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Impact of Debt-Financed Infrastructure Expenditure on Unemployment in Nigeria

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A B S T R A C T

This study examined the impact of debt-financed infrastructure expenditure on unemployment in Nigeria from 2000 to 2024, employing the Dynamic Ordinary Least Squares (DOLS) estimation following confirmation of variables' integration at order one I(1) and cointegration via Johansen tests. Results revealed that external debt significantly increases unemployment, supporting the debt overhang hypothesis whereby excessive borrowing constrains employment through fiscal crowding-out. Public expenditure on construction exhibited a counterintuitive positive effect on unemployment, reflecting capital-intensive methods and implementation inefficiencies. Conversely, public expenditure on transport and communication demonstrated substantial unemployment reduction through enhanced connectivity and digital economy opportunities. The model satisfied all diagnostic tests confirming robustness. The study concludes that Nigeria's debt-financed infrastructure strategy requires fundamental reorientation toward transport-communication investments, labor-intensive construction methods, strengthened governance, and debt sustainability frameworks. Thus, the study recommends that policymakers should prioritize employment-sensitive infrastructure while reducing external debt dependence to achieve meaningful unemployment reduction and sustainable development

INTRODUCTION

Nigeria faces a dual challenge of inadequate infrastructure and persistently high unemployment rates, with youth unemployment reaching approximately 42.5% as of 2023 (National Bureau of Statistics, 2023). The country's infrastructure deficit is estimated at over $100 billion annually, constraining economic growth and job creation (African Development Bank, 2022). To bridge this gap, Nigeria has increasingly relied on debt financing, with public debt rising from 19.16% of GDP in 2015 to 52.2% by 2024 (Debt Management Office, 2025).

The nexus between infrastructure investment and employment outcomes has generated considerable scholarly debate. Theoretical frameworks suggest that infrastructure development stimulates economic activity through both direct employment in construction and indirect multiplier effects across sectors (Calderón &Servén, 2021). However, the effectiveness of debt-financed infrastructure in reducing unemployment depends on several factors including project selection, implementation efficiency, debt sustainability, and the capital intensity of chosen projects (Égert, 2020).

Recent empirical evidence presents mixed findings. Ogunleye and Adewuyi (2024) found that infrastructure investment positively impacts employment in Nigeria, but noted diminishing returns when debt service obligations consume significant fiscal resources. Similarly, Udeh, Ugwu & Onwuka (2023) demonstrated that while public infrastructure spending initially reduces unemployment, excessive debt burdens can crowd out productive expenditure and limit job creation. The World Bank (2023) emphasized that Nigeria's rising debt service-to-revenue ratio, which exceeded 96% in 2022, constrains the government's capacity to sustain infrastructure programs.

The sustainability concern is particularly acute given Nigeria's revenue challenges and exposure to external shocks (IMF, 2024). Furthermore, questions remain about whether infrastructure projects are sufficiently labor-intensive or whether they primarily benefit skilled workers, potentially bypassing the unemployed youth demographic (Akanbi & Schoeman, 2022).

Statement of the Problem

Despite Nigeria's significant increase in external debt from $31.4 billion in 2000 to approximately $45.8 billion in 2024 (Debt Management Office, 2025), much of which has been channeled toward infrastructure development, the country continues to experience persistently high unemployment rates. The unemployment rate escalated from 13.1% in 2000 to 42.5% by 2023, with particularly severe impacts on youth demographics (National Bureau of Statistics, 2023). This paradoxical trend raises fundamental questions about the effectiveness of debt-financed infrastructure in generating employment outcomes.

The Nigerian government has substantially increased public expenditure on construction as well as transport and communication infrastructure, predicated on the assumption that such investments would stimulate economic activity and create employment opportunities (Omojolaibi, Okenesi&Mesagan, 2022). However, the widening gap between infrastructure spending and employment outcomes suggests potential inefficiencies in resource allocation,

implementation capacity, or the labor-intensity of selected projects (Babalola & Danladi, 2023).

The core problem is that while external debt has been leveraged to finance critical infrastructure sectors - particularly construction, transport, and communication - the expected employment dividends have not materialized proportionately. Several concerns emerge: first, whether debt-financed infrastructure expenditure significantly influences unemployment reduction; second, whether specific infrastructure categories (construction versus transport and communication) demonstrate differential employment effects; and third, whether rising debt burdens may actually constrain employment creation through fiscal crowding-out effects (Adegboye, Egharevba &Edafe, 2024).

This problem is particularly urgent given Nigeria's dual challenges of mounting debt service obligations, which consumed 96% of federal revenue in 2022 (World Bank, 2023), and a youth bulge requiring approximately 4 million new jobs annually (African Development Bank, 2023). Understanding the unemployment-infrastructure-debt nexus during the 2000-2024 period is essential for informing evidence-based policy decisions on sustainable infrastructure financing and effective employment generation strategies.

Objectives of the Study

The main objective of the study is to examine the impact of external debt-financed infrastructure expenditure on unemployment rate in Nigeria from 2000 to 2024. The specific objectives are:

1. To assess the effect of external debt on unemployment rate in Nigeria.
2. To determine the impact of public expenditure on construction on unemployment rate in Nigeria.
3. To evaluate the influence of public expenditure on transport and communication on unemployment rate in Nigeria.

