EXAMINING THE INFLUENCE OF THE MANUFACTURING SECTOR AND HUMAN CAPITAL DEVELOPMENT ON UNEMPLOYMENT IN NIGERIA: NEW EVIDENCE FROM ARDL

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ABSTRACT

This study examines the impact of the manufacturing sector and human capital development on unemployment in Nigeria using the Autoregressive Distributed Lag (ARDL) model to analyze both short- and long-run dynamics. Utilizing annual data on unemployment rate (LUMR), manufacturing value added (LMVA), manufacturing sector growth rate (LMSGR), primary school enrolment (LPRE), and government expenditure on education (LGEE), the analysis confirms that the variables are stationary at level or first difference, validating the ARDL approach. A three-lag structure is selected based on lag criteria, and the results indicate that LMVA, LMSGR, and LGEE significantly influence unemployment in the short run, while their long-run effects are statistically insignificant. Nonetheless, the ARDL bounds test confirms a long run cointegrating relationship among the variables. Diagnostic tests show no evidence of serial correlation or heteroskedasticity, and CUSUM and CUSUMSQ tests confirm model stability. The findings suggest that while improvements in the manufacturing sector and human capital development can reduce unemployment in the short term, their limited long-run impact points to deeper structural issues. The study recommends policies aimed at strengthening the manufacturing sector through infrastructure and innovation support, alongside sustained investment in quality education and vocational training to address structural unemployment in Nigeria.

Keywords: *ARDL, Human Capital Development, Manufacturing Sector, Unemployment*

JEL Classification; C32, E24, J21, J64, O14

1. Introduction

Unemployment remains one of Nigeria's most critical socio-economic challenges, persistently undermining economic stability, social cohesion, and sustainable development. According to Nigeria's National Bureau of Statistics (NBS), the national unemployment rate surged from 10.4% in Q4 2015 to an unprecedented high of 33.3% by Q4 2020, indicating over 23 million unemployed persons before easing slightly to 32.5% by Q2 2022 (National Bureau of Statistics [NBS], 2021; NBS, 2023).

Beyond these figures, the worsening unemployment crisis signals deep structural distortions, deficiencies in human capital development, and inadequate job creation capacities within Africa's largest economy (Adesua & Agbaeze, 2020; Osinubi, 2005).

Fundamentally, Nigeria's unemployment challenge reflects its dysfunctional economic structure and complexity as an emerging lower middle-income market economy. Despite being classified as a major oil-exporting country, Nigeria's economic base remains predominantly informal, agrarian, and lacks industrialization (Anyanwu, 2014; Odumosu & Oluwatobi, 2017). While the oil sector accounts for over 80% of exports and half of fiscal revenues, it contributes only 7.5% to GDP, reflecting very weak production linkages within the economy (Central Bank of Nigeria, 2022; Trading Economics, 2022). Conversely, the informal sector, engaging in low-skilled petty services and trade, employs over 80% of the labor force, while agriculture, accounting for around 30% of GDP, engages over 35% of total employment (NBS, 2021). Overall, Nigeria's economy suffers from premature deindustrialization, with manufacturing contributing less than 10% of GDP, unlike shares exceeding 30% in fast-emerging markets like China, Malaysia, and South Africa (Dasgupta & Singh, 2007; UNIDO, 2020).

Furthermore, empirical evidence affirms that Nigeria's expanding unemployment reflects the economy's inadequate job creation and absorptive capacity. Studies underscore those developing economies like Nigeria, experiencing rapid population growth and urbanization, require their productive sectors to sustain around 3-4% annual employment elasticity ratios that is, the percentage change in employment over the percentage change in economic output (Ajilore & Yinusa, 2011; Osinubi, 2005). However, during 2010-2020, Nigeria's overall employment elasticity averaged only 0.72%, indicating that annual GDP growth rates over 5% induced less than 1.5% new employment (NBS, 2021; Ogunniyi et al., 2022). More critically, the manufacturing sector's employment elasticity ratio slumped further to 0.08%, while the highest elasticities manifest in informal low-productivity agriculture and services (NBS, 2021). These findings indicate Nigeria's urgent imperative to correct structural bottlenecks toward transforming manufacturing into an engine of mass job creation.

Concerning unemployment causation, empirical scholars highlight both cyclical factors, such as economic recessions, and structural rigidities across socio-economic institutions (Adegboyega, 2022; Ajilore & Yinusa, 2011; Anyanwu, 2014). Nigeria's 2014-2017 economic recession, triggered by the global oil price crash, saw consecutive quarters of negative output growth that erased many existing jobs and livelihoods (NBS, 2019). As Akande (2014) indicates, business losses kept swelling unabated at over 50,000 during the crisis, with manufacturing firms operating at just 20-45% capacity utilization by 2017 amidst scarce inputs and depressed consumer demand. Consequently, over 3.6 million jobs were lost, while labor force participation rates dropped as many grew discouraged from seeking ever-scarcer employment opportunities (NBS, 2019).

However, empirical studies affirm that micro and macro-rigidities, especially infrastructure gaps, weak firm capabilities, and dysfunctional credit markets are the prime instigators of the economy's dismal employment generation (Akinyemi et al., 2022; Osinubi, 2005). Constraints like acute power outages and logistics bottlenecks impose high operating costs on Nigerian firms, undermining their productivity, profitability, and workforce expansion capabilities relative to international peers (Chete et al., 2014). Thus, local manufacturing firms remain stuck in low-production equilibrium traps, unable to tap into the economy's latent comparative

advantages. As a result, Nigeria underperforms significantly in labor-intensive light manufacturing export niches that should drive mass industrial employment, as evident in Bangladesh and Vietnam (Dinh et al., 2012). As Nassar et al. (2019) estimate, if Nigeria attained appropriate structural reforms benchmarked to their sample average levels, overall unemployment rates could significantly decline by over six percentage points, illustrating strong causal linkages between supportive economic institutions and job creation.

Moreover, human capital limitations severely worsen Nigeria's unemployment situation. Empirical evidence demonstrates strong associations between higher workforce education, health status, skills proficiency, and lower incidence of joblessness or underemployment across diverse country contexts (Ajani & Igbokwe, 2014; Nassar et al., 2019). Fundamentally, human capital advancement expands labor productivity and incomes while signaling employability to potential recruiters. Thereby, unemployment rates significantly fall as education levels rise, affirming human capital theory postulates (Ogunniyi et al., 2022).

However, Nigeria grapples with severe education sector challenges, ranging from chronic underfunding of public schools to frequent institutional strikes and human capital flight draining limited talent (Chukwuma & Ugochukwu, 2022). These factors manifest in over 13 million Nigerian children being out of school and only 7% of youths enrolled in post-secondary education or skills programs, compared to ratios exceeding 60% across emerging economies like China or Malaysia (UNESCO, 2021). Overall, Nigeria ranked lowest in human capital development globally within the World Bank's 2020 Human Capital Index assessments. In turn, most graduates lack competitive job-relevant skills, with just 33% of employers expressing satisfaction over Nigerian workforce competencies (Adesua & Agbaeze, 2020; World Bank, 2020). Consequently, human capital constraints significantly worsen labor demand-supply mismatches and graduate unemployability in Nigeria's job market.

Furthermore, empirical studies demonstrate extensive complementarities and synergies between dynamic manufacturing sectors and human capital development in driving high-productivity, high-employment growth equilibrium in developing countries (Dinh et al., 2012; Nassar et al., 2019; UNIDO, 2020). As Ostojic et al. (2022) indicate, globally competitive manufacturing sectors stimulate demand for advanced technical skills and education for engineers and technicians directly employed within industries or across input supply chains, thereby incentivizing huge human capital investments. In turn, enhanced human capital stock raises labor and total factor productivity, further bolstering manufacturing sector competitiveness and output growth. This generates virtuous cycles of expanding manufacturing FDI inflows, rising exports, and mass job multipliers across most East Asian industrializers like China or Malaysia (Dasgupta & Singh, 2007; Dinh et al., 2012).

In contrast, Nigeria remains stuck in low human capital low manufacturing traps. Empirical studies demonstrate the economy's skills gaps and human capital development bottlenecks severely undermine manufacturing sector capabilities by engendering negative productivity differentials of up to 40 percentage points against efficiency frontier benchmarks (Chete et al., 2014). Consequently, local industries lack scale, capabilities, and incentives to invest in workforce skills upgrading, ultimately perpetuating low-productivity equilibriums. As Nassar et al. (2019) indicate, escaping such inferior institutional traps requires coordinated policy efforts targeted at simultaneously expanding human capital investments and raising manufacturing technologization and skills intensity, as evident across progressive emerging markets.

Therefore, Nigeria's runaway unemployment crisis signals entrenched structural economic deficiencies rather than mere cyclical shocks. This study aims to investigate the impacts of manufacturing sector performance dynamics and human capital investments on determining unemployment outcomes in Nigeria over the extensive period of 1980 to 2022, contributing uniquely longitudinal empirical perspectives to policy discourse on combating unemployment through strategic structural transformation approaches.

Moreover, Nigeria's persistent unemployment crisis, exacerbated by a weak manufacturing sector and inadequate human capital development, threatens socio-economic stability and growth. Despite rising joblessness, especially among youths, empirical studies evaluating the joint impacts of the manufacturing sector's performance and human capital investment on unemployment remain limited. Existing research often lacks rigorous econometric modeling to guide policy interventions. This study aims to fill this gap by analyzing the relationship between manufacturing sector growth, human capital development, and unemployment trends in Nigeria from 1980 to 2022. Specifically, it examines the impact of manufacturing sector performance on unemployment, assesses how human capital development influences job creation, and explores the long-run relationship between primary school enrollment and unemployment rates.

