

Infrastructure Financing, Institutional Quality, and Poverty in Nigeria

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ABSTRACT

This study investigated the baseline and interactive effects of infrastructure financing and institutional quality on poverty reduction in Nigeria. The study adopted an ex-post facto research design, utilizing secondary time-series data covering a twenty-six-year period (1999–2024). Data were analyzed using the Johansen Cointegration test and Ordinary Least Squares (OLS) multiple regression. The baseline OLS regression results (Model 1) revealed that public expenditure on infrastructure had a significant positive impact on per capita income ($\beta = 0.1056$, $t = 3.1803$, $p = 0.0043$), while unmoderated private investment was statistically insignificant ($\beta = 0.0103$, $t = 0.6154$, $p = 0.5446$), yielding an R^2 of 0.3465 and an F -statistic of 3.8887 ($p = 0.0226$). However, in the interactive model (Model 2) where financing was moderated by institutional quality, private investment demonstrated a highly significant positive impact on poverty alleviation ($\beta = 3.76E-07$, $t = 6.5553$, $p = 0.0000$), causing the explanatory power of the model to surge to an R^2 of 0.7800 and an F -statistic of 24.8197 ($p = 0.0000$). Conversely, public expenditure moderated by institutional quality lost its statistical significance ($\beta = 2.77E-06$, $t = 1.3057$, $p = 0.2058$), exposing a profound public spending paradox where government funds are neutralized by systemic inefficiencies. The study concluded that public capital expenditure is statistically inefficient at reducing poverty in the absence of strong governance, whereas institutionally protected private investment acts as a vital catalyst for wealth creation. Therefore, the study recommends the aggressive promotion of Public-Private Partnerships and the implementation of comprehensive anti-corruption reforms to maximize the macroeconomic impact of infrastructure investments.

Keywords: Infrastructure Financing, Institutional Quality, Poverty Reduction, Public Expenditure, Private Investment, Interactive Analysis.

INTRODUCTION

Background to the Study

The persistence of poverty and economic deprivation remains one of the most critical and complex challenges in the global development discourse, particularly within the context of sub-Saharan Africa. In recent years, the global economic environment has been characterized by severe macroeconomic shocks, widening economic disparities, and a profound stagnation in household consumption. The continuous surge in the economic misery index a composite macroeconomic indicator that aggregates inflation and unemployment rates signals an escalating level of economic hardship for individuals, families, and businesses alike. As articulated by Atapattu (2020), poverty in many developing nations has transcended transient economic downturns to become a deeply entrenched structural reality. This situation is further compounded by inflationary pressures that relentlessly erode the purchasing power of the citizenry and a rising tide of job insecurity that leaves millions vulnerable to absolute poverty. The global trend of worsening poverty is not merely a symptom of isolated fiscal failures; rather, it reflects a systemic inability to translate national wealth and economic growth into inclusive, pro-poor development.

In addressing this structural poverty, economic theorists and development practitioners have consistently identified infrastructure as the foundational backbone of any viable economic transformation. The availability of efficient transport logistics networks, reliable and expansive power grids, and advanced digital

telecommunication systems are non-negotiable prerequisites for sustained productivity and wealth creation. Timilsina et al. (2020) emphasize that poor infrastructure and inadequate access to essential public services serve as severe constraints on economic mobility, effectively trapping populations in a vicious cycle of deprivation. A pronounced infrastructure deficit acts as an implicit tax on the economy, exponentially raising the cost of doing business, deterring foreign and domestic investment, and limiting market access for small and medium-scale enterprises (SMEs) which are typically the largest employers of the poor. According to the "Supply-Leading Hypothesis," economic growth is heavily dependent on the prior establishment of robust infrastructure. Therefore, aggressive infrastructure financing is theoretically expected to catalyze economic expansion, reduce the misery index, and ultimately elevate the Gross Domestic Product per capita (GDPC) of the population (Wahyuningsih et al., 2020).

Within the Nigerian context, the nexus between infrastructure financing and poverty reduction presents a profound and troubling paradox. Nigeria is endowed with vast natural resources, particularly hydrocarbon revenues, and has historically directed substantial budgetary allocations toward capital expenditure and infrastructural development programs. Yet, despite these multi-billion Naira investments over the past two decades, these financial commitments have stubbornly failed to translate into a measurable, proportionate reduction in poverty. Recent macroeconomic data indicates that a significant percentage of the Nigerian population continues to languish below the poverty line, with GDPC growth either stagnating or being entirely wiped out by inflation. Wiratama et al. (2023) argue that infrastructure development programs in developing regions must be strategically targeted to be effective; otherwise, they manifest as prestige-driven, "urban-centric" mega-projects that fail to reach the grassroots or stimulate rural economies. This glaring disconnect heavily implies that the mere aggregate volume of infrastructure financing is not the sole determinant of poverty alleviation.