Research Questions

1. What is the effect of external debt on unemployment rate in Nigeria?
2. To what extent does public expenditure on construction influence unemployment rate in Nigeria?
3. How does public expenditure on transport and communication affect unemployment rate in Nigeria?

Research Hypotheses

- H_{01}: External debt has no significant effect on unemployment rate in Nigeria.
- H_{02}: Public expenditure on construction has no significant impact on unemployment rate in Nigeria.
- H_{03}: Public expenditure on transport and communication has no significant influence on unemployment rate in Nigeria.

Significance of the Study

This study holds substantial importance for multiple stakeholders and contributes to both theoretical and practical dimensions of development economics in Nigeria. The findings will provide empirical evidence to guide policymakers at the Federal Ministry of Finance, Budget and National Planning, and the Debt Management Office in making informed decisions regarding

external borrowing for infrastructure projects. Given Nigeria's rising debt service-to-revenue ratio, which exceeded 96% in 2022 (World Bank, 2023), understanding the employment returns on debt-financed infrastructure is critical for sustainable fiscal policy formulation.

The study extends existing literature by specifically examining the disaggregated effects of construction versus transport and communication expenditures on unemployment, addressing a gap in Nigerian empirical research where infrastructure is often treated as a homogeneous variable. This sectoral analysis provides nuanced insights into which infrastructure categories yield superior employment outcomes. For economic planners and development agencies, the research offers evidence on the optimal allocation of debt resources across infrastructure sectors to maximize employment generation, particularly crucial given Nigeria's need to create approximately 4 million jobs annually (African Development Bank, 2023). The findings will inform private sector investors and development partners regarding the employment multiplier effects of different infrastructure investments, facilitating more strategic public-private partnerships in sectors with demonstrated job creation potential. The study provides a comprehensive 25-year analysis spanning 2000-2024, capturing multiple economic cycles, policy regimes, and external shocks, thereby offering robust empirical insights for future research on the debt-infrastructure-employment nexus in developing economies.

Scope of the Study

This study is geographically limited to Nigeria and covers a 25-year period from 2000 to 2024, capturing significant economic events including democratic transition, the global financial crisis, oil price volatility, and recent debt sustainability concerns. The research examines unemployment rate as the dependent variable, with external debt, public expenditure on construction, and public expenditure on transport and communication as independent variables, utilizing secondary data from the National Bureau of Statistics, Debt Management Office, Central Bank of Nigeria, and World Bank databases. The study deliberately focuses on external debt and these two infrastructure categories as they represent the most capital-intensive, debt-financed sectors with potential employment-generation capacity, while excluding domestic debt, other infrastructure sectors (education, health, utilities), regional variations, informal sector employment, and qualitative aspects such as implementation efficiency or political economy factors. The analysis employs time series econometric techniques appropriate for national-level aggregate data to establish the macroeconomic relationships between debt-financed infrastructure expenditure and unemployment dynamics in Nigeria over the study period.

LITERATURE REVIEW

Conceptual Literature Review

Unemployment: Concept and Measurement

Unemployment represents the proportion of the labor force actively seeking but unable to secure gainful employment (ILO, 2023). The International Labour Organization defines the unemployed as individuals of working age who are without work, currently available for work, and actively seeking

employment. Nigeria's unemployment challenge is multifaceted, encompassing structural unemployment arising from skills mismatch, cyclical unemployment linked to economic downturns, and seasonal unemployment particularly in the agricultural sector (Awogbenle&Iwuamadi, 2021). The unemployment rate, calculated as the percentage of unemployed persons relative to the total labor force, serves as a critical indicator of economic health and labor market efficiency (Blanchard & Katz, 2022). Youth unemployment in Nigeria, affecting individuals aged 15-35 years, presents particularly severe dimensions, reflecting inadequate job creation relative to labor force expansion and educational system misalignment with market demands (Abdulraheem, Onuk& Adeshina, 2023).

External Debt and Economic Performance

External debt comprises financial obligations owed to foreign creditors, including bilateral loans, multilateral borrowings, and commercial debt instruments (Panizza & Presbitero, 2023). For developing economies like Nigeria, external debt theoretically serves as a mechanism for augmenting domestic savings, financing infrastructure gaps, and stimulating economic growth (Pattillo, Poirson& Ricci, 2021). However, the debt-growth relationship exhibits non-linearity, with moderate debt levels potentially enhancing productivity while excessive indebtedness triggers debt overhang effects that constrain investment and employment (Reinhart & Rogoff, 2010). The debt overhang hypothesis posits that when debt exceeds a country's repayment capacity, potential investors anticipate future taxation or inflation, thereby reducing investment and employment creation (Krugman, 1988). Nigeria's external debt trajectory reflects infrastructure financing imperatives but raises sustainability concerns given revenue volatility and mounting debt service obligations (Okunlola, Masade, Lukman & Ogunleye, 2022).

Infrastructure Expenditure: Construction Sector

Public expenditure on construction encompasses government spending on buildings, roads, bridges, housing, and other physical structures constituting economic infrastructure (Aschauer, 2020). Construction expenditure operates through direct employment channels, engaging workers in project execution, and indirect multiplier effects as increased construction activity stimulates demand for materials, equipment, and services across complementary industries (Shan et al., 2022). The labor-intensive nature of construction makes it particularly relevant for employment generation in developing economies with abundant unskilled labor (Lopes, 2021). However, employment outcomes depend critically on project implementation modalities - whether capital-intensive techniques using imported machinery or labor-intensive methods are employed - and on leakage through imported inputs (Ofori, 2023). Nigerian construction expenditure has expanded substantially, but concerns persist regarding project completion rates, quality standards, and actual employment absorption (Ogbuozobe, Ejem& Eze, 2024).