This study is structured into five chapters. Chapter one introduces the research background. Chapter two reviews relevant literature on manufacturing sector growth, human capital investment, and unemployment, discussing theoretical frameworks and empirical findings. Chapter three outlines the research methodology, detailing the quantitative design, data collection, descriptive trends, and econometric modeling approach. Chapter four presents and analyzes empirical results, examining the statistical relationships between manufacturing, human capital, and unemployment. Finally, chapter five summarizes key findings, discusses policy implications, provides recommendations, and highlights study limitations for future research.

2. Literature review and Theoretical Literature

2.1 Conceptual Clarification

2.1.1 Unemployment

The International Labour Organization (ILO) defines the unemployed as people above specified working age who were without jobs, currently available and seeking work during the reference period (ILO, 2022). The unemployment rate measures the proportion of the active labour force in the economy that is unemployed. It signals unutilized labour resources and loses economic output for a nation. The key criteria separating unemployment from out of the labour force classification is the active job search effort. Discouraged job seekers who cease seeking work are excluded.

Nigeria's unemployment data face reliability concerns given the large informal sector is difficult to fully capture (Umar & Osinubi, 2020). However, the adjusted national unemployment rates published provide indicative trends on evolving job market conditions when consistently measured over time.Youth unemployment rates typically run higher in developing countries like Nigeria, signaling their greater vulnerabilities from constrained modern sector job creation capacities.

Conceptually, mass unemployment represents both economic and social crisis for any nation indicating dysfunctional labour markets, skills mismatches and insufficient production and enterprise structures that fail

to provide adequate livelihoods and incomes for citizens willing to work (Anyanwu, 2014). As Adegboyega (2022) highlights, unemployment constitutes wasted potential and negative social externalities including heightened unrest risks from disenfranchised populations especially youths.

2.1.2 Measuring Labour Market Slack

Beyond unemployed, the labour underutilization rate provides a broader gauge of unused labour market capacity encompassing those unemployed, underemployed working below capacity, and some people outside the labour force (ILO, 2018). Nigeria's labour underutilization rate averaged over 40% in 2018, signaling large unengaged human capital deficits even beyond the unemployed.

Youths are recognized as disproportionately affected by labour market slack and unemployment given barriers entering workforce amid high dependents' burden and insufficient job creation (Okafor, 2020). Youths possess peak productive potentials hence their capacities underutilization generate negative intergenerational economic implications.

2.1.3 Nexus of Growth, Productivity and Unemployment

Sound theoretical and empirical basis affirms the linkages between accelerating economic growth rates and falling unemployment levels, although magnitudes of responsiveness vary based on productivity dynamics. Where output expansions arise from more efficient use of existing factor inputs as postulated under Verdoorn's law, larger job creation impacts occur (Rowthorn, 1975).

Okun's law further quantifies growth-employment interrelations by estimating that for mature industrialized economies, annual GDP growth over 2-3% induces falling unemployment while negative output shocks trigger rising joblessness (Okun, 1962). The Okun coefficient signals responsiveness of unemployment rates to changing cyclical output gaps. Estimates for developing countries are sparse but indicate higher Okun coefficients and unemployment volatility from growth fluctuations.

However, the pattern between economic growth and unemployment also depends on structural and technological forces influencing productivity pathways occurring. Productivity-enhancing mechanisms that raise technological capacity, innovation, human capital quality and institutional capacities can stimulate sufficient economy-wide employment creation and absorption effects that offset any labour displacement within modernizing sectors, resulting in net lower unemployment (Amaghionyeodiwe & Agu, 2020).

East Asian miracle economies like South Korea and Taiwan exemplified positive productivity unemployment linkages from rapid industrialization, export competitiveness and human capital development that expanded job creation capacities economy-wide (Page, 1994). Therefore, beyond just growth, the composition and sources fueling output expansion and productivity improvements determine corresponding unemployment effects (Blankenau et al., 2000).

2.1.4 Natural Rate of Unemployment Concept

The natural rate of unemployment (NRU) popularized by Milton Friedman and Edmund Phelps in the late 1960s signifies an equilibrium unemployment rate consistent with aggregate production capacity and market wage-price nexus in an economy (Friedman, 1968). The NRU signals an optimal joblessness level consistent

with steady inflation. Attempts stimulating excess employment below NRU risk rising prices. The non-accelerating inflation rate of unemployment (NAIRU) closely resembles the NRU concept.

However, estimating the unobservable true NRU is complex with critics arguing actual unemployment dynamics exhibit hysteresis - path dependency on historical shocks. Thereby, persistent demand weakness prolongs high unemployment without mean reversion towards hypothesized NRUs, such as Japan's experience over its 1990s lost decades of stagnation and deflation (Papell et al., 2000).

Hysteresis undermines belief that supply-side policies alone can restore full employment in contexts of chronically depressed aggregate demand. Thereby necessitating demand-management stimulus coupled with structural reforms of labour and product markets to lower NRUs through enhanced competition, flexibility and information flows (Blanchard, 2018). NRUs decline too with human capital improvements raising workforce quality, adaptability and mobility.

2.1.5 Overcoming Labour Market Segmentation

Education expansion, proactive non-discriminatory employment legislation, competitive markets development, informal sector productivity programs and social protection schemes help redress disadvantages certain subgroups face in accessing primary formal jobs to minimize segmented labour market inequalities over time (Fields, 2009). Progressively transitioning more workers into highly productive modern sector jobs centrally spurs economy-wide living standards upgrades.

2.1.6 Behavioral Economics Perspective

Behavioral analysis enriches understanding unemployment determinants by spotlighting cognitive limitations, motivational and informational asymmetries influencing job search efficiency, employment choices and human capital under-investments that worsen skills mismatch. Policy mechanisms like employment counselling, job search assistance, unemployment insurance, skills forecasts and active labour market programs help counter behavioral unemployment traps (DellaVigna, 2018).

2.1.7 Manufacturing Sector

The manufacturing sector encompasses enterprises engaged in production process businesses that transform raw inputs like natural resources, chemicals or components into finished physical goods ready for use by industrial enterprises or final consumer markets (UNIDO, 2020): (UNCTAD 2021).

Manufacturing represents the hallmark of a modern industrialized economy, enabling vital linkage, diversification and spillover effects supporting rising economy-wide productivity, technological dynamism and mass job formalization. Sustained manufacturing sector expansion and competitiveness enhancement drives structural transformation process for developing countries to transit towards industrialized high-income digital economies.

Manufacturing activities are grouped into different sub-sectors based on production similarity and technological linkages using International Standard Industrial Classification (ISIC) taxonomy codes for analytical purposes (UN, 2008), (UNIDO, 2019) :(UNIDO, 2020; Rodrik, 2016). Major manufacturing

branches include food products, textiles, chemicals, machinery, electronics, transport equipment, metals and refined petroleum products, (Hausmann, 2007).

2.1.11 Human Capital

Human capital constitutes knowledge, creative competencies, skills, health and attributes embodied in individuals that determine their productive capacities, innovativeness and earnings potential (Olaniyan & Okemakinde, 2008). Human capital directly influences value generation abilities at individual, organizational and national economic levels. It resides in people rather than physical assets.

The OECD defines human capital as the knowledge, skills, competencies and attributes embodied in individuals that facilitate personal, social and economic well-being (Keeley, 2007): (Kraay, 2018). Human capital resources appreciate or depreciate over time based on investments levels just like physical capital. However, human capital remains bound to individuals hence not own-able by corporate entities or states.

Core components constituting human capital include (CIPD, 2015):

i. educational attainment signifying knowledge and cognitive abilities gained through schooling institutions.
ii. Work skills and experience determining performance capacities acquired on jobs.
iii. Physical and mental health status enabling vigour and resilience to apply effort.
iv. Emotional intelligence and creativity provide adaptiveness and innovation aptitudes.
v. Beyond born talents, purposeful investments in education, training, mentoring and health care services help systematically build up human capital stocks across society for economic development needs.

2.1.13 Role of Human Capital Development

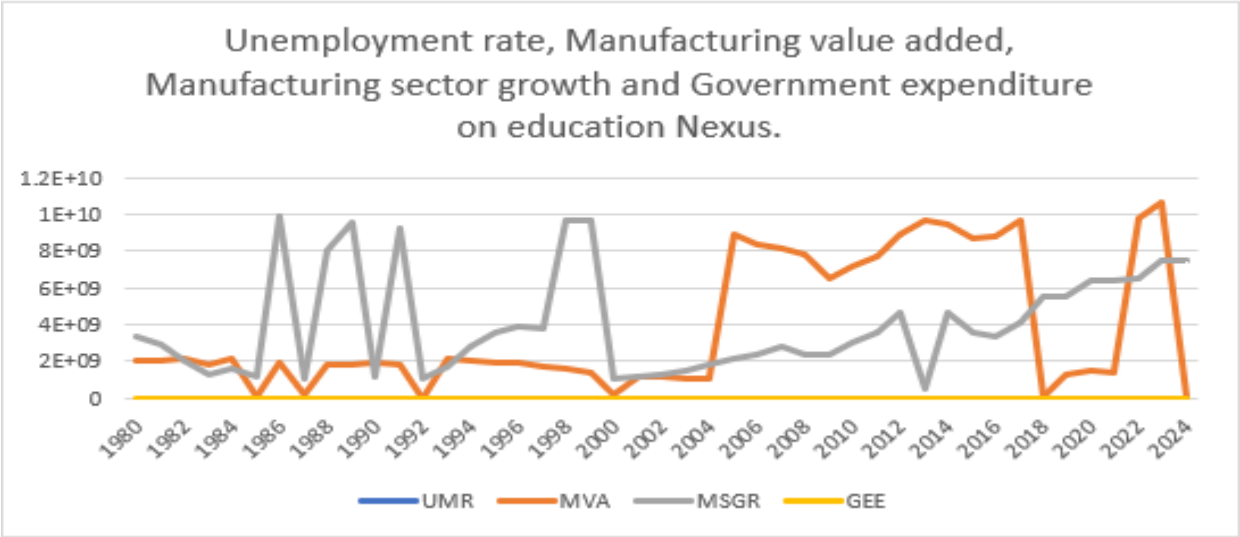
Economic research and country experiences affirm human capital constitutes fundamental driver of sustainable prosperity, with significant positive externalities (Psacharopoulos & Patrinos, 2018). Human capital development exponentially amplifies the abilities of nations, organizations and individuals to:

Adopt existing frontier innovations and technologies for raising productivity performance through enhanced absorptive capacities.