To systematically analyze this infrastructure-poverty dynamic, it is necessary to disaggregate infrastructure financing into its two primary macroeconomic components: Public Expenditure on Infrastructure (PEI) and Private Investment in Infrastructure (PII). Traditionally, the Nigerian government has been the dominant provider of infrastructure, relying on annual budgetary allocations and public debt. However, the systemic inefficiencies associated with public sector dominance have become increasingly apparent. Edo and Oigiangbe (2024) observe that government-led infrastructure spending often lacks the stringent accountability, competitive bidding, and profit-driven efficiency inherent in the private sector. Consequently, there has been a strategic pivot toward Private Investment in Infrastructure (PII) through mechanisms such as Public-Private Partnerships (PPPs). Sahni et al. (2021) and Sani and Yahaya (2021) highlight that private capital investments tend to have a more direct and significant impact on domestic business growth because they are usually directed toward economically viable, high-impact projects that demand strict operational efficiency.

However, neither public expenditure nor private investment operates within a vacuum. The critical, yet frequently overlooked, missing link in the infrastructure-poverty equation is Institutional Quality (INQ). Institutional quality encompasses the fundamental governance architecture of a nation, including the rule of law, government effectiveness, regulatory quality, and the strict control of corruption. It dictates the "absorptive capacity" of an economy the efficiency with which financial capital is converted into functional, physical public goods. Ukwueze et al. (2021) point out that in environments characterized by weak or compromised institutional frameworks, infrastructure projects are highly susceptible to bureaucratic leakages, political patronage, massive cost overruns, and outright abandonment. Therefore, evaluating infrastructure financing in isolation is analytically insufficient. Yakubu and Aladejare (2024) posit that institutional quality acts as a powerful moderating variable; it ultimately determines whether capital investments and external financing will trigger inclusive wealth creation or merely facilitate rent-seeking behaviors that exacerbate income inequality. Wu et al. (2024) further corroborate this by stating that multidimensional poverty can only be effectively dismantled when physical infrastructure investments are tightly paired with institutional reforms that guarantee inclusive growth.

Statement of the Problem

The central problem necessitating this research is the persistent, unresolved "Public Spending Paradox" characterizing the Nigerian economy. Despite the consistent formulation of National Development Plans and

the allocation of massive financial resources toward capital projects over the last twenty-five years, Nigeria's poverty metrics remain alarmingly high. Economic theory dictates that increased capital expenditure on infrastructure should organically stimulate aggregate demand, lower production costs, create employment, and subsequently increase the per capita income of the population. However, the empirical reality in Nigeria sharply contradicts this theoretical expectation, as the natural logarithm of Gross Domestic Product per capita (LOGGDPC) has failed to respond proportionately or sustainably to surges in public infrastructure financing.

This failure strongly suggests that public expenditure on infrastructure (PEI), while theoretically sound, is practically neutralized by deep-seated systemic inefficiencies. Studies by Funlayo et al. (2022) indicate that without the anchor of institutional integrity, public funds designated for poverty-alleviating infrastructure are frequently diverted or lost to corruption, rendering such expenditures statistically impotent in the fight against poverty. On the other hand, while private investment in infrastructure (PII) is increasingly championed as the optimal alternative, its autonomous effectiveness in an environment plagued by regulatory uncertainty and weak governance remains highly questionable. Private capital is inherently risk-averse; without strong institutional protection, it may either bypass the most impoverished demographics entirely or fail to deploy at the scale required to induce macroeconomic transformation.

Furthermore, a critical review of existing literature reveals a significant conceptual and empirical gap. The majority of prior studies have examined infrastructure financing and institutional quality as independent, isolated variables affecting economic growth. There is a conspicuous dearth of empirical research in the Nigerian context that specifically models and evaluates the *joint/interactive effect* of these variables on poverty. Without an interactive analysis that empirically tests how institutional quality moderates both public and private infrastructure spending, economic planners are left with a fragmented, incomplete diagnosis of why poverty alleviation strategies continually fail.

The fundamental problem, therefore, is determining whether Nigeria's inability to eradicate poverty stems merely from a deficit of infrastructure financing, or from a critical deficit in institutional quality that renders available financing ineffective. By investigating the baseline effects of financing and then explicitly modeling the interactive moderation of governance, this study seeks to provide a definitive econometric resolution to this enduring economic paradox.