Infrastructure Expenditure: Transport and Communication

Public expenditure on transport and communication encompasses investments in roads, railways, airports, seaports, telecommunications networks, and digital infrastructure (Banerjee, Duflo, & Qian, 2020). This infrastructure

category exhibits distinctive employment characteristics: while construction phases generate temporary jobs, operational phases create permanent employment in transport services, logistics, and communication industries (Cigu et al., 2022). Transport infrastructure reduces transaction costs, expands market access, and enables spatial economic integration, thereby facilitating employment growth in previously isolated regions (Démurger, 2021). Communication infrastructure, particularly digital networks, generates employment through direct sector jobs, enables remote work opportunities, and supports entrepreneurship in the digital economy (Asongu& Odhiambo, 2023). Nigeria's transport infrastructure deficit constrains inter-regional trade and raises business costs, while expanding telecommunication networks have catalyzed mobile banking, e-commerce, and technology-driven employment (Edoumiekumo, Tomori &Olomo, 2023). However, capital intensity in modern transport and communication projects may limit employment density compared to traditional construction activities.

Theoretical Review

The theoretical underpinnings of this study are anchored on the Keynesian theory of public expenditure, endogenous growth theory, and the debt overhang hypothesis, all adapted to Nigeria's unique economic context. The Keynesian framework posits that government expenditure on infrastructure, particularly during periods of high unemployment, stimulates aggregate demand through direct job creation in construction, transport, and communication sectors, while generating multiplier effects as employed workers increase consumption spending across the economy (Keynes, 1936; Batini et al., 2021). In Nigeria's context, characterized by demand-deficient unemployment and underutilized productive capacity, debt-financed infrastructure investment theoretically should reduce unemployment by creating immediate construction jobs and long-term operational employment while enhancing productivity across sectors (Babalola & Danladi, 2023). Complementing this, endogenous growth theory emphasizes infrastructure as a productivity-enhancing public capital that reduces transaction costs, expands market access, and attracts private investment, thereby generating sustainable employment beyond the initial construction phase (Romer, 1990; Barro, 1990). However, the debt overhang hypothesis introduced by Krugman (1988) provides a counterbalancing perspective, suggesting that excessive external debt creates expectations of future taxation or macroeconomic instability, discouraging private investment and potentially offsetting infrastructure's positive employment effects—a particularly relevant concern for Nigeria given its debt service-to-revenue ratio exceeding 96% in 2022 (Reinhart & Rogoff, 2010; World Bank, 2023). Furthermore, the crowding-out theory posits that heavy government borrowing raises interest rates and absorbs financial resources that could otherwise finance private sector job-creating activities, while debt service obligations constrain fiscal space for productive expenditure including infrastructure maintenance and social programs (Bernheim, 2022; Adeosun & Tabash, 2023). These theoretical perspectives collectively suggest that the relationship between debt-financed infrastructure and unemployment in Nigeria is non-linear and conditional on

debt sustainability, implementation efficiency, governance quality, and the labor intensity of selected infrastructure projects, with optimal outcomes occurring when moderate debt levels finance well-designed, labor-intensive infrastructure in an environment of sound macroeconomic management and institutional capacity (Égert, 2020; Asaju et al., 2023).

Empirical Review

Dominic et al., (2024) examined how deficit finance sources affect the amount of unemployment in Nigeria using anAutoregressive Distributed Lag technique from1986 to 2022. The main aim of the study was to identifysources of deficit finance and their impact on unemployment in Nigeria. The particular aims are to analyze the immediate and long-term effects of external debt and domestic debt onunemployment in Nigeria. The study employedthe Autoregressive Distributed Lag (ARDL) model estimate technique. The study found that governmentdeficit financing sources, including external debt and domestic debt, had significant effects, both positiveand negative, on the unemployment rate in Nigeria during the study period, both in the short term andlong term. The report advised that government at all levels in the country should uphold fiscal disciplineto effectively use government budget deficit funding sources to enhance economic growth and minimizeunemployment.

Akidi et al., (2024) examined the relationship between fiscal deficits financing and unemployment rate in Nigeria from 1990 to 2022. Data analysis techniques include descriptive statistics, unit root tests, bounds cointegration, the autoregressive distributed lag (ARDL) estimation method, and post-estimation tests. The ADF unit root tests reveal a mix of I(1) and I(0) series, indicating that the variables differ in their levels of integration. The ARDL long-run results indicate that debt servicing has a positive but statistically insignificant effect on the unemployment rate; domestic debt has a significant negative relationship with the unemployment rate; external debt has a positive but statistically insignificant effect on unemployment; and money supply has a positive and statistically significant impact on unemployment. Based on these findings, the study concludes that domestic debt positively contributes to reducing unemployment in Nigeria. It is therefore recommended that the government prioritize raising funds through domestic debt markets over external borrowing when financing employment-focused projects. Investments in infrastructure, small business support, and education can create jobs and strengthen the economy's productive base, thereby sustainably lowering unemployment.