Adapt flexibly to volatile economic changes and complex job transformations through continual reskilling avenues.

Architect novel breakthrough processes, products and services inventions that shift competitive frontiers outwards across market domains via fostered creativity capacities.

Therefore, prioritizing systematic human capital investments represents imperative both for unlocking individual potential as well as laying foundations for ongoing innovation-led growth of nations and enterprises. East Asian miracle economies like South Korea strategically focused education and skills programs for accelerating industrialization and income levels (Young, 1992). Successive economic transformations to services and digital economies further elevate human capital centrality over physical means for value creation and competitive positioning (World Bank, 2022).



2.2 Theoretical Background

Several major economic theories provide insightful perspectives for examining drivers and solutions to unemployment problem, including the roles of manufacturing sector development and human capital advancement.

2.2.1 Classical Theory

The Classical Unemployment Theory originated during the late 18th century pioneering phase of modern economics propounded by seminal thinkers including Adam Smith (1776) and David Ricardo (1817) in their landmark works. The theory espouses a classical economic framework positing fully flexible market wage rates and prices as the adjustment mechanism for maintaining macro equilibrium of full employment or the natural unemployment rate (Jordà & Taylor, 2016).

Specifically, Smith (1776) postulated unfettered wage-price signals incentivize rapid reallocation of surplus labor towards optimal economic uses across sectors, thereby self-correcting transitory unemployment aside steady-state full employment (Atesoglu & Smithin, 2015). Subsequently, Ricardo (1817) formulated an elegant mathematical model demonstrating how flexible real wages in response to labor market disequilibria enable continuous market clearing towards a natural unemployment rate trajectory governed by economic fundamentals (King & French, 2017).

Thus, the Classical Theory fundamentally discounts sustained involuntary joblessness within competitive economies given rapid wage-price adjustments that correct temporary frictional or structural unemployment from skill mismatches or mobility costs (Gallaway & Bernasek, 2018). Thereby, it heavily influenced early 20th century policy views against active government unemployment reductions based on notions of self-regulating labor markets (Thomas & Dimsdale, 2017).

However, assumptions of perfect competition and flexibility underpinning the classical full employment equilibrium have proven unrealistic in application to imperfect developing and advanced economies

exhibiting market failures, rigidities and involuntary joblessness (Irwin, 2018; Sawyer, 2016). Accordingly, the parsimonious classical framework offers restricted explanative and predictive capacity for informing unemployment mitigation policies in contemporary complex, dynamic economies.

2.2.2 Neoclassical Growth Theory

Solow's neoclassical growth model explains long run economic growth tendencies based on exogenously driven technological innovations and capital investments that induce rising labour productivity and output per worker (Solow, 1956). But unemployment issues are not directly addressed in the basic model. Nevertheless, the prediction that sustained growth requires continued technological progress remains relevant.

2.2.3 Keynesian Theory

In contrast, Keynesian macroeconomics posits downward wage inflexibility perpetuates demand deficient unemployment amid income shortfalls and weak aggregate spending (Keynes, 1936). Involuntary unemployment equilibrium emerges below full employment without government fiscal stimulus to expand production and employment given wages stickiness above market clearing rates. This insight remains pertinent for developing states with large informal sectors.

2.2.4 Endogenous Growth Theory

Endogenous growth theory emerged in the mid-1980s to early 1990s pioneered by leading economists including Paul Romer, Robert Lucas and Edward Barro to address perceived limitations of mainstream neoclassical growth models of the time (Romer, 2015). Seminal 1986 and 1990 papers by Romer introduced conceptual foundations underscoring technological innovations and knowledge accumulation as new endogenous engines of productivity and economic growth rather than purely exogenous variables (Romer, 2015). Romer emphasized sustained investments in human capital enrichment and R&D-led technological advances can continuously spur rising marginal returns enabling durable expansion (Amavilah, 2016).

Subsequently, Lucas's influential 1994 symposium paper formally consolidated emerging endogenous growth theory strands, highlighting mechanisms that render technological progress and human capital accumulation as economically embedded processes rather than entirely external forces (Lucas, 2015). Lucas stressed appropriately designed government interventions in areas like infrastructure, education access and information flows couldfeature more prominently within formal growth theories and empirical testing (Acemoglu, 2022).

Additionally, Barro's 1990s research illuminated robust statistical relationships linking human capital investments, inequality, demographics and growth outcomes, expanding the conceptual boundaries of endogeneity (Barro, 2015). Thus, unlike neoclassical counterparts, endogenous growth theory underscores persistently rising productivity and sustainable long-run growth to be continually regenerated by embedded mechanisms like innovation-catalyzed technological advancement, knowledge spillover externalities, and human skills upliftment rather than solely exogenous variables (Helpman & Grossman, 2015). Therefore, it provides a sounder theoretical basis for asserting productivity-enhancing government investments in manufacturing R&D, infrastructure and education can engender higher employment-generating growth.

2.2.5 Schumpeter's Theory

The Schumpeterian Growth Theory pioneered by the Austrian-American economist Joseph Schumpeter in his seminal 1942 book Capitalism, Socialism and Democracy underscores the pivotal role of disruptive innovations, new products/processes introduction and technological modernization spearheaded by enterprising entrepreneurs and risk-taking business firms in engendering temporary economic disturbances but raising economy-wide productivities, competitiveness and employment levels over the long-term through positive spillovers (Schumpeter, 1942).

Fundamentally, Schumpeter highlighted capitalism's innate tendency to incessantly revolutionize itself from within through bouts of what he vividly termed as 'creative destruction' induced by waves of impactful innovations that outweigh temporary disruptions. As new technological production modes and goods get adopted, older firm structures and jobs inevitably get displaced. However, higher efficiencies and cost savings mean more output gets produced for less, expanding real incomes, consumption demands and economy-wide employment in the aggregate over time. Thereby rather than static resource allocation optimization, Schumpeter stressed capitalism's dynamic growth dilemmas stemming from entrepreneurs driving disruptive Development through innovations underpin long-run employment progression (Schumpeter, 1942).

Several contemporary empirical analyses validate Schumpeterian expectations over the long-term capitalist growth trajectory. An extensive study of over 5000 British firms during 1984-2007 found both job destruction and creation rates averaged nearly 10% per annum confirming intensely churning labour markets (Haltiwanger et al., 2013). But net employment rose due to disproportionately rapid expansions by innovative young startups compared to contractions across structurally declining incumbent firms. Notably, net job creation was nil in firms without innovation. Another recent cross-country industry-level analysis discovered both product and process upgrading positively correlated to employment expansions, upholding Schumpeter's creative destruction dynamics that productivity-boosting technological progress raises job creation by enhancing competitiveness, market access and growth (Vivarelli, 2021).

Moreover, the Schumpeterian framework directly complements manufacturing-led development models. As industrialization theories posit, dynamic manufacturing provides an especial hotbed for impactful process and product innovations given scale, linkages and global competition incentives continually catalyze technological upgrading by firms (UNIDO, 2020). Thereby, manufacturing exports growth trajectories intrinsically reflect Schumpeterian expectations as competitiveness gets continually bolstered through new product introduction and production modernization that displace backward firms and workers. This simultaneously expands output, real incomes and aggregates employment over the long-term. Empirically, during the 2000s expansion, China's manufacturing sector created over 40 million new jobs through rapid productivity growth and global market share capture enabled by extensive creative destruction flows as less efficient state-owned enterprises got restructured while technologically agile private firms vigorously expanded (Huang, 2021).

Therefore, Schumpeter's seminal insight underscores capitalism's innate tendency to perpetually revolutionize itself through entrepreneur-led innovations but transiently displace antiquated structures. However, higher efficiencies, competitiveness and real income gains induced expanded employment and

living standards over time. Thereby, growth pangs from temporary creative destruction processes engender positive job creation spillovers when impactful manufacturing innovations materialize.

2.2.6 Dual Sector Theory

The dual-sector model developed by the pioneering development economist Sir Arthur Lewis in his 1954 paper and 1955 book on Theory of Economic Growth represents one of the seminal frameworks for analyzing structural transformation and employment dynamics within developing economies. Lewis highlighted developing countries essentially comprise dualistic production structures bifurcating between lower productivity traditional agricultural peasant farming on one hand and modern capitalist sectors encompassing modern manufacturing, organized services etc. on the other that remain delimited in relative size despite higher capital use and labor productivities (Lewis, 1954).

