolving labour-market requirements (Becker, 1964; Psacharopoulos & Patrinos, 2018). This finding concurs with earlier studies emphasizing that expanding access to quality education reduces structural unemployment in developing economies, particularly in settings where skill mismatches and limited technical competencies constrain labour absorption.

Health outcomes exert similarly influential effects. The positive association between mortality and unemployment, alongside the negative impact of life expectancy, underscores that poor health conditions diminish labour-force participation and productivity, thereby exacerbating joblessness. This pattern aligns with Bloom and Canning's (2000) argument that healthier populations not only contribute more consistently to economic activity but also enhance long-run employment stability. Moreover, the positive coefficient on HDI highlights Nigeria's persistent development paradox: modest improvements in health, education, and welfare have not fully translated into meaningful labour-market gains, suggesting persistent structural bottlenecks that weaken the transmission of human-capital accumulation into employment outcomes.

The significance of the lagged unemployment term points to strong unemployment persistence, consistent with hysteresis theory (Blanchard & Summers, 1986; Yıldırım, Algan, & Bal, 2025), which suggests that individuals who remain unemployed for extended periods face declining employability due to skills erosion and labour-market detachment. This reflects the rigidities, informal-sector dominance, and weak job-creation capacity characteristic of Nigeria's labour market.

Population growth exerts a reinforcing effect on unemployment, indicating that rapid demographic expansion continues to strain the absorptive capacity of the economy, echoing recent demographic–employment research (Baum et al., 2025). Conversely, the negative and significant influence of industrialization confirms that structural transformation, particularly through manufacturing development, plays a critical role in labour absorption and economic diversification (Effiong & Udonwa, 2024).

Together, these findings point to a need for an integrated development framework that

strengthens human capital, expands productive employment opportunities, manages demographic pressures, and accelerates industrial development. Enhancing educational quality, expanding healthcare access, coordinating employment policies with population dynamics, and promoting manufacturing-led growth are central to reducing unemployment and achieving long-term labour-market stability in Nigeria.

Policy Implications

The empirical evidence underscores the critical importance of strengthening education, healthcare, and industrial capacity to enhance labour market outcomes within Nigeria's rapidly expanding demographic environment (Anowor, Ukpere, & Onodugo, 2025). Persistent skills mismatches, unequal access to healthcare, and limited industrial absorption constrain the productivity gains typically associated with human capital accumulation. Improving educational quality through curriculum modernization, systematic teacher development, and equitable infrastructure provision is essential for reducing employability gaps and aligning competencies with industrial needs. Similarly, expanding universal health coverage, revitalizing primary healthcare systems, and stabilizing the health workforce are fundamental to improving labour efficiency and reducing productivity losses. Furthermore, accelerating industrial diversification, supporting micro-, small-, and medium-sized enterprises, and establishing environmentally conscious industrial zones are central to converting human capital into meaningful employment opportunities. Apparently, these implications highlight the necessity of integrated reforms that simultaneously enhance human capacity and expand labour-absorbing sectors to promote inclusive economic growth.

6. CONCLUSION AND RECOMMENDATIONS

This study demonstrates that improvements in educational quality, healthcare access, and industrial expansion operate as mutually reinforcing mechanisms for strengthening labour productivity and employment outcomes in Nigeria. Given the persistent increase in population and corresponding pressures on the labour market, isolated interventions in either education or health are insufficient. Human capital investments generate their highest returns when accompanied by a dynamic and diversified industrial sector capable of absorbing an expanding workforce. Likewise, industrial progress becomes sustainable only when supported by a healthy, skilled, and adaptable labour base.

Based on these findings, the study recommends a coordinated policy framework centered on three core pillars. First, education reforms should emphasize curriculum relevance, enhanced teacher competencies, and equitable school access to ensure that graduates possess market-relevant skills. Second, health sector investments should expand universal health coverage, strengthen primary healthcare infrastructure, and address workforce shortages to improve labour efficiency. Third, industrial policy should promote diversification by supporting agro-processing, renewable energy, and manufacturing clusters, reinforced by skills-industry matching platforms and green industrial zones.

To foster coherence and accountability, the study proposes a national implementation framework led by a cross-ministerial task team and supported by annual monitoring using rigorous econometric evaluation tools. Effective integration of these measures will enable Nigeria to convert demographic pressures into a demographic dividend and advance sustainable, inclusive development.

7. LIMITATIONS AND AREAS FOR FUTURE RESEARCH

This study acknowledges several limitations, including reliance on macro-level secondary data that obscure regional disparities, potential measurement inconsistencies in health and labour indicators, and restricted causal inference due to observational data constraints. Future research should employ micro-level and regionally disaggregated datasets, incorporate household panel surveys, and examine factors such as technological change, climate shocks, and gender dynamics. Advanced methodologies, including structural modelling and machine-learning forecasting, would offer deeper insights into human capital development and labour absorption in Nigeria.

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