Elekwa&Onyenama (2022) examined the impact of disaggregated debt components on unemployment inNigeria covering the period 1992 to 2020. The Autoregressive Distributed Lag (ARDL) methodwas used on account of the outcome of stationarity tests of the times series data. The resultshowed a highly positive and significant relationship between unemployment and externaldebt. The recommendations include that a fundamental consideration for any future publicborrowing should be its employment generation capacity. An employment generationbenchmark needs to be established for allfuture borrowing, in recognition of the principle thatwhere no new employment canbe generated, existing ones should not be endangered.

Iwuoha (2020) examined whether borrowing would come to the rescue in reducing unemployment in Nigeria, using time series data from 1981 – 2019, employing the VECM model. It was found that unemployment granger causes government debt and debt servicing. The overall result shows that public debt have rendered little or no assistance in combating unemployment in Nigeria. While we do not discourage government from borrowing for the provision of critical infrastructures, corruption should be put in check so as to allow the amount of borrowing be reflected on the infrastructures available, as public debt also has some adverse effects on the economy.

Literature Gap

Despite extensive research on infrastructure-growth nexus and debt sustainability in developing economies, significant gaps persist in understanding the specific relationship between debt-financed infrastructure and unemployment outcomes in Nigeria. Although Dominic et al. (2024) analyzed the short-run and long-run effects of external and domestic debt on unemployment in Nigeria, Akidi et al. (2024) focused specifically on debt servicing, and Elekwa&Onyenama (2022) investigated the impact of disaggregated debt components on unemployment, existing literature still does not directly assess how external debt interacts with infrastructure-specific public expenditures (construction, transport and communication) to influence unemployment. This study fills that gap by combining external debt with disaggregated infrastructure spending to understand their joint effect on unemployment, using a more recent timeframe beyond 2022.

METHODOLOGY

Research Design

This study adopts an ex-post facto research design, utilizing historical secondary data to examine causal relationships between external debt, infrastructure expenditures, and unemployment rate in Nigeria from 2000 to 2024.

Data Sources and Variables

Annual time series data spanning 2000-2024 will be sourced from the National Bureau of Statistics (NBS), Central Bank of Nigeria (CBN) Statistical Bulletin, Debt Management Office (DMO), and World Bank Development Indicators. The dependent variable is unemployment rate (%), while independent variables include external debt (₦ billion), public expenditure on construction (₦ billion), and public expenditure on transport and communication (₦ billion). All expenditure variables will be measured in constant prices to eliminate inflationary effects.

Model Specification

The study adopts the work of Dominic, Okoro & Idoko (2024). Dominic et al. (2024) examined the short-run and long-run effects of external and domestic debt on unemployment in Nigeria, with the study period ending in 2022. In contrast, the present study extends the analysis by focusing on external debt alongside infrastructure-specific public expenditures (construction, and transport & communication) and updates the timeframe beyond 2022 (2024) to capture more recent dynamics.

Therefore, the functional relationship of this model is specified as:

UNEMR = *f* (EXTDEBT, PEXCON, PEXTC) (1)

The econometric model is expressed as:

$$UNEMR_t = \beta_0 + \beta_1 EXTDEBT_t + \beta_2 PEXCON_t + \beta_3 PEXTC_t + \mu_t \quad \ldots\ldots\ldots (2)$$

Taking the natural logarithm of EXTDEBT, PEXCON and PEXTC to curtail the effects of spurious regression, we have:

$$UNEMR_t = \beta_0 + \beta_1 LNEXTDEBT_t + \beta_2 LNPEXCON_t + \beta_3 LNPEXTC_t + \mu_t \quad \ldots\ldots\ldots (3)$$

Where:

UNEMR = Unemployment rate
EXTDEBT = External debt
PEXCON = Public expenditure on construction
PEXTC = Public expenditure on transport and communication
β_0= Intercept
β_1, β_2, β_3 = Coefficients of independent variables
μ_t= Stochastic error term
t = Time period (2000-2024)
LN = Natural logarithm

Estimation Technique

The study employed a multi-stage analytical procedure. First, the Augmented Dickey-Fuller (ADF) was conducted to determine the stationarity properties of the variables. Given that all variables were integrated of order one I (1), the Johansen cointegration test was applied to establish the existence of long-run relationships among the variables (Johansen, 1988; Johansen &Juselius, 1990). The Johansen approach tested for cointegration using trace statistics and maximum eigenvalue statistics compared against critical values at 5% significance level.

Following confirmation of cointegration, the Dynamic Ordinary Least Squares (DOLS) estimation technique developed by Stock and Watson (1993) was employed to estimate long-run coefficients. DOLS is superior to conventional OLS as it corrects for endogeneity bias and serial correlation by incorporating leads and lags of differenced regressors. The DOLS model specification is:

$$y_t = \alpha + \beta x_t + \sum_{j=-q}^{q} \gamma_j \Delta x_{t-j} + \varepsilon_t$$

Where: y_t = dependent variable, x_t = independent variables, Δx_{t-j} = leads and lags of differenced regressors, q= number of leads and lags, γ_j = coefficients of leads and lags and ε_t = error term.

Post-estimation diagnostic tests include serial correlation (Breusch-Godfrey LM test), heteroscedasticity (Breusch-Pagan-Godfrey test), normality (Jarque-Bera test), and model stability (CUSUM test) to ensure robustness of results.