Lewis stressed developing countries face massive labour underutilization challenges given boundless supplies of low marginal productivity subsistence agricultural workers as population growth chronically outpaces their income and livelihood generation capacities from finite cultivatable land. Thereby 'surplus labour' exists since agricultural output gains require negligible labour additions unlike another sector. However, modern sectors facing relative capital shortages and unmet consumer demand offer high marginal labour productivities. Hence, expanding modern sector employment provides the strategic pathway for productive absorption of hidden rural underutilized labour towards raising economy-wide output and incomes rather than alternative strategies like promoting village handicrafts which face limited domestic market size in impoverished countries (Lewis, 1955).

According to Lewis, the modern sector can expand without facing wage inflation pressures given vast surplus labour reserves implying near-infinite elasticity of labour supply curves to the capitalists. However, the process eventually ends after surplus labour gets fully transferred at the 'Lewis Turning Point' when tightening labour markets cause rising wage pressures necessitating intensified capital investments to substitute labour (Lewis, 1979). Nevertheless, optimally managed transitions can enable developing countries to sustain high growth and job creation patterns over long periods through expanding manufacturing and services until surplus labour reserves diminish.

Lewis' seminal dual sector schema profoundly influenced development policy thinking by formally highlighting labour transfer towards higher productive modern organised sectors centred on manufacturing as the prime structural change pathway for simultaneously alleviating disguised rural unemployment and underemployment while accelerating industrial development in poorer agrarian developing countries (Todaro & Smith, 2015). Empirically, the miraculous growth, poverty alleviation and employment creation successes across East Asian tiger economies like South Korea and China have validated Lewis' surplus labour transition model (Huang, 2021). Their export-oriented industrialization drives massively absorbed hidden rural underemployment by creating over 200-300 million better quality salaried jobs across modern manufacturing sectors and forward linked services over the past half-century accompanied by sustained growth 'miracles' averaging over 8-10% annual GDP expansion rates during their peak industrial transformation epochs (Dinh et al., 2012).

2.2.7 Harris-Todaro Model

The Harris-Todaro migration model developed by John Harris and Michael Todaro in their seminal 1970 paper represents an important conceptual extension to the Lewis two-sector surplus labour framework by seeking to explain the phenomenon of sustained urban unemployment co-existing with large rural-urban expected income differentials in developing countries (Harris & Todaro, 1970). Within Lewis' simpler schema, the wage differential should keep inducing continual migration from rural agriculture to higher paying modern sector jobs until the surplus labour gets fully exhausted. However, empirical evidence indicated urban formal sector wages substantially exceeded rural incomes in many developing countries, yet rural-urban migration continued despite rising urban unemployment, constituting an apparent paradox (Fields, 1975).

Harris and Todaro resolved this puzzle by formalizing a probabilistic decision-making framework where rural workers also consider prospects of accessing lucrative modern sector jobs when taking migration decisions rather than merely wage differentials (Harris & Todaro, 1970). They highlighted that in developing countries, urban formal sector jobs like in public agencies or large factories coexist with informal sector work like petty retail wherein marginal productivities and hence wages differ substantially given segmented labour markets. Crucially, formal sector jobs are rationed given scarce openings. Hence prospective rural migrants assess expected incomes accounting for probabilities of securing scarce high-wage formal sector jobs versus likely informal sector prospects.

Thereby the rural-urban expected differential gets adjusted by the likelihood of informal sector absorption implying urban migration continues until expectation parity. Harris-Todaro insightfully shows governments and employers can worsen unemployment if expanded modern sector job creation lags migration fluxes or wage policies raised urban minimum wages. Their integrated framework underscores balanced industrial and skill policies expansion together with avoiding overvalued currencies that skew incentives towards urban service sectors rather than rural and export sectors. Thereby the augmented model provides broader general equilibrium guidance for job-creating rural-urban structural transformation.

The Harris-Todaro model significantly extended migration decision analysis within dual economy settings by elegantly incorporating probability-weighted employment prospects across segmented urban labour markets. Its integrated insights complemented Lewis' surplus labour theory for explaining informal sector expansions and sustained urban unemployment even with sizable rural-urban income differentials in developing countries. Thereby it provided crucial implications for designing balanced structural change and educational policies that promote industrial and skill advancement synergies for maximizing productive employment outcomes during economic transition processes.

2.2.8 Search and Matching Models

Job search theories developed by pioneering economists including George Stigler in his seminal 1962 paper, Christopher Pissarides in his 1990 book and Dale Mortensen in their 1994 research works provide pivotal microeconomic frameworks for analyzing labour market information costs, skill mismatches and worker mobility constraints that together can perpetuate significant disequilibrium unemployment amidst job vacancies in both developing and advanced economies (McCall, 1970; Mortensen& Pissarides, 1994; Pissarides, 2011). By spotlighting such labour market imperfections limiting efficient matching, search

models complement classical and new Keynesian macroeconomic analysis that respectively assume seamless market clearing tendencies or stress insufficient demand in explaining unemployment scenarios.

Fundamentally, search theories posit labour markets intrinsically feature informational uncertainties and transition frictions unlike idealized perfectly competitive systems due to the heterogeneous, multidimensional bespoke nature of both employee capabilities/preferences and job skill necessities/attributes coupled with searcher decision-making constraints (Rogerson et al., 2005). Thereby, workers acquiring updated occupational information and selecting suitable jobs while employers locating qualified candidates require significant search efforts. Meanwhile mobility limitations perpetuate mismatch unemployment.

Elegant mathematical models outline workers assessing job suitability based on wage offers and employment conditions by weighing prospects of prolonging the search for potentially better matches against income losses from further unemployment while firms screen applicants to minimize hiring unproductive workers (Mortensen & Pissarides 1994; P)

Theory to be adopted

The study adopts the dual sector economic model developed by Arthur Lewis in 1954 as the main theoretical framework, along with the Harris-Todaro rural-urban migration model. Lewis' theory explains structural transformation and productivity growth dynamics in developing economies like Nigeria, where industrialization and manufacturing absorption of surplus rural labour eventually eliminates agricultural underemployment.

The model fits Nigeria's economic progression since independence. Nigeria exemplifies Lewis' dual economy concept - a large low-productivity agricultural sector accounting for half the labour force but less than a quarter of GDP, while the modern industrial and services economy generates most incomes but employs less than a fifth of workers. Nigeria's manufacturing sector drove income and demand growth, enabling high wage job creation and rural-urban migration despite mounting unemployment.

However, Nigeria failed to sustain rapid industrialization, hence mounting unemployment indicates lagging modern wage job creation relative to labor transfers, due to manufacturing decline since the 1980s. Harris-Todaro's model enriches analysis by explaining continued urban migration chasing few modern sector jobs despite rising unemployment, fitting Nigeria’s experience. Beyond Nigeria, Lewis' model explains structural shifts and unemployment issues in developing countries where manufacturing-centered industrialization succeeded in absorbing surplus labor and raising productivity like East Asia or failed and caused unemployment where industrial job creation faltered like in some Latin American countries since the 1980s.

Finally, Lewis' model can integrate analysis of impacts from human capital development. Therefore, it represents the most relevant theoretical lens for examining Nigeria's structural economic changes, manufacturing sector performance, skills investments and persistent unemployment problem over recent decades - with its explanatory power enriched by Harris-Todaro's migration analysis.

2.4 Empirical Review

A sizable body of empirical research analyzes determinants of unemployment outcomes across countries. However, integrated analysis focusing on relative and interactive impacts of advancing manufacturing sector

productivity and human capital development jointly on alleviating or perpetuating unemployment remains sparse, especially in developing countries context.

2.4.1 Nexus between Manufacturing Sector and Unemployment

A considerable amount of empirical evidence affirms that productive manufacturing sector growth significantly predicts falling unemployment across countries by expanding modern wage job opportunities necessary to absorb and formalize surplus labour from traditional sectors.

Across 18 Latin American and Caribbean economies over 1991-2014 period, Grazzi and Jung (2021) find a 1 percent increase in manufacturing sector share of total value-added associates with a 0.72 percent decline in national unemployment rates. The results robustly demonstrate manufacturing sector strength exhibits strongest employment generation effect relative to other major sectors like agriculture and resource mining.

Similarly for a panel of 19 middle income economies over 1991-2018, Gordon (2021) determines a 10 percent greater manufacturing sector share of total employment correlates with around 7 percent lower youth unemployment rates. The study affirms potent employment multiplier role of manufacturing industries for lower-middle income country contexts through both direct and indirect extensive production chain links.

On Nigeria context, Ogunyiola and Ladan (2020) estimate that declining manufacturing capacity utilization and output explains over half the variations in rising unemployment rates in Nigeria from 1981 to 2018, indicating progressive deindustrialization bears significant blame for joblessness crisis. The results prompt urgent revalidation of Nigeria's industrial policies to stimulate manufacturing productivity and exports.

Likewise for Bangladesh, Daniya et al. (2022) evidence increased manufacturing sector value added as share of GDP positively predicts falling unemployment rates for the economy over 1980-2017 period. Every percentage point rise in manufacturing share forecasts 0.05 percentage points decline in Bangladesh's joblessness rate. This further confirms potent employment generation effect of manufacturing expansion.

In Kenya, cross-county analysis by Moyi and Ronge (2018) demonstrate that higher manufacturing sector share of county GDP strongly correlates with greater modern sector job count absorbed, confirming manufacturing possesses superior employment multiplier effect relative to the agricultural or basic services sectors across Kenyan counties over survey period.