Objectives of the Study

The main objective of this study is to assess the specific effects of infrastructure financing and institutional quality on poverty reduction in Nigeria. Based on the identified gaps in the literature, the specific objectives are to:

1. Examine the baseline effect of infrastructure financing (Public Expenditure and Private Investment) on poverty in Nigeria.
2. Evaluate the joint (interactive) effect of infrastructure financing and institutional quality on poverty in Nigeria.

Research Hypotheses

To empirically achieve the stated objectives, the following null hypotheses (H_0) were formulated and tested:

H_{01} : Infrastructure financing has no significant effect on poverty reduction in Nigeria.

H_{02} : There is no significant joint effect of infrastructure financing and institutional quality on poverty reduction in Nigeria.

LITERATURE REVIEW

Theoretical Framework: The Trickle-Down Effect Theory

This study is theoretically anchored on the Trickle-Down Effect Theory, a foundational macroeconomic

paradigm highly relevant for understanding the complex dynamics between infrastructure financing, institutional quality, and poverty alleviation in Nigeria. Originating from supply-side economic thought, the theory fundamentally posits that economic benefits generated through large-scale capital investments, corporate incentives, and elite wealth accumulation will eventually and organically "trickle down" to the broader society, including the most economically disadvantaged demographics. Within the specific context of infrastructure financing, the theory implies that massive, concentrated capital injections into public infrastructure such as transportation logistics, national energy grids, and telecommunication networks act as the primary engines of macroeconomic expansion. Whether funded through public expenditure, aggressively pursued private sector investments (such as Public-Private Partnerships), or sovereign debt financing, these foundational projects are theoretically expected to stimulate a chain reaction of economic prosperity.

The theory assumes that enhanced physical infrastructure exponentially reduces the aggregate cost of doing business, attracts foreign direct investment, and increases industrial productivity. Consequently, the wealth generated at the macroeconomic level diffuses downward by creating millions of direct and indirect employment opportunities, boosting household consumption, and ultimately elevating the per capita income of the poorest citizens. However, the critical boundary condition of the Trickle-Down Effect Theory and its specific relevance to this study lies in the structural environment where this wealth is generated. Critics of the theory, and the empirical realities of developing nations, argue that the expected downward diffusion of wealth frequently fails to materialize in environments characterized by weak governance and systemic corruption. In Nigeria, the theoretical trickle-down mechanism is often blocked by a "leaky bucket" of poor institutional quality. When public procurement is compromised and private investments lack regulatory protection, the wealth generated by infrastructure financing remains concentrated at the top, exacerbating income inequality rather than eradicating poverty. Therefore, this theoretical framework perfectly anchors the study's central premise: while infrastructure financing is the theoretical catalyst for wealth creation, it is the strict moderation of Institutional Quality that guarantees the wealth actually trickles down to achieve measurable, grassroots poverty reduction.

Empirical Review of Related Studies

Fagbemi et al. (2022) investigated the relationship between infrastructure development and poverty reduction in Nigeria over a period from 1996 to 2019. Methodologically, the study adopted the Autoregressive Distributed Lag (ARDL) bounds testing approach alongside the Granger causality test to explore the long-term macroeconomic links between capital investments and social welfare. The empirical findings established that infrastructure development has a highly significant, positive impact on poverty reduction, with a bidirectional causal relationship strictly observed in the long run. The study concluded that aggressive infrastructure investment improves public sector performance and efficiently allocates resources to the poor. However, a critical gap in this study is its failure to empirically model the specific moderating role of institutional quality. It assumes infrastructure functions in a vacuum, ignoring how systemic corruption might neutralize these investments before they reach the impoverished demographic.

Funlayo et al. (2022) examined the simultaneous impact of physical infrastructure and institutional quality on economic growth across ECOWAS countries from 2006 to 2020. Utilizing the Generalized Method of Moments (GMM) estimation technique to control for endogeneity among macroeconomic variables, the study revealed a negative relationship between unmoderated physical infrastructure and economic growth. Conversely, government effectiveness acting as a proxy for institutional quality was found to positively and significantly impact regional growth. The study highlighted that weak institutional quality actively undermines the effectiveness of infrastructure investments across the region. While this study brilliantly captures the institutional bottleneck, a notable literature gap exists: it strictly focuses on aggregate economic growth rather than specific poverty indices. The dynamic relationship between infrastructure financing, institutional frameworks, and direct poverty alleviation remains underexamined in their specified model.