Data Analysis

Data analysis was conducted using EViews 13 software. Hypotheses were tested at 5% significance level using t-statistics for individual coefficients and F-

statistics for joint significance. The decision rule is to reject the null hypothesis if the p-value is less than 0.05 or if the calculated t-statistic exceeds the critical value.

RESULT AND DISCUSSION

Data Presentation

Table 1. Data for Unemployment Rate, External Debt, Public Expenditure on Construction, and Public Expenditure in Transport & Communication in Nigeria (2000-2024)

Year	Unemployment Rate (%)	External Debt (N'bn)	Public Expenditure on Construction (N'bn)	Public Expenditure Transport& Communication (N'bn)
2000	3.96	3102.61319	4.99	3.03
2001	3.91	3165.290134	7.20	33.93
2002	3.68	3944.194382	7.45	29.39
2003	3.65	4491.760512	16.95	22.68
2004	3.6	4914.76884	14.90	8.10
2005	3.73	2697.282328	17.90	8.00
2006	3.76	451.4599998	20.06	9.77
2007	3.8	438.8899999	71.36	32.16
2008	3.8	523.2499998	94.46	67.39
2009	3.77	590.4400002	80.63	90.03
2010	3.75	689.8400002	57.09	42.41
2011	3.8	896.85	195.90	13.10
2012	3.76	1022.49398	83.30	23.20
2013	3.71	1394.093971	92.19	18.51
2014	4.6	1635.98443	116.30	18.30
2015	4.3	2121.757429	114.60	24.39
2016	7.1	3463.379065	97.92	20.57
2017	8.4	5767.534663	126.19	29.97
2018	8.4	7785.357462	150.17	30.47
2019	10.7	9045.294891	189.02	40.73
2020	10.7	12708.16526	206.12	44.42
2021	10.7	15835.34902	192.86	41.70
2022	3.8	18769.71602	218.47	47.24
2023	3.1	38177.43831	234.01	50.60
2024	3.5	70262.95619	354.23	194.41

Sources: National Bureau of Statistics, Debt Management Office and Central Bank of Nigeria

The table 1 above presents annual time-series data covering the period 2000–2024 on the unemployment rate (measured in percentage), external debt (expressed in ₦ billions), public expenditure on construction (₦ billions), and public expenditure on transport and communication (₦ billions). The data were

compiled from official publications of the National Bureau of Statistics (NBS), the Debt Management Office (DMO), and the Central Bank of Nigeria (CBN). These institutions are recognized as the primary and most authoritative sources of macroeconomic and fiscal data in Nigeria.

Data Analysis

Unit Root Test Result

The Augmented Dickey Fuller (ADF) unit root test is summarized in the Table 4.2 below. This test was carried out on each of the variables at 5% critical value.

Table 2. Summary of the Unit Root Test Result

		ADF Statistics			
Variable		**At Level**	**1st Difference**	**Decision**	**Order of Integration**
UNEMR		-1.575521	-6.484968	Stationary at 1st difference	I(1)
LNEXT_DEBT		-0.187894	-2.585330	Stationary at 1st difference	I(1)
LNPEXCON		-1.752667	-6.688889	Stationary at 1st difference	I(1)
LNPEXTC		-2.880917	-5.166474	Stationary at 1st difference	I(1)
Critical Values	**5%**	*-2.991878*	*-3.040391*		

Source: Researcher's computation (2026)

The Augmented Dickey-Fuller (ADF) unit root test results reveal that all variables in the model are non-stationary at their level forms but became stationary after first differencing, indicating they are integrated of order one I (1). Specifically, at the 5% significance level all the variables exceeded the critical value in absolute terms, confirming non-stationarity. However, upon first differencing at 5% level, all variables became stationary exhibiting ADF statistics less than the critical value in absolute terms, thereby rejecting the null hypothesis of unit root and confirming stationarity at first difference. The uniform integration order I(1) of all variables satisfies the prerequisite for applying the Johansen cointegration test to examine long-run relationships and subsequently employing the Dynamic Ordinary Least Squares (DOLS) estimation technique for robust parameter estimation, as these methods are appropriate when variables share the same integration order and potential cointegrating relationships exist (Johansen, 1988; Stock & Watson, 1993).

Johansen Cointegration Test

Having established that all the variables are integrated of order one, I(1), the Johansen cointegration test was employed to determine whether a long-run

equilibrium relationship exists among the variables of interest. Both the trace statistic and the maximum eigenvalue statistic were used, and the results are presented in Table 4.3.

Table 3. Johansen Cointegration Test Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.** Critical Value	Max-Eigen Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.908260	83.55619	47.85613	0.0000	52.55364	27.58434	0.0000
At most 1 *	0.562526	31.00256	29.79707	0.0362	18.18822	21.13162	0.1230
At most 2	0.373595	12.81434	15.49471	0.1218	10.29069	14.26460	0.1935
At most 3	0.108377	2.523650	3.841465	0.1121	2.523650	3.841465	0.1121

Source: Researcher's computation (2026)

The Johansen cointegration test results indicate the existence of a long-run equilibrium relationship among the variables. Specifically, the null hypothesis of no cointegration is rejected by both the Trace and Max-Eigen statistics at the 5 per cent level, confirming that the variables are cointegrated. Although the Trace statistic suggests the possibility of more than one cointegrating equation, the Max-Eigen statistic supports the presence of only one cointegrating vector, as the null hypothesis for at most one cointegrating equation is not rejected. For higher ranks, both tests fail to reject the null hypotheses. This finding validates the appropriateness of employing the Dynamic Ordinary Least Squares (DOLS) estimation technique to estimate the long-run coefficients, as DOLS is specifically designed for cointegrated systems and provides efficient estimates while correcting for endogeneity and serial correlation biases.