However, some countries' studies also produce more ambiguous or insignificant results on magnitude of direct manufacturing sector effects on unemployment levels, attributed to rising automation. For South Africa, Rankin and Roberts (2011) found manufacturing sector expansion failed to deliver expected jobs growth due to capital-intensive import-dependent nature of domestic manufacturing base over long run. Growth has concentrated in non-tradable tertiary sectors instead.

Likewise in India and South Korea's context, Ali and Son (2007) evidence weak long run employment elasticities for manufacturing sector due to rapid automation and skills-biased technological adoption. But input-output analyses confirm their sizeable indirect job creation links. Hence, manufacturing structure and policies still matter for explaining unemployment outcomes.

2.4.2 Human Capital Development and Unemployment Linkages

The mainstream perspective rooted in human capital theory posits that enhancing education and workforce skills foster higher labour productivity, occupational mobility and incomes necessary to incentivise continued human capital investments that support rising employment levels economy-wide (Becker, 1962).

For Nigeria, Fatukasi and Mbabazor (2014) determine that every additional year of education attainment among labour force participants is associated with 2 percent higher likelihood of securing wage employment rather than vulnerability to unemployment. The study establishes significant boost higher learning outcomes provide employability in Nigeria's job market context of supply shortages.

In South Africa over 1995-2004 period, Burger and Von Fintel (2014) similarly evidence educational attainment levels among workforce strongly predicts lower unemployment likelihood, confirming superior employment prospects conferred by tertiary qualifications relative to secondary or primary education holders. Though unemployment rose for all groups recently reflecting wider economic slumps.

Likewise in Ethiopia context, Mezgebo's (2015) probit regression analysis found an additional year of schooling completed predicts almost 4 percent higher probability of obtaining gainful employment during survey period. Positive skills complementarity from wider labour force education profiles further amplified employability and hence lowered aggregate urban unemployment rates.

Across 57 developing and developed countries empirically studied by Bbaale and Mutenyo (2011), secondary and tertiary education enrolment ratios exhibit robust statistically significant correlations with lower national unemployment rates over 1991-2004 period. This signals positive externalities from wider workforce literacy and skill sets improving information access, mobility and matching efficiencies hence lowering unemployment equilibrium.

However, Reddy (2010) cautions education quantity alone does not guarantee employability for India, given many university graduates remain unemployed while companies face skill shortages. Quality mismatches persist. Similarly, GCC countries also exhibit rising graduate unemployment coexisting with expatriate skills imports for technical roles, reflecting curriculum gaps (Al-Sharffi, 2017). Skill mismatches can heighten unemployment.

Only a few empirical studies attempt to integrate analysis of both manufacturing and human capital advancement pathways jointly on unemployment outcomes to enable comparing their relative economic importance. For South Africa, Sheik (2021) finds rising tertiary education strongly lowers regional graduate unemployment whereas tradable manufacturing sector shares per province display weaker job absorption effects due to prevalent capital intensity. This highlights evolving composition within manufacturing sub-sectors matters. More granular disaggregation is necessary to inform integrated policy packages responding to unemployment crisis across developing country contexts.

Therefore, further empirical research is warranted adopting holistic and longitudinally extensive view examining manufacturing sector productivity trends alongside human capital investments over time using recent datasets to validate their relative and complementary employment generation efficiency for tackling

crisis of high unemployment afflicting developing countries like Nigeria. Findings stand to enrich unemployment theory and policy insights.

2.4 Research Gap

Several empirical knowledge gaps motivate the current study's investigation into the linkages between manufacturing sector performance, human capital development and unemployment in Nigeria. First, most existing analyses tended to examine the determinants of unemployment levels in Nigeria using descriptive approaches rather than statistically modeling dynamic lead-lag predictive relationships based on rigorous time series econometric frameworks for generating forward-looking evidence-based policy guidance (Ajani & Igbokwe, 2014; Ogunniyi et al., 2022).

Typically, studies like Adesua and Agbaeze (2020) utilize basic tables, percentages and charts to highlight unemployment trends and descriptive association patterns between joblessness rates and potential economic drivers like GDP growth levels without further tests of statistical strengths, directions and predictive capacities. Consequently, the magnitudes and temporal progressions of impacts that strategic manufacturing sector expansion and human capital investments path scenarios can exert on modeled unemployment rate trajectories remain inadequately quantified to inform policy regimes for adequate employment-oriented structural reforms.

This study addresses that methodology gap by adopting more robust statistical techniques encompassing stationarity, cointegration and error correction approaches towards establishing valid long-run and short-run predictive empirical linkages between key indicators of manufacturing sector performance, human capital development milestones and unemployment rate targets in Nigeria over past decades (Adegboye, 2022). Appropriately specified multivariate time series models estimated will determine both contemporaneous and temporal multidirectional effects between identified drivers and unemployment outcomes while quantifying relativer effect sizes.

Thereby the research promises more empirically validated and temporally precise evidence regarding combinations of manufacturing sector revitalization efforts and human capital development initiatives potentially capable of sustainably inducing sizable reductions in Nigeria's escalating joblessness metrics based on empirically derived predictive simulations rather than just indicative associations.

Another gap is the lack of clear-cut comparative assessment on whether expanding manufacturing sector activities or enhancing education and skills training dimensions exerts relatively greater impact on lowering unemployment over time (Chete et al., 2014). Existing discourse often analyzed both factors disparately without capturing potential complementarity and tradeoffs that policymakers face given limited resources. This research addresses this gap by evaluating dynamic lead/lag interactions between key manufacturing sector indicators like value added contribution or factory job shares against human capital measures such as school enrollment and workforce vocational training investments. Thereby the generated evidence illuminates optimal balancing strategies.

Likewise, most studies concentrate on analyzing drivers of aggregate economy-wide unemployment without examining variations across rural versus urban regions or high versus low skilled manpower groups (Dinh et al., 2012). Hence policy insights remain confined. This research will assess unemployment rate trajectory

differentials between relevant segmented labour subgroups over the decades. Thereby findings can inform more customized remedial approaches targeting regions or skills brackets experiencing disproportionate employment defects.

Another limitation is existing empirical assessments often utilized small, localized samples or short 5-10 years horizons failing to capture long-term nationwide shifts (Nassar et al., 2019). But gaining insights into temporal transformations and inflexion points over decades remains vital. Therefore, this study examines extensive 42 years national time series data from 1980-2022 to illuminate meaningful trends. Thereby the enhanced scope promises more representative and dynamically complete empirical perspectives on unemployment challenges.

Finally, a key deficiency is the inadequacy of predictive simulations. Past discourse stressed diagnosing prevailing unemployment scenarios rather than modeling forward-looking trajectories assessing measurable unemployment rate milestones achievable by 2030 or 2040 given plausible manufacturing sector and human capital development policy initiatives that governments or private sector partnerships could undertake (Otekunrin et al., 2019). Hence actionable strategy remains deficient. This study deploys empirical models capable of projecting ahead multidecade unemployment rates paths conditionally linked to realistic manufacturing revival goals and educational achievement targets. Thereby it offers vital added value for strategy.

3.0 Methodology

3.1. Sources and Method of Data Collection

This study uses secondary spanning from 1980 to 2022, the data which were obtained from the online database of the World Bank Development Indicator (WDI 2023). The data obtained include; Unemployment rate (UMR), Manufacturing Value added %GDP (MVA), Manufacturing Sector growth %GDP (MSGR), Primary enrolment (PRE), Secondary enrolment (SDE) and Government Expenditure on education (GEE).

3.2 Model Specification

The study is aimed to examine an analysis of the impact of manufacturing sector, and human capital development on Unemployment in Nigeria. This study however, adopted model by adding other variables from the model of Moyi and Ronge (2018) and Mbabazor (2014). This is because some of the variables added in the model are supported by economic theory. Thus, the model in the study.

$$UMR_t = f\,(MVA, MSGR, PRE, GEE) \qquad (1)$$

$$UMR_t = a_0 + a_1\,MVA_t + a_2\,MSGR_t + a_3 PRE_t + a_4 GEE_t + U_t \qquad (2)$$

where: Unemployment Rate (UMR), Manufacturing Value added (% GDP) (MVA), Manufacturing srctor growth (%GDP) (MSGR), Primary enrolment (PRE), Government expenditure on education (GEE), where: α_0 *= constant term,* α_1 *= parameters of the estimates,* μt *= error term. A priori expectation* $\beta_1, \beta_1, \beta_1, \beta_1, > 0$

Objective 1 and 2: to examine the impact of manufacturing sector performance on the unemployment rate in Nigeria and to determine human capital development influence the unemployment rate in Nigeria. This study will utilize the Autoregressive Distributed Lag (ARDL) model developed by Pesaran, Shin, and Smith (2001).

The functional form of the model is specified as;

$UMR_t = f\,(MVA, MSGR, PRE, GEE)$ (1)

Equation 1 is transformed into an econometric model as;

$UMR_t = a_0 + a_1\,MVA_t + a_2\,MSGR_t + a_3 PRE_t + a_4 GEE_t + U_t$ (2)

Transformed 2 to the ARDL specification as;

$$\Delta lnUMR_t = \theta_0 + \theta_1 lnUMR_{t-1} + \alpha_1 lnMVA_{t-1} + \alpha_2 lnMSGR_{t-1} + \alpha_3 lnPRE_{t-1} + \alpha_4 lnGEE_{t-1} + \sum_{i=1}^{b} \beta_1\,\Delta lnUMR_{t-1} + \sum_{i=1}^{b} \beta_2\,\Delta lnMVA_{t-1} + \sum_{i=1}^{b} \beta_3\,\Delta lnMSGR_{t-1} + \sum_{i=1}^{b} \beta_4\,\Delta lnPRE_{t-1} + \sum_{i=1}^{b} \beta_5\,\Delta lnGEE_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The first part of the equation without Δ indicates long-run dynamics while the second part with Δ indicates the short-run dynamics. The bound testing approach is utilized to establish cointegration among the variables before estimating the equation. To estimate the short-run adjustment to equilibrium we specify the Error Correction Model (ECM) in equation 3 as follows;

$$\Delta \ln UMR_t = \theta_0 + \sum_{i=1}^{b} \beta_1\,\Delta \ln UMR_{t-1} + \sum_{i=1}^{b} \beta_2\,\Delta \ln MVA_{t-1} + \sum_{i=1}^{b} \beta_3\,\Delta \ln MSGR_{t-1} + \sum_{i=1}^{b} \beta_4\,\Delta \ln PRE_{t-1} + \sum_{i=1}^{b} \beta_5\,\Delta \ln GEE_{t-1} + +\delta ECM_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where, the speed of adjustment of the parameters for the long run equilibrium following a shock to the system is δ, and the error correction model is $ECMt{-}1$.