Ojeka et al. (2024) explored the critical moderating effect of institutional quality on the relationship between external debt financing and domestic investment in sub-Saharan Africa. The researchers utilized panel data spanning 47 countries between 1996 and 2021, employing conventional and robust econometric estimation techniques. The findings demonstrated that external debt inherently exercises a negative effect on domestic

investment; however, institutional quality acts as a powerful moderating variable that neutralizes this adverse effect. The authors concluded that high institutional quality once a specific threshold is surpassed enables nations to utilize external debt effectively to promote infrastructure investment. While highly informative regarding debt mechanics, the study presents a gap by not directly addressing how this mitigated investment environment translates into actual poverty reduction, leaving the specific infrastructure-poverty nexus in sub-Saharan Africa unaddressed.

Ofino (2023) investigated the interactive effects of institutional quality and human capital development on aggregate poverty levels in Nigeria, covering the period from 1981 to 2020. Methodologically, the study applied the ARDL bounds testing method to analyze components such as education and recurrent health expenditure against governance metrics. The empirical results revealed that institutional quality shares a positive, significant relationship with poverty levels in both the short and long run. The study concluded that while human capital development possesses the innate potential to drastically reduce poverty, these positive effects are severely stunted by weak institutional frameworks in Nigeria. A primary gap in this research is its narrow definition of capital development; it heavily limits its focus to health and education, entirely omitting physical infrastructure financing, which is structurally paramount for economic wealth creation.

Yakubu and Aladejare (2024) assessed the complex macroeconomic impact of economic growth, external debt financing, and institutional quality on poverty and income inequality in Nigeria from 1990 to 2022. Employing the ARDL econometric approach, the findings revealed that mere economic growth does not significantly reduce poverty and actually increases income inequality in the short run. Furthermore, external debt was found to exacerbate poverty in the long run, whereas government effectiveness significantly impacted poverty reduction. The study recommended urgent policy interventions focusing on social infrastructure and financial inclusion. Despite these robust findings, a noticeable gap exists: the study fails to explicitly integrate the interactive, moderating role of institutional quality specifically on infrastructure financing models (public vs. private), which is necessary for a deeper understanding of Nigeria's wealth distribution mechanics.

Sani and Yahaya (2021) investigated the specific role of institutional quality in mediating the relationship between public debt financing and the incidence of poverty in Sub-Saharan Africa from 2011 to 2019. Using the rigorous Generalized Method of Moments (GMM) approach to handle dynamic panel biases, the empirical results proved that unmitigated public debt accumulation systematically worsens poverty levels. However, the study heavily emphasized that improving institutional quality acts as a powerful corrective force, actively mitigating and reversing the adverse relationship between national debt and poverty. The researchers strongly underscored the necessity of governance reforms. A critical gap, however, is that the study evaluates debt in isolation and does not address how this dynamic plays out when the debt is specifically channeled into physical infrastructure development to alleviate poverty.

Olanrewaju et al. (2020) investigated the underlying relationship between institutional quality and inclusive economic growth in Nigeria spanning the years 1998 to 2017. Utilizing the Autoregressive Distributed Lag (ARDL) bounds testing methodology, the study concluded that institutional quality exercises a highly significant, positive impact on inclusive growth, which was measured by the real GDP per person employed. The authors highlighted that elevating institutional quality beyond its current historic threshold is an absolute necessity to successfully harness human capital. While the study effectively advocates for labor-intensive development strategies to integrate poor households into the economy, it leaves a distinct conceptual gap. It does not explicitly link institutional quality or inclusive growth directly to physical infrastructure financing, leaving the mechanical pathways of how inclusive growth translates into measurable poverty reduction largely unexplained.

Appiah-Otoo et al. (2022) analyzed the crucial moderating role of institutional quality within the finance-poverty nexus in West Africa, utilizing a comprehensive dataset from 16 countries spanning 2002 to 2019. The econometric analysis established that broad financial development specifically domestic credit expansion and money supply naturally functions to reduce poverty. However, the core finding revealed that weak institutional quality severely diminishes, and often neutralizes, the positive effects of finance on poverty reduction. The researchers concluded that structural improvements in institutional quality are required to boost the effectiveness of financial systems. Despite this, a major gap remains in the literature: the study strictly focuses

on generalized financial development and does not evaluate the specific interaction between targeted physical infrastructure financing (public and private) and institutional quality in the fight against regional poverty.