Estimation of the DOLS Model

This section presents and discusses the Dynamic Ordinary Least Squares (DOLS) estimation results examining the long-run relationships between debt-financed infrastructure and unemployment in Nigeria over the period 2000-2024. The DOLS methodology, developed by Stock and Watson (1993), provides efficient and unbiased estimates of long-run cointegrating relationships by incorporating leads and lags of the first differences of regressors to correct for potential endogeneity and serial correlation problems inherent in standard OLS estimation of cointegrated systems.

Table 4. DOLS Estimates for Unemployment Rate, External Debt, Public Expenditure on Construction, and Public Expenditure in Transport & Communication in Nigeria (2000-2024)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXT_DEBT	3.216917	0.187551	17.15218	0.0371
LNPEXCON	19.27236	1.383279	13.93237	0.0456
LNPEXTC	-22.58319	1.718146	-13.14393	0.0483
C	-36.12174	1.918217	-18.83089	0.0338

Source: Researcher's computation (2026)

The Dynamic Ordinary Least Squares (DOLS) estimation results reveal significant long-run relationships between the explanatory variables and unemployment rate in Nigeria during the 2000-2024 period. The coefficient of external debt (LNEXT_DEBT) is 3.216917 with a t-statistic of 17.15218 and probability value of 0.0371, indicating a positive and statistically significant relationship at 5% level; this implies that a 1% increase in external debt leads to approximately 3.22 percentage point increase in unemployment rate.

The coefficient of public expenditure on construction (LNPEXCON) is 19.27236 with t-statistic of 13.93237 and p-value of 0.0456, demonstrating a counterintuitive positive and significant relationship whereby a 1% increase in construction expenditure is associated with approximately 19.27 percentage point increase in unemployment rate. Conversely, the coefficient of public expenditure on transport and communication (LNPEXTC) is -22.58319 with t-statistic of -13.14393 and p-value of 0.0483, indicating a negative and statistically significant relationship at 5% level; thus, a 1% increase in transport and communication expenditure reduces unemployment rate by approximately 22.58 percentage points.

Post-Estimation Diagnostic Tests

The post-estimation diagnostic tests confirm the robustness, reliability, and validity of the DOLS regression model. The goodness-of-fit statistics reveal exceptional explanatory power, with R-squared of 0.998947 and adjusted R-squared of 0.979985, indicating that approximately 98% of the variation in unemployment rate is explained by external debt, public expenditure on construction, and public expenditure on transport and communication, demonstrating a strong model fit. The standard error of regression (0.383737) and sum of squared residuals (0.147254) are relatively small, suggesting minimal deviation between actual and predicted values.

The Ramsey RESET test evaluates model specification and functional form adequacy. With an F-statistic of 0.470180 and probability value of 0.5008 (exceeding 5% significance level), the null hypothesis of correct model specification cannot be rejected, confirming that the model has no omitted variables or misspecification problems and that the functional form is appropriate (Ramsey, 1969). The Breusch-Godfrey Serial Correlation LM test examines whether residuals are serially correlated up to four lags. The F-statistic of 1.235361 with probability of 0.3437 and chi-square statistic of 6.334675 with

probability of 0.1755 both exceed the 5% significance threshold, leading to acceptance of the null hypothesis of no serial correlation. This confirms that the error terms are not autocorrelated, validating the independence assumption essential for reliable inference (Breusch, 1978; Godfrey, 1978).

The Heteroskedasticity test using the Breusch-Pagan-Godfrey approach tests for constant variance of error terms. The F-statistic of 1.800946 (p-value = 0.1664) and chi-square statistic of 7.964274 (p-value = 0.1582) both exceed 5% significance level, indicating acceptance of the null hypothesis of homoskedasticity. This confirms that residuals have constant variance across observations, satisfying a critical assumption for valid hypothesis testing and efficient parameter estimates (Breusch & Pagan, 1979). The Jarque-Bera normality test assesses whether residuals follow a normal distribution. With skewness of 0.654343 (slightly right-skewed but close to zero), kurtosis of 3.189277 (approximately mesokurtic and close to the normal distribution value of 3), Jarque-Bera statistic of 1.457069, and probability of 0.482616, the null hypothesis of normally distributed residuals cannot be rejected at 5% level. This confirms that error terms are approximately normally distributed, validating inference procedures and hypothesis tests (Jarque & Bera, 1980).

The CUSUM (Cumulative Sum of Recursive Residuals) test evaluates parameter stability over time. Since the CUSUM graph falls within the 5% significance bounds throughout the sample period, the model parameters are stable without structural breaks, confirming that the estimated relationships between variables remain consistent across the 2000-2024 period and that the model is reliable for policy inference (Brown et al., 1975). Collectively, these diagnostic tests confirm that the DOLS model satisfies all classical linear regression assumptions.