Objective Three: analyse the long run relationship between the primary school enrolment ration in Nigeria and the unemployment level. The most common way to test the causal relationship between two variables is the Granger-Causality proposed by Granger (1969). The test involves estimating the following simple vector autoregressions (VAR):

$$UMR_t = \sum_{i=1}^{n} \alpha_i\,PRE_{t-1} + \sum_{j=1}^{n} \alpha_j\,UMR_{t-j} + \mu_{1t} \quad (5)$$

$$PRE_t = \sum_{i=1}^{n} \alpha_i\,UMR_{t-1} + \sum_{j=1}^{n} \alpha_j\,PRE_{t-j} + \mu_{2t} \quad (6)$$

Where it is assumed that the disturbances $\mu_{1t}$and μ_{2t} are uncorrelated. Equation (5) represents that variable X is decided by lagged variable Y and X, so does equation (6) except that its dependent variable is Y instead of X.

3.3. Technique of Analysis

The data collected of this study is analysed in four stages. First the data have been subjected to descriptive statistics, followed by checking the properties of the data using the Augmented Dickey-Fuller (ADF) test, and the Phillip-perron test, Autoregressive Distributed lag (ARDL) model will also be conducted to examine the long run and short run relationship among the variables and diagnostic checks for stability.

3.3.1 The Unit Root Test

The first step in time series study is to the Stationarity of the variables. For the study, the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) unit root test will be used. The premise behind these tests of Stationarity is to ensure that the results of the regression analysis are not spurious.

$$\Delta Y_t = \mu + \alpha y_{t-1} + \sum_{i-1}^{k} \beta \Delta Y_{t-1} + \varepsilon_t \quad (7)$$

$$\Delta Y_t = \mu + \beta_t + \alpha y_{t-1} + \sum_{i-1}^{k} \beta \Delta Y_{t-1} + \varepsilon_t \quad (8)$$

$$\Delta Y_t = \mu + \alpha y_{t-1} + \sum_{i-1}^{k} \beta \Delta Y_{t-1} + \varepsilon_t \quad (9)$$

Where Δrepresents the first difference operator,y_t is the series under consideration,μ is the intercept term,t is the time trend, y_{t-1} is the lag variable being tested,k denotes lag length,Δy_{t-1} means first difference lagged series usually taken to eliminate the problem of serial correlation (Dickey & Fuller, 1979) and ε is the white noise process with $\varepsilon_t \sim iid(0, \sigma^2)$. The term k in this test is determined by Schwert (1987) to get the optimal lag length and ensure white noise process of the residuals.

3.3.2 The Augmented Dickey-Fuller Unit Root Test

The Augmented Dickey-Fuller (ADF) test constructs a parametric correction for higher-order correlation by assuming that the series follows an AR(1) process and adding lagged difference terms of the dependent variable to te right-hand side of the test regression.

$$\Delta y_t = \partial y_{t-1} + \sum_{i=1}^{p} \alpha i \Delta Y_{t-i} + \mu_t \quad (9)$$

This augmented specification is applied using the t-ration. An important result obtained by fuller is that the asymptotic distribution of the t-ration is independent of the number of lagged in the first differences.

3.3.3. The Autoregressive Distributed Lag (ARDL) Model Approach

The autoregressive distributed lag (ARDL) bound testing Cointegration procedure introduced by Pesaran and Shin (1999) and further extended by Pesaran, Shin and Smith (2001) have been used to verify if the long-run relationship exists in the model between devaluation of Naira and Nigeria economy. The ARDL bound test has several advantages over the well-known residual-based approach proposed by Engel and Granger (1987)

and the maximum likelihood-based approach proposed by Johansen and Julius (1990) and Johansen (1992). One of the important features of this test is that it does not require the pre-testing of the variables included in the model for unit roots unlike other techniques such as the Johansens approach and can be applied regardless of whether regressors (variables) are I(0) or I(1). In addition, it does not matter whether explanatory variables are exogenous (Pesaran *et al,* 2001).

4.1. Results and Discussion

The key findings from the research, organized into tables, charts, or graphs. It interprets the data to identify significant patterns, trends, and relationships. This analysis forms the basis for drawing conclusions that address the research objectives or hypotheses.

Table 4. 1: Descriptive Statistic

	LUMR	LMVA	LMSGR	LPRE	LGEE
Mean	1.577539	2.593093	3.060420	4.515725	3.053312
Median	1.395502	2.633712	3.140871	4.504539	4.059753
Maximum	2.549445	3.049190	4.162724	4.728677	6.775286
Minimum	1.254761	1.879895	2.088938	4.336807	-1.832581
Std. Dev.	0.360820	0.379326	0.621986	0.095818	2.849212
Skewness	1.250353	-0.264085	0.048016	0.525498	-0.522028
Kurtosis	3.169931	1.567023	1.662290	2.718996	1.870941
Jarque-Bera	10.73244	3.984494	3.072761	2.021905	4.039910
Probability	0.004672	0.136389	0.215158	0.363872	0.132661
Sum	64.67911	106.3168	125.4772	185.1447	125.1858
Sum Sq. Dev.	5.207631	5.755521	15.47467	0.367241	324.7204
Observations	41	41	41	41	41

Source: Author Computation using Eview (2024)

Table 4.1, the descriptive statistics for the variables LUMR, LMVA, LMSGR, LPRE, and LGEE reveal distinct distributional characteristics. LUMR has a mean of 1.5775 and a median of 1.3955, indicating a positively skewed distribution with a skewness of 1.2504. This rightward tail is further supported by its Jarque-Bera test statistic of 10.7324 (p-value: 0.0047), which suggests a significant deviation from normality. Although its kurtosis is close to that of a normal distribution at 3.1699, the positive skew and significant Jarque-Bera statistic highlights non-normal behavior. LMVA shows a mean of 2.5931 and a median of 2.6337, with a slight negative skewness of -0.2641. This leftward tail is relatively mild, and the kurtosis of 1.5670 indicates a flatter distribution compared to a normal distribution. The Jarque-Bera test statistic of 3.9845 (p-value: 0.1364) suggests that LMVA does not significantly deviate from normality, aligning more closely with normal distribution characteristics. LMSGR has a mean of 3.0604 and a median of 3.1409, with skewness near zero (0.0480), suggesting an approximately symmetric distribution. The kurtosis of 1.6623 indicates a flatter shape relative to a normal distribution. The Jarque-Bera test statistic of 3.0728 (p-value: 0.2152) supports that LMSGR does not significantly deviate from normality, reinforcing its near-normal distribution. LPRE has a mean of 4.5157 and a median of 4.5045, with a positive skewness of 0.5255, indicating a rightward tail. Its kurtosis of 2.7190 is leptokurtic, showing a more peaked distribution with heavier tails

compared to a normal distribution. The Jarque-Bera test statistic of 2.0219 (p-value: 0.3639) suggests that LPRE does not significantly deviate from normality, despite its leptokurtic nature. LGEE has a mean of 3.0533 and a median of 4.0598, with a negative skewness of -0.5220, indicating a leftward tail. Its kurtosis of 1.8709 shows a flatter distribution, and the Jarque-Bera test statistic of 4.0399 (p-value: 0.1327) indicates no significant deviation from normality. This suggests that while LGEE exhibits some skewness, it does not significantly depart from normal distribution characteristics.

Table 4. 2: Correlation Matrix

	LUMR	LMVA	LMSGR	LPRE	LGEE
LUMR	1.000000				
LMVA	0.510189	1.000000			
LMSGR	-0.176188	-0.417883	1.000000		
LPRE	0.320842	0.377273	-0.251938	1.000000	
LGEE	-0.670959	-0.821364	0.548175	-0.491847	1.000000

Source: Author Computation using Eview (2024)

The 4.1.1 correlation matrix shows the relationships between LUMR, LMVA, LMSGR, LPRE, and LGEE. Notably, LGEE has strong negative correlations with both LUMR (-0.671) and LMVA (-0.821), indicating that as LUMR and LMVA increase, LGEE tends to decrease significantly. LUMR and LMVA have a moderate positive correlation (0.510), suggesting these two variables tend to move together. LMSGR shows moderate correlations with LGEE (0.548) and LMVA (-0.418), reflecting some influence from these variables. The relationships between the other variables, such as LPRE and LGEE (-0.492), are weaker, highlighting a mix of strong and moderate interdependencies within the dataset.