Nadabo (2023) examined the dynamic relationship between foundational infrastructure development and manufacturing sector performance in Nigeria, with a specific focus on the moderating role of institutional quality between 2002 and 2021. Employing the ARDL econometric model, the findings confirmed that while infrastructure development inherently exerts a positive effect on manufacturing performance, the prevailing low institutional quality actively and negatively impacts this relationship in both the short and long run. The study concluded that enhancing governance is an absolute prerequisite to unlocking the industrial benefits of infrastructure. However, a significant gap is apparent: the study strictly limits its dependent variable to manufacturing output. It does not explore how this moderated industrial growth subsequently flows downward to influence household consumption, unemployment, and aggregate poverty reduction in the Nigerian economy.

Kouadio and Gakpa (2022) examined the complex interplay between economic growth, institutional quality, and poverty reduction across West Africa. Utilizing a robust combination of World Development Indicators, the International Country Risk Guide, and the Standardized World Income Inequality Database, the researchers deployed advanced econometric analysis to investigate long-term governance effects. The empirical results indicated that while baseline economic growth is a necessary precondition, it is the overall improvement in institutional quality specifically strengthening judicial systems, combating corruption, and enhancing bureaucratic efficiency that significantly drives down both poverty and inequality. Despite these highly relevant findings, the study overlooks a critical macroeconomic variable: it fails to integrate infrastructure financing into the equation. This creates a gap, particularly for Nigeria, where severe infrastructure deficits represent the primary structural barrier to poverty alleviation.

Ajide et al. (2022) explored the vital role of institutional infrastructures in mediating the nexus between financial inclusion and economic growth in Sub-Saharan Africa (SSA). Employing the System Generalized Method of Moments (GMM) on a panel dataset of 20 SSA nations, the empirical results revealed that physical access to financial tools (like ATMs) positively stimulates economic growth. Crucially, the study emphasized that macroeconomic governance indicators encompassing both political and economic governance are essential for improving credit access for marginalized, low-income populations. The authors identified that imperfections in financial markets disproportionately impoverish the vulnerable. A conceptual gap exists, however, as the study concentrates strictly on micro-financial inclusion. It largely ignores the macro-level dynamics of large-scale infrastructure financing and how institutional quality dictates the success of these massive public investments in reducing poverty.

Suhaibu et al. (2022) assessed the overarching impact of institutional quality on the standard of living across 20 Sub-Saharan African countries. Utilizing panel data from 2000 to 2019, the researchers employed a Vector Auto-regressive (VAR) framework to trace the complex, indirect effects of governance on societal welfare. The findings revealed a fascinating dynamic: institutional quality does not directly or autonomously influence living standards. Instead, it operates indirectly by enhancing financial development, which subsequently functions to improve the standard of living. The study heavily underscored the necessity of reforming financial institutions to elevate citizen welfare. While offering valuable structural insights, the research presents a gap by completely bypassing the direct, tangible impact of physical infrastructure financing on poverty reduction, an area of absolute critical importance for Nigeria's immediate developmental trajectory.

Adegbeye et al. (2020) examined exactly how institutional quality influences foreign direct investment (FDI) inflows and subsequent economic development across Sub-Saharan Africa. Utilizing pooled panel data from 30 SSA countries covering the period from 2000 to 2018, the authors employed both fixed and random effects regression models. The empirical findings demonstrated that institutional quality is a highly significant determinant of FDI inflows, which in turn acts as a primary driver of economic development. Conversely, the study noted that weak institutional quality leads directly to the underutilization of domestic resources, severely hampering growth. While the study effectively highlights the critical role of institutions in attracting foreign capital, it presents a gap by failing to address how this capital is specifically deployed into infrastructure financing to actively interact with and reduce poverty.

Ajide et al. (2023) analyzed the precise impact of electricity infrastructure access and institutional frameworks on aggregate health outcomes across Africa. Utilizing the System Generalized Method of Moments (GMM) on data from 45 African countries spanning 2001 to 2018, the study found that poor electricity access drastically worsens health metrics. Furthermore, the empirical results showed that high institutional quality positively influences life expectancy while significantly reducing infant mortality. The authors concluded that dysfunctional, corrupt institutions actively exacerbate the adverse socio-economic effects of poor infrastructure, particularly within congested urban areas. Despite highlighting the devastating consequences of institutional failure, the study focuses strictly on health outcomes. It presents a gap by not exploring the broader macroeconomic relationship between public/private infrastructure financing, institutional quality, and aggregate income-based poverty metrics in Nigeria.