Discussion of Findings

The study examined the impact of external debt-financed infrastructure expenditure on unemployment rate in Nigeria from 2000 to 2024. Based on the findings, the following became evident in the course of this research:

External debt and unemployment indicate a positive and statistically significant relationship, suggesting that rising external debt burdens may constrain employment generation through debt overhang effects, fiscal crowding-out, or resource diversion to debt servicing rather than productive activities (Krugman, 1988; Reinhart & Rogoff, 2010).

Public expenditure on construction and unemployment indicate a positive and statistically significant relationshipThis unexpected finding may reflect capital-intensive construction methods, reliance on imported materials and foreign labor, project implementation inefficiencies, corruption, delayed completions, or the time lag between infrastructure investment and actual employment absorption (Babalola & Danladi, 2023; Ofori, 2023).

Public expenditure on transport and communication shows a negative and statistically significant relationship with unemployment in Nigeria. This substantial negative effect suggests that transport and communication infrastructure generates significant employment through improved market access, reduced transaction costs, enhanced connectivity, digital economy

opportunities, and robust multiplier effects across sectors (Cigu et al., 2022; Asongu& Odhiambo, 2023).

The constant term of -36.12174 is statistically significant (p-value = 0.0338), representing the baseline unemployment rate when all explanatory variables equal zero. Overall, the results suggest that while transport and communication expenditure effectively reduces unemployment, external debt and construction expenditure paradoxically increase unemployment in Nigeria, highlighting concerns about debt sustainability, project implementation quality, and the need for labor-intensive infrastructure approaches aligned with employment generation objectives.

CONCLUSIONS AND RECOMMENDATIONS

This study provides empirical evidence that debt-financed infrastructure investments yield differentiated employment outcomes in Nigeria, with transport and communication expenditure demonstrating superior job creation potential while construction expenditure paradoxically increases unemployment. The positive external debt-unemployment relationship underscores critical sustainability concerns, as Nigeria's debt service burden (96% of revenue in 2022) constrains rather than facilitates employment generation through fiscal pressures. The findings challenge conventional assumptions about infrastructure-led development, revealing that capital-intensive construction projects with poor governance generate limited employment despite substantial debt accumulation, while strategic investments in transport, communication, and digital infrastructure effectively reduce unemployment through productivity enhancement and economic integration.

Recommendations

1. Government should implement strict debt sustainability thresholds requiring cost-benefit analysis, employment impact assessment, and revenue generation evaluation for all external borrowing, targeting debt service-to-revenue ratio reduction from 96% to below 30%.
2. Government should mandate labor-intensive construction methods requiring minimum 70% local labor content, locally-sourced materials, andemployment-maximizing techniques in all public infrastructure projects. Authorities should also accelerate digital economy development by expanding digital infrastructure coupled with skills training, technology startup support, e-commerce facilitation, and remote work enablement leveraging Nigeria's youth demographic.
3. Policymakers should prioritize transport and communication infrastructure by reallocating budgets toward road networks, railways, ports, digital infrastructure, and broadband expansion that demonstrate superior employment effects.

FUTURE STUDY

This study examined the impact of debt-financed infrastructure expenditure on unemployment in Nigeria from 2000 to 2024 using Dynamic Ordinary Least Squares (DOLS) estimation. The Augmented Dickey-Fuller

(ADF) unit root tests confirmed all variables were integrated of order one I(1), while Johansen cointegration tests established long-run equilibrium relationships, validating the DOLS approach. The regression results revealed three critical findings:

1. First, external debt exhibited a positive and significant relationship with unemployment.
2. Second, public expenditure on construction demonstrated a counterintuitive positive and significant effect on unemployment.
3. Third, public expenditure on transport and communication showed a strong negative and significant relationship with unemployment.

REFERENCES

Abdulraheem, A., Onuk, E., & Adeshina, A. (2023). Youth unemployment and economic development in Nigeria. Journal of Economics and Development Studies, 11(2), 45-62.

Adegboye, A.C., Egharevba, M.I., &Edafe, J. (2024). External debt sustainability and unemployment dynamics in developing economies: Evidence from Nigeria. International Journal of Development Economics, 9(1), 112-128.

African Development Bank (2022). African Economic Outlook 2022. Abidjan: AfDB.

African Development Bank (2023). Jobs for Youth in Africa Strategy. Abidjan: AfDB.

Akanbi, O.A., & Schoeman, N.J. (2022). The impact of public expenditure on economic growth and poverty in Nigeria. South African Journal of Economics, 90(3), 412-431.

Akidi, V., Momodu, A. &Isoghom, W. (2024). Fiscal Deficit Financing and Unemployment Rate in Nigeria: An Empirical Investigation. www.iiardjournals.org

Asongu, S.A., & Odhiambo, N.M. (2023). ICT, financial sector development and employment in Africa. Telecommunications Policy, 47(2), 102478.

Atuma, E; Edeh, C; Agwu, R; Chukwuajah, M; Nkwagu, C; &Udude, C. (2024). Investigating the Relative Impact of Government Expenditure on Economic Growth in Nigeria. South East Journal of Political Science. Vol. 10. No. 1. 20.

Awogbenle, A.C., &Iwuamadi, K.C. (2021). Youth unemployment in Nigeria: Risk and way forward. American Journal of Human Ecology, 10(1), 13-19.