Table 4. 3: Root Unit Test (ADF)

Variables	At Level	Prob.	1st Diff.	Prob.	Order of Integration
LUMR	-2.2278	0.4622	-9.6659	0.0000***	I(1)
LMVA	-0.4050	0.9841	-6.0116	0.0001***	I(1)
LMSGR	-3.4812	0.0552*	-5.1125	0.0009***	I(0)
LPRE	-2.3979	0.3752	-6.2433	0.0000***	I(1)
LGEE	-3.0318	0.1369	-5.9246	0.0001***	I(1)

Source: Author Computation using Eview (2024)

Table 4.1.2 presents the results of both the Augmented Dickey-Fuller (ADF) tests. Based on the condition that the bound test assumes that variables are either integrated into I(1) or I(0) or a combination of both, it is mandatory to check for the stationarity of the data series to be used for analysis. This is also essential to avoid obtaining an unbiased estimation. However, the summary of the results reveals that all the variables, such as the unemployment rate (UMR), manufacturing value added (% of GDP), Primary school enrolment (PRE) and Government expenditure on education (GEE) are statistically significance after first difference and Manufacturing sector growth rate (MSGR) are statistically significance and therefore, the appropriate estimation to be employed is the autoregressive distributed lag (ARDL) model.

Table 4. 4: VAR lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-64.65167	NA	2.97e-05	3.764955	3.982647	3.841702
1	71.94779	228.8964	7.23e-08	-2.267448	-0.961298*	-1.806969
2	97.51198	35.92806	7.58e-08	-2.297945	0.096663	-1.453734
3	153.7036	63.78512*	1.74e-08*	-3.983980*	-0.500914	-2.756036*

* indicates lag order selected by the criterion

Table 4.1.3, the lag length selection criteria suggest that Lag 3 is generally the most optimal choice for the model. It has the lowest values in the Akaike Information Criterion (AIC), Final Prediction Error (FPE), and Hannan-Quinn Criterion (HQ), and it is supported by the Likelihood Ratio (LR) test, indicating a better model fit with this lag length. However, the Schwarz Criterion (SC), which penalizes more for additional parameters, suggests Lag 1 as the optimal lag, favoring a more parsimonious model.

Table 4. 5: ARDL Short run

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LUMR(-1))	-0.861024	0.165092	-5.215422	0.0001
D(LUMR(-2))	-0.601593	0.174792	-3.441764	0.0029
D(LMVA)	-1.029833	0.237356	-4.338767	0.0004
D(LMVA(-1))	0.681002	0.204551	3.329245	0.0037
D(LMVA(-2))	0.337392	0.245976	1.371645	0.1870
D(LMSGR)	0.251779	0.079421	3.170159	0.0053
D(LMSGR(-1))	-0.071870	0.074911	-0.959408	0.3501
D(LMSGR(-2))	-0.348718	0.087257	-3.996443	0.0008
D(LPRE)	0.404660	0.329136	1.229462	0.2347
D(LPRE(-1))	-0.885567	0.351929	-2.516328	0.0216
D(LGEE)	0.160280	0.036721	4.364845	0.0004
D(LGEE(-1))	0.078532	0.032498	2.416524	0.0265
D(LGEE(-2))	-0.072385	0.027392	-2.642562	0.0165
CointEq(-1)	-0.185264	0.032369	-5.723484	0.0000

R^2=0.939482 DW= 1.736517

Source: Author Computation using Eview (2024)

The table 4.1.4 presents the results of a regression analysis, with coefficients indicating the relationship between various lagged independent variables and the unemployment rate in Nigeria. Significant negative relationships are observed for the first and second lags of LUMR, with coefficients of -0.861024 and -0.601593, both statistically significant at the 1% level. The impact of LMVA is mixed, with the current value showing a significant negative effect (-1.029833) and the first lag showing a significant positive effect (0.681002), while the second lag is not significant. LMSGR has a significant positive effect, but only the current value and the second lag are significant, with the first lag being insignificant. LPRE has a positive but insignificant relationship in its current form, while the first lag shows a significant negative effect. LGEE positively influences the dependent variable, with both the current value and the first lag being significant, while the second lag shows a significant negative relationship. The error correction term (CointEq(-1)) has a coefficient of -0.185264, indicating the speed at which the model returns to equilibrium as 18%, and statistically significance at 1% level. The overall model is robust, explaining approximately 93.95% of the

variation in the dependent variable ($R^2 = 0.939482$), and the Durbin-Watson statistic of 1.736517 suggests no severe autocorrelation issues.

Table 4. 6: ARDL Long Run

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LMVA	-0.813948	0.799788	-1.017704	0.3223
LMSGR	1.983021	1.649347	1.202306	0.2448
LPRE	6.680731	6.249406	1.069019	0.2992
LGEE	-0.147915	0.113348	-1.304967	0.2083
C	-32.329901	32.257903	-1.002232	0.3295

Source: Author Computation using Eview (2024)

The table 4.1.5 presents the long-run coefficients of various independent variables and their respective significance levels. The coefficient for LMVA is -0.813948, indicating a negative relationship with the dependent variable in the long run, but with a p-value of 0.3223, this relationship is not statistically significant. Similarly, LMSGR shows a positive coefficient of 1.983021, suggesting a potential positive impact, but the p-value of 0.2448 indicates a lack of statistical significance. LPRE also has a positive coefficient of 6.680731, yet with a p-value of 0.2992, it is not statistically significant. LGEE has a negative coefficient of -0.147915, but the p-value of 0.2083 shows that this relationship is also not significant. Lastly, the constant term, with a coefficient of -32.329901, is not statistically significant, as indicated by a p-value of 0.3295. Overall, the results suggest that none of the independent variables in this long-run model have a statistically significant impact on the unemployment rate in Nigeria, as all p-values exceed typical significance thresholds.

Table 4. 7: Bound F-test for Cointegration

Test Statistic	Value	K
F-Statistic	4.572817	4
	Critical Value Bound	
Significant Level	**I(0) Bound**	**I(1) Bound**
10%	2.2	3.09
5%	2.56	3.49
1%	3.29	4.37

Source: Author Computation using Eview (2024)

Table 4.1.6 displays the results of the ARDL-bound test for cointegration. Comparing the value of the calculated f-statistics with the critical value bounds is the first stage in this process. Table 4 shows that the estimated f-statistic of 4.572817, evaluated at k = 4 (number of explanatory variables), at the 5 percent level of significance, surpasses the upper critical boundaries, the null hypothesis that there is no long-run relationship between the variables, which is thus rejected. This suggests that the variables have a long-run relationship.

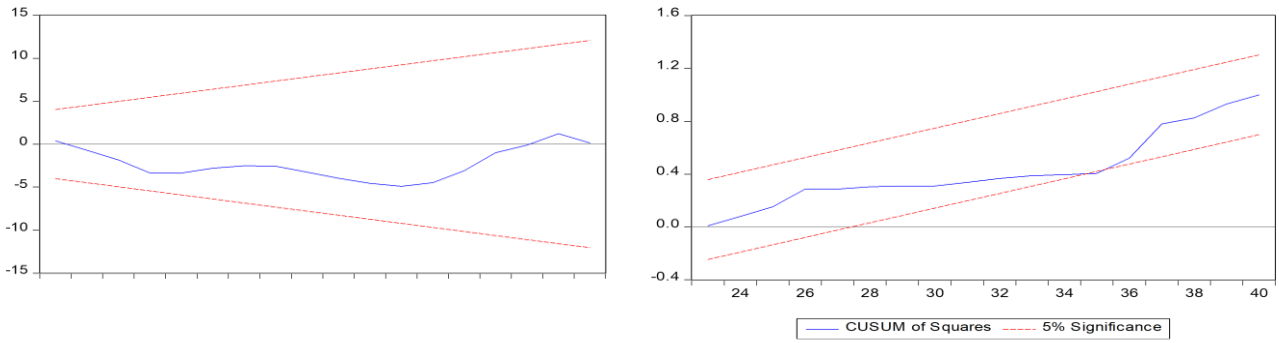
Table 4. 8: Diagnostic Test Result

Test	Coefficient	P-Value
Serial Correlation LM Test	0.207916	0.8144
Residual Heteroskedasticity Test	0.758370	0.7183

Source: Author Computation using Eview (2024)

As presented in table 4.1.7 there is no evidence for post-estimated diagnostic test problem in the model. The serial correlation langrange multiplier (LM) test indicates the evidence of no serial correlation with the coefficient of 0.207916 with P-value of 0.8144. The Breusch-Pagan-Godfrey Test (BP) for heteroskedasticity test shows that the disturbance term in the model is homoscedastic with the coefficient of 0.758370 with P-value of 0.7183 and thus, the ARDL model is correctly specified given all the P-value are greater than 0.5% level of significance.

4.1.8 Cumulative Sum of Recursive Residuals of CUSUM and CUSUM Square



Model stability is crucial for prediction and economic inference, representing a sufficient condition. Therefore, the study conducted stability tests for estimated parameters by employing the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares (CUSUMS Q) tests. The graphical presentation of these tests is depicted in Figures 1 and 2.