Kouton et al. (2023) explored the pivotal role of institutional quality in determining risk allocation within energy infrastructure Public-Private Partnerships (PPPs) across Africa. The researchers conducted a rigorous analysis of 396 distinct energy infrastructure PPP projects spanning 35 African countries between 1990 and 2019. The empirical findings clearly established that strong governance indicators specifically political stability and the strict control of corruption positively and significantly influence the willingness to allocate project risks to the private sector. The study heavily highlighted that institutional quality is absolutely essential for the successful, sustainable implementation of private infrastructure financing. However, a critical gap remains: the research strictly evaluates the contractual and financial success of the PPP projects, completely failing to address how these completed projects subsequently contribute to measurable, grassroots poverty reduction across the continent.

METHODOLOGY

Research Design and Data Source

This study adopted an *ex-post facto* research design. This design is highly appropriate for macroeconomic studies where the independent variables have already occurred and cannot be manipulated by the researcher. The study utilized a time-series dataset covering a twenty-six-year period from 1999 to 2024. The secondary data were meticulously sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and the World Bank's World Development Indicators (WDI) databases.

Operationalization of Variables

To capture the specific macroeconomic dynamics of the Nigerian economy, the dependent variable, Poverty, was proxied by the natural logarithm of Gross Domestic Product per Capita (LOGGDPC). The core independent variable, Infrastructure Financing, was disaggregated into Private Investment in Infrastructure (PII) and the natural logarithm of Public Expenditure on Infrastructure (LOGPEI). Institutional Quality (INQ), which serves as the critical moderating variable, was proxied using the Corruption Perception Index. Finally, the Unemployment Rate (UNEMP) was incorporated as a macroeconomic control variable to ensure structural robustness and prevent omitted variable bias.

Model Specification

The study assessed the nexus between infrastructure financing, institutional quality, and poverty in Nigeria. The relationships are specified in two functional econometric models to address the study's specific objectives:

Model 1: Baseline Effect of Infrastructure Financing on Poverty

This model examines the autonomous effect of public and private infrastructure financing on poverty levels.

$$\text{LOGGDPC}_t = \alpha_0 + \alpha_1\text{PII} + \alpha_2\text{LOGPEI} + \alpha_3\text{UNEMP} + \varepsilon_t$$

Model 2: Joint Effect of Infrastructure Financing and Institutional Quality

This model introduces Institutional Quality as a moderating variable to evaluate the interactive effect.

$$\text{LOGGDPC}_t = \beta_0 + \beta_1\text{PII}*\text{INSQ} + \beta_2\text{LOGPEI}*\text{INSQ} + \beta_3\text{UNEMP} + u_t$$

Where:

LOGGDPC = Natural logarithm of Gross Domestic Product per Capita

LOGPEI = Natural logarithm of Public Expenditure on Infrastructure

PII = Private Investment in Infrastructure

INQ = Institutional Quality

UNEMP = Unemployment Rate

α_0, β_0 = Intercepts (Constants)

$\alpha_{1-3}, \beta_{1-3}$ = Regression Coefficients

ϵ_t, u_t = Stochastic Error Terms

Estimation Techniques

The empirical analysis was conducted using EViews12. Preliminary diagnostics included descriptive statistics to ascertain the distributional properties of the data and a Pearson Correlation Matrix to detect preliminary associations and potential multicollinearity. The Augmented Dickey-Fuller (ADF) unit root test was employed to verify the stationarity properties of the variables and determine their order of integration. Upon confirming a mixed order of integration, the Johansen Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue) was conducted to determine the existence of a long-run equilibrium relationship among the variables.

Finally, the Ordinary Least Squares (OLS) multiple regression technique was utilized to estimate the parameters for both the baseline and interactive models. To ensure that the estimators remained Best Linear Unbiased Estimators (BLUE) and to validate the models for sound policy inference, rigorous post-estimation diagnostics were conducted. These included the Variance Inflation Factor (VIF) for multicollinearity, the Breusch-Godfrey LM Test for serial correlation, the Breusch-Pagan-Godfrey Test for heteroskedasticity, the Jarque-Bera Test for normality, and the Cumulative Sum of Recursive Residuals (CUSUM) test to confirm long-run parameter stability.

RESULTS AND DISCUSSION

Descriptive Statistics and Correlation Analysis

Prior to estimating the regression models, a preliminary analysis was conducted to ascertain the distributional properties and linear associations among the variables. As presented in Table 1, the natural logarithm of Gross Domestic Product per Capita (LOGGDPC) recorded a mean of 2.8797 with a low standard deviation of 0.1709, indicating relatively stagnant per capita income growth over the 26-year review period. The interacted independent variables, *PII*INQ* and *PEI*INQ*, exhibit significant standard deviations, reflecting the high volatility of capital inflows when subjected to Nigeria's fluctuating institutional and political climate.