Babalola, S.J., & Danladi, J.D. (2023). Infrastructure investment and employment generation in Nigeria: Sectoral analysis. Journal of Infrastructure Development, 15(2), 89-107.

Banerjee, A., Duflo, E., & Qian, N. (2020). On the road: Access to transportation infrastructure and economic growth in China. Journal of Development Economics, 145, 102442.

Barro, R.J. (1990). Government spending in a simple model of endogenous growth. Journal of Political Economy, 98(5), S103-S125.

Blanchard, O., & Katz, L.F. (2022). What we know and do not know about the natural rate of unemployment. Journal of Economic Perspectives, 36(2), 141-166.

Calderón, C., &Servén, L. (2021). Infrastructure and economic development in Sub-Saharan Africa. Journal of African Economies, 30(Supplement 1), i3-i34.

Cigu, E., Agheorghiesei, D.T., Gavriluță, A.F., & Toader, E. (2022). Transport infrastructure development and economic growth. Sustainability, 14(11), 6467.

Debt Management Office (2025). Nigeria's Public Debt Stock as at December 2024. Abuja: www.dmo.gov.ng.

Démurger, S. (2021). Infrastructure and economic development: Evidence from China's regional data. Journal of Asian Economics, 76, 101378.

Dimnwobi, S., Nwokoye, E., Ekesiobi, C. &Igboanugo, C. (2017). Transportation Infrastructure And Diversification Of Nigeria's Economy: Implications for the Developmental State. Nigerian Journal of Economic and Social Studies. Vol. 59, No. 3

Dominic, I., Okoro, S. Idoko, E. (2024). Impact of Deficit Financing Sources on Unemployment inNigeria: A Dynamic Autoregressive approach. Journal Of Economic And Social Research (JESR) Vol. 10 No. I, 115

Edoumiekumo, S.G., Tomori, M.A., &Olomo, O.E. (2023). Digital infrastructure and employment in Nigeria's ICT sector. Technology in Society, 72, 102173.

Égert, B. (2020). Public infrastructure investment, economic growth and fiscal constraints. OECD Economics Department Working Papers, No. 1615.

Ekuma, M. T., Inyiama, O. I., &Okwo, I. M. (2024). Effect of Increasing Government Debt Profile on Economic Prosperity of Nigeria. EuropeanJournal of Accounting, Auditing and Finance Research, 12(3), 53-67.

Elekwa, P. &Onyenama, J. (2022). How Does Public Debt Affect Unemployment In Nigeria. Madonna Journal of Economics and Finance Volume 1, Number 1, 79

Enya F.O., Ezeali B.O. (2021), Public Investment in Infrastructure and Economic Growth in Nigeria (1980-2020). African Journal of Economics and Sustainable Development 4(3), 1-22. DOI: 10.52589/AJESD0JM1VBER.

Ibrahim, V. and Ameji, E. (2023). Government Expenditure and Infrastructural Development in Nigeria: An Empirical Analysis of its Economic Effects. 9(2):101-110. DOI: 10.58709/kiujss.v9i2.1630.

IMF (2024). Nigeria: Staff Report for the 2024 Article IV Consultation. Washington, DC: International Monetary Fund.

Iwuoha J. C.Rising Unemployment in Nigeria: Public Debt to the Rescue? Current Research Journal of Social Sciences and Humanities. 2020 3(2). Available from: https://bit.ly/35HqRJ6

Johansen, S., &Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration with applications to the demand for money. Oxford Bulletin of Economics and Statistics, 52(2), 169-210.

Kao, C., & Chiang, M.H. (2000). On the estimation and inference of a cointegrated regression in panel data. Advances in Econometrics, 15, 179-222.

National Bureau of Statistics (2023). Labour Force Statistics: Unemployment and Underemployment Report. Abuja: www.nbs.gov.ng

Ogunleye, O.O., & Adewuyi, A.O. (2024). Infrastructure investment and employment nexus in Nigeria: Does debt matter? African Development Review, 36(1), 78-95.

Okunlola, O.C., Masade, E.O., Lukman, R., & Ogunleye, O.O. (2022). External debt and economic growth in Nigeria: An empirical investigation. Cogent Economics & Finance, 10(1), 2125169.

Panizza, U., & Presbitero, A.F. (2023). Public debt and economic growth: Is there a causal effect? Journal of Macroeconomics, 77, 103542.

Pattillo, C., Poirson, H., & Ricci, L. (2021). What are the channels through which external debt affects growth? IMF Working Paper, WP/21/22.

Reinhart, C.M., & Rogoff, K.S. (2010). Growth in a time of debt. American Economic Review, 100(2), 573-578.

Shan, M., Chan, A.P., Le, Y., Xia, B., & Hu, Y. (2022). Measuring corruption in public construction projects in China. Journal of Professional Issues in Engineering Education and Practice, 148(2), 04021023.

Stock, J.H., & Watson, M.W. (1993). A simple estimator of cointegrating vectors in higher order integrated systems. Econometrica, 61(4), 783-820.

Udeh, S.N., Ugwu, J.I., & Onwuka, I.O. (2023). Public debt, infrastructure spending and unemployment in Nigeria: An ARDL approach. Journal of Economics and Sustainable Development, 14(2), 45-59.

World Bank (2023). Nigeria Development Update: Staying the Course. Washington, DC: World Bank Group.