4.2. Discussion

Table 4.1, the descriptive statistics for the variables LUMR, LMVA, LMSGR, LPRE, and LGEE reveal distinct distributional characteristics. LUMR has a mean of 1.5775 and a median of 1.3955, indicating a positively skewed distribution with a skewness of 1.2504. This rightward tail is further supported by its Jarque-Bera test statistic of 10.7324 (p-value: 0.0047), which suggests a significant deviation from normality. Although its kurtosis is close to that of a normal distribution at 3.1699, the positive skew and significant Jarque-Bera statistic highlights non-normal behaviour. LMVA shows a mean of 2.5931 and a median of 2.6337, with a slight negative skewness of -0.2641. This leftward tail is relatively mild, and the kurtosis of 1.5670 indicates a flatter distribution compared to a normal distribution. The Jarque-Bera test statistic of 3.9845 (p-value: 0.1364) suggests that LMVA does not significantly deviate from normality, aligning more closely with normal distribution characteristics. LMSGR has a mean of 3.0604 and a median of 3.1409, with

skewness near zero (0.0480), suggesting an approximately symmetric distribution. The kurtosis of 1.6623 indicates a flatter shape relative to a normal distribution. The Jarque-Bera test statistic of 3.0728 (p-value: 0.2152) supports that LMSGR does not significantly deviate from normality, reinforcing its near-normal distribution. LPRE has a mean of 4.5157 and a median of 4.5045, with a positive skewness of 0.5255, indicating a rightward tail. Its kurtosis of 2.7190 is leptokurtic, showing a more peaked distribution with heavier tails compared to a normal distribution. The Jarque-Bera test statistic of 2.0219 (p-value: 0.3639) suggests that LPRE does not significantly deviate from normality, despite its leptokurtic nature**.** LGEE has a mean of 3.0533 and a median of 4.0598, with a negative skewness of -0.5220, indicating a leftward tail. Its kurtosis of 1.8709 shows a flatter distribution, and the Jarque-Bera test statistic of 4.0399 (p-value: 0.1327) indicates no significant deviation from normality. This suggests that while LGEE exhibits some skewness, it does not significantly depart from normal distribution characteristics.

The 4.1.1 correlation matrix shows the relationships between LUMR, LMVA, LMSGR, LPRE, and LGEE. Notably, LGEE has strong negative correlations with both LUMR (-0.671) and LMVA (-0.821), indicating that as LUMR and LMVA increase, LGEE tends to decrease significantly. LUMR and LMVA have a moderate positive correlation (0.510), suggesting these two variables tend to move together. LMSGR shows moderate correlations with LGEE (0.548) and LMVA (-0.418), reflecting some influence from these variables. The relationships between the other variables, such as LPRE and LGEE (-0.492), are weaker, highlighting a mix of strong and moderate interdependencies within the dataset.

Table 4.1.2 presents the results of both the Augmented Dickey-Fuller (ADF) tests. Based on the condition that the bound test assumes that variables are either integrated into I(1) or I(0) or a combination of both, it is mandatory to check for the stationarity of the data series to be used for analysis. This is also essential to avoid obtaining an unbiased estimation. However, the summary of the results reveals that all the variables, such as the unemployment rate (UMR), manufacturing value added (% of GDP), Primary school enrolment (PRE) and Government expenditure on education (GEE) are statistically significance after first difference and Manufacturing sector growth rate (MSGR) are statistically significance and therefore, the appropriate estimation to be employed is the autoregressive distributed lag (ARDL) model.

Table 4.1.3, the lag length selection criteria suggest that Lag 3 is generally the most optimal choice for the model. It has the lowest values in the Akaike Information Criterion (AIC), Final Prediction Error (FPE), and Hannan-Quinn Criterion (HQ), and it is supported by the Likelihood Ratio (LR) test, indicating a better model fit with this lag length. However, the Schwarz Criterion (SC), which penalizes more for additional parameters, suggests Lag 1 as the optimal lag, favoring a more parsimonious model.

The table 4.1.4 presents the results of a regression analysis, with coefficients indicating the relationship between various lagged independent variables and the unemployment rate in Nigeria. Significant negative relationships are observed for the first and second lags of LUMR, with coefficients of -0.861024 and -0.601593, both statistically significant at the 1% level. The impact of LMVA is mixed, with the current value showing a significant negative effect (-1.029833) and the first lag showing a significant positive effect (0.681002), while the second lag is not significant. LMSGR has a significant positive effect, but only the current value and the second lag are significant, with the first lag being insignificant. LPRE has a positive but insignificant relationship in its current form, while the first lag shows a significant negative effect. LGEE

positively influences the dependent variable, with both the current value and the first lag being significant, while the second lag shows a significant negative relationship. The error correction term (CointEq(-1)) has a coefficient of -0.185264, indicating the speed at which the model returns to equilibrium as 16%, and statistically significance at 1% level. The overall model is robust, explaining approximately 93.95% of the variation in the dependent variable ($R^2 = 0.939482$), and the Durbin-Watson statistic of 1.736517 suggests no severe autocorrelation issues.

The table 4.1.5 presents the long-run coefficients of various independent variables and their respective significance levels. The coefficient for LMVA is -0.813948, indicating a negative relationship with the dependent variable in the long run, but with a p-value of 0.3223, this relationship is not statistically significant. Similarly, LMSGR shows a positive coefficient of 1.983021, suggesting a potential positive impact, but the p-value of 0.2448 indicates a lack of statistical significance. LPRE also has a positive coefficient of 6.680731, yet with a p-value of 0.2992, it is not statistically significant. LGEE has a negative coefficient of -0.147915, but the p-value of 0.2083 shows that this relationship is also not significant. Lastly, the constant term, with a coefficient of -32.329901, is not statistically significant, as indicated by a p-value of 0.3295. Overall, the results suggest that none of the independent variables in this long-run model have a statistically significant impact on the unemployment rate in Nigeria, as all p-values exceed typical significance thresholds.

Table 4.1.6 displays the results of the ARDL-bound test for cointegration. Comparing the value of the calculated f-statistics with the critical value bounds is the first stage in this process. Table 4 shows that the estimated f-statistic of 4.572817, evaluated at k = 4 (number of explanatory variables), at the 5 percent level of significance, surpasses the upper critical boundaries, the null hypothesis that there is no long-run relationship between the variables, which is thus rejected. This suggests that the variables have a long-run relationship.

As presented in table 4.1.7 there is no evidence for post-estimated diagnostic test problem in the model. The serial correlation langrange multiplier (LM) test indicates the evidence of no serial correlation with the coefficient of 0.207916 with P-value of 0.8144. The Breusch-Pagan-Godfrey Test (BP) for heteroskedasticity test shows that the disturbance term in the model is homoscedastic with the coefficient of 0.758370 with P-value of 0.7183 and thus, the ARDL model is correctly specified given all the P-value are greater than 0.5% level of significance.

Model stability is crucial for prediction and economic inference, representing a sufficient condition. Therefore, the study conducted stability tests for estimated parameters by employing the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares (CUSUMS Q) tests. The graphical presentation of these tests is depicted in Figures 1 and 2.

5.1. Conclusion and Policy Recommendations

The analysis provides a detailed examination of various statistical tests and regression analyses applied to variables related to the unemployment rate in Nigeria. Descriptive statistics indicate that LUMR is positively skewed and deviates significantly from normality, while other variables like LMVA and LMSGR exhibit near-normal distributions. The correlation matrix reveals strong negative correlations between LGEE and both LUMR and LMVA, suggesting that increases in these variables are associated with decreases in LGEE.

Stationarity tests confirm that the variables are either integrated of order I(1) or I(0), justifying the use of the ARDL model. The model selection criteria identify Lag 3 as the most optimal, though the Schwarz Criterion suggests a more parsimonious Lag 1. Regression results show significant short-run relationships, particularly with the lags of LUMR, LMVA, and LMSGR, while long-run coefficients indicate that none of the variables have a statistically significant impact on the unemployment rate. The ARDL-bound test confirms the presence of a long-run relationship among the variables. Diagnostic tests indicate no issues with serial correlation or heteroskedasticity, and stability tests confirm that the model is stable. Overall, the analysis suggests a robust model with meaningful short-run dynamics but no significant long-run effects on unemployment in Nigeria.

Based on the summary of the major findings, the study concludes that while there are significant short-run relationships between the unemployment rate and variables such as LUMR, LMVA, and LMSGR in Nigeria, these relationships do not persist in the long run. The significant short-run effects highlight the importance of these factors in influencing unemployment rates over shorter periods, but their lack of long-run significance suggests that other factors may play a more substantial role in determining unemployment over extended periods. Additionally, the presence of a long-run equilibrium relationship among the variables, as indicated by the ARDL-bound test, implies that despite short-run fluctuations, the system tends to return to equilibrium over time. The model's robustness, supported by diagnostic tests and stability analyses, further validates the reliability of the findings. Therefore, policymakers should consider both short-run and long-run dynamics when designing interventions aimed at reducing unemployment in Nigeria, with a focus on addressing factors that might contribute to sustainable long-term employment.

5.2. Policy Recommendations

i. Government should boost employment through manufacturing sector performance, with subsidies, infrastructure investment, and support for innovation.

ii. Government should strengthen human capital requires investing in quality education and vocational training to build a skilled workforce.

iii. Government should improve long-term unemployment linked to primary school enrolment and enhance primary education quality and expand access, especially in underserved areas.

5.3. Contribution to Knowledge

The study contributes to the understanding of unemployment dynamics in Nigeria by highlighting the roles of manufacturing sector performance, human capital development, and primary education in shaping employment outcomes. It reveals that while short-run impacts from manufacturing and human capital are significant, long-term unemployment is more closely linked to foundational education quality and access. This insight underscores the importance of a multifaceted approach, integrating immediate sectoral support with long-term educational reforms to effectively address unemployment and enhance economic stability.

5.5. Suggestion For Further Studies

i. Comparative Impact of Sectoral Growth on Employment Dynamics: Beyond the Manufacturing Sector

ii. Long-Term Effects of Primary Education Quality and Access on Labor Market Outcomes in Nigeria

iii. Evaluating the Effectiveness of Vocational Training Programs in Addressing Unemployment and Skill Mismatches

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