Table 1: Descriptive Statistics and Pearson Correlation Matrix

Variables	Mean	Std. Dev.	LOGGDPC	PII*INQ	PEI*INQ	UNEMP
LOGGDPC	2.8797	0.1709	1.0000			
PII*INQ	1,585,388	944,090	-0.7795	1.0000		
PEI*INQ	28,195.60	25,874	-0.4935	0.4626	1.0000	
UNEMP	4.0952	0.6548	-0.2640	0.1106	0.1994	1.0000

Source: Author’s Computation via EViews 12 (2026).

The correlation matrix in Table 1 serves as an indispensable baseline diagnostic tool. It reveals a highly pronounced negative correlation (-0.7795) between the institutionally moderated private investment (PIINQ) and the poverty proxy, indicating a strong preliminary inverse relationship prior to executing full multivariate controls. Crucially, the matrix confirms the absence of severe multicollinearity, as the highest inter-variable correlation (0.4626 between PIINQ and PEI*INQ) is strictly below the dangerous 0.80 threshold.

Pre-Estimation and Post-Estimation Diagnostics

To prevent spurious regression estimates, the Augmented Dickey-Fuller (ADF) unit root test was conducted, revealing a fractional integration matrix of I(0) and I(1) variables. Consequently, the Johansen Unrestricted Cointegration Rank Test was applied, which confirmed the presence of exactly one (1) cointegrating equation at the 0.05 significance level. This established a stable, long-run equilibrium relationship among infrastructure financing, governance, and poverty metrics. Rigorous post-estimation diagnostics confirmed that the Ordinary Least Squares (OLS) estimators remained Best Linear Unbiased Estimators (BLUE). The Variance Inflation Factor (VIF) values (maximum 1.8171) confirmed the absence of multicollinearity, while the Breusch-Godfrey LM test (p = 0.0871) and Breusch-Pagan-Godfrey test (p = 0.4522) confirmed that the models were free from serial correlation and heteroskedasticity.

Presentation of Regression Results

To address the core objectives of the study, the empirical results of the baseline model (Model 1) and the interactive model (Model 2) are presented comparatively in Table 2. Model 1 examines the autonomous impact of infrastructure financing on poverty, while Model 2 evaluates the joint effect when the financing variables are mathematically moderated by Institutional Quality (INQ).

Table 2: Ordinary Least Squares (OLS) Multiple Regression Results

Variables	Model 1: Baseline Effect	Model 2: Interactive Effect
Dependent Variable	LOGGDPC	LOGGDPC*INQ
Constant (C)	2.1843 (p = 0.0000)*	7.5846 (p = 0.0000)*
PII	0.0103 (p = 0.5446)	-
LOGPEI	0.1056 (p = 0.0043)*	-
PII*INQ	-	3.76E-07 (p = 0.0000)*
PEI*INQ	-	2.77E-06 (p = 0.2058)
UNEMP	0.0051 (p = 0.9155)	0.1326 (p = 0.0910)
R-squared	0.3465	0.7800
Adjusted R-squared	0.2574	0.7485
F-statistic	3.8887	24.8197
Prob (F-statistic)	0.0226*	0.0000*

Note: (*) indicates statistical significance at the 5% level (p < 0.05).

Source: Author’s Computation via EViews 12 (2026).

DISCUSSION OF FINDINGS

The Baseline Dynamics of Infrastructure Financing

The empirical results from Model 1 reveal that public expenditure on infrastructure (LOGPEI) exerts a positive and highly statistically significant influence on per capita income ($\beta = 0.1056$, p = 0.0043). This finding indicates that autonomous government capital spending on critical physical structures directly translates into economic expansion, providing robust quantitative validation for the Big Push Theory. This aligns with the

empirical submissions of Fagbemi et al. (2022), who posited that targeted public investments lower aggregate business costs. Conversely, unmoderated Private Investment in Infrastructure (PII) recorded a statistically insignificant effect ($p = 0.5446$), suggesting that in isolation, private infrastructure funding in Nigeria is heavily concentrated in commercialized projects with restrictive user fees, thereby limiting trickledown benefits to the rural poor.

The Interactive Effect of Institutional Quality (The Public Spending Paradox)

The introduction of Institutional Quality (INQ) as a moderating variable in Model 2 radically alters the macroeconomic narrative, drastically improving the explanatory power of the model from 34.65% to an exceptional 78.00% ($R^2 = 0.7800$). The most groundbreaking finding is the highly significant, positive impact of Private Investment moderated by Institutional Quality (PII*INQ) on the poverty proxy ($p = 0.0000$). This econometrically establishes that private sector capital, when operating under the protection of effective governance and stringent regulatory frameworks, serves as an aggressive and highly efficient catalyst for wealth creation. This corroborates the assertions of Sani and Yahaya (2021), who argued that institutional integrity unlocks the latent capacity of private capital to stimulate inclusive growth.

However, the model reveals a profound "Public Spending Paradox." When moderated by Institutional Quality, Public Expenditure on Infrastructure (PEI*INQ) loses its statistical significance ($p = 0.2058$). This paradox implies that even when accounting for governance indicators, public capital spending struggles to efficiently execute structural improvements in per capita income compared to private capital. This finding challenges traditional Keynesian assumptions, heavily supporting the conclusions of Funlayo et al. (2022) and Edo and Oigiangbe (2024), indicating that deep-seated systemic inefficiencies, bureaucratic bottlenecks, and political patronage in public procurement persistently dilute the impact of public funds.

Limitations of the Study

This study acknowledges certain limitations. First, reliance on secondary macroeconomic data may involve minor reporting lags. Second, data constraints necessitated utilizing Gross Domestic Product per Capita (LOGGDPC) as a poverty proxy; while reliable for aggregate welfare, it omits non-income dimensions like healthcare and education. Finally, Institutional Quality was measured solely using the Corruption Perception Index, whereas future research could adopt a composite governance index. Despite these data constraints, the econometric models remain structurally sound, and the core findings are highly robust for policy inference.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study set out to empirically resolve the persistent macroeconomic paradox surrounding infrastructure financing and poverty alleviation in Nigeria. By disaggregating capital investments and explicitly modeling the moderating role of governance, the study provides a definitive explanation for why decades of massive budgetary allocations have failed to sustainably eradicate poverty. The baseline empirical evidence confirms that while public capital expenditure theoretically drives economic expansion, evaluating infrastructure financing strictly in isolation presents a dangerously incomplete picture.

The overarching conclusion of this study is that infrastructure financing is not merely a function of financial volume, but critically, a function of institutional "absorptive capacity." The interactive model definitively established that Private Investment in Infrastructure, when strictly moderated and protected by Institutional Quality, is an aggressive, highly significant catalyst for wealth creation and poverty reduction. Conversely, the study concludes that a profound "Public Spending Paradox" exists within the Nigerian economy: public expenditure fundamentally loses its statistical power to alleviate poverty even when weighed against governance indicators. This implies that the sheer magnitude of government spending is inherently neutralized by deep-seated systemic inefficiencies and bureaucratic leakages. Ultimately, to successfully eradicate poverty, Nigeria must pivot from relying solely on state-sponsored mega-projects and explicitly integrate institutional integrity with aggressive, private-sector-led infrastructure funding.

RECOMMENDATIONS

Based on the empirical findings and the conclusions drawn, the following policy recommendations are specifically prescribed for economic planners and policymakers in Nigeria:

1. **Aggressive Promotion of Public-Private Partnerships (PPPs):** Given the highly significant impact of institutionally moderated private investment on poverty reduction, the Nigerian government must aggressively incentivize private sector participation in foundational infrastructure. Policymakers should transition from government-monopolized procurement to expanded PPPs, offering targeted tax holidays and de-risking long-term civil engineering projects. Private capital should be deliberately directed toward high-impact, pro-poor sectors like rural electrification and agricultural transport logistics.
2. **Comprehensive Institutional and Anti-Corruption Reforms:** The finding that public expenditure loses its poverty-alleviating efficacy highlights a critical governance deficit. To maximize the return on public capital investments, the government must drastically overhaul its procurement and contracting architecture. Implementing strict, transparent e-procurement systems and empowering independent anti-graft agencies will block bureaucratic leakages, ensuring that budgeted funds translate directly into physical assets rather than rent-seeking activities.
3. **Strategic Reallocation of Public Capital Expenditure:** The government must intentionally redirect public infrastructure budgets away from prestige, urban-centric mega-projects that offer minimal trickledown benefits. Instead, public expenditure should be strictly targeted at foundational, grassroots infrastructure such as rural feeder roads and primary healthcare facilities that directly stimulate local economies, lower the cost of doing business for SMEs, and have an immediate, measurable impact on the per capita income of the poorest demographic.

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