
Private Sector Financing of Public Infrastructure and Social Welfare: A Comparative Analysis of Poverty and Unemployment in Nigeria and South Africa

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Abstract

This study investigated the effect of private sector financing of public infrastructure on social welfare in Nigeria and South Africa. The main objective was to examine the impact of private infrastructure investments on poverty reduction and unemployment. Specifically, the study analyzed the trends of infrastructural financing; determined the effect of private investments in transportation, electricity, technology, and education on the poverty index; and assessed the impact of these sector-specific investments on the unemployment rate.

The study adopted an ex-post facto research design. Time-series data covering a twenty-year period from 2005 to 2024 were sourced from the African Infrastructure Development Index and the World Bank's World Development Indicators. Data were analyzed using descriptive statistics, Augmented Dickey-Fuller unit root tests, Johansen Cointegration tests, and Multiple Ordinary Least Squares (OLS) regression. All hypotheses were tested at the 0.05 level of significance.

Results from the multiple regression analysis showed that in the Nigerian poverty model, private investment in transportation had a highly significant negative impact on the poverty index ($\beta = -8.8018$, $p = 0.0021$), while electricity financing remained statistically insignificant ($\beta = -1.8301$, $p = 0.5198$). The model yielded an $R^2 = 0.6044$. In the South African unemployment model, educational infrastructure financing had a significant positive impact on the unemployment rate ($\beta = 0.3583$, $p = 0.0006$), indicating a paradoxical short-term exacerbation of joblessness ($R^2 = 0.8862$). Furthermore, Johansen cointegration tests established significant long-run equilibrium

relationships among the infrastructural variables and social welfare indicators across both nations.

The study concluded that private investment in transport and technology infrastructure serves as a potent tool for poverty alleviation in Nigeria, whereas capital-intensive infrastructural expansion in South Africa paradoxically exacerbates unemployment due to structural labor rigidities. Recommendations include mandating local content utilization within private concession agreements to absorb local labor, enforcing pro-poor tariff structuring to prevent service commodification, and aligning educational curricula to mitigate the skills mismatch induced by technological advancements.

Keywords: Poverty index, Private investment in education, Private investment in electricity, Private investment in transportation, Social welfare, Unemployment

1. Introduction

Sustainable economic development is fundamentally tethered to the availability of robust physical infrastructure (Brueckner, 2021). Across emerging markets, critical facilities such as transportation networks, electricity grids, and technological frameworks serve as primary conduits for social welfare. They alleviate poverty and generate employment by lowering operational frictions and integrating marginalized populations into the formal economy (Du et al., 2022; Rehman et al., 2023). However, the African Development Bank (2021) estimates an annual infrastructure financing gap of over \$100 billion across the continent. To bridge this deficit, governments are shifting away from traditional state-funded models, increasingly mobilizing private capital to achieve inclusive socioeconomic development.

1.1 Statement of the Problem

Eradicating poverty and reducing structural unemployment remain defining challenges for sub-Saharan African economies (World Bank, 2023). Historically, infrastructure provision was the exclusive purview of the public sector. Today, however, constrained fiscal revenues and escalating sovereign debt have rendered public funding inadequate, resulting in massive infrastructural deficits (Ozili, 2022). Consequently, nations like Nigeria and South Africa have increasingly turned to the private sector through Public-Private Partnerships (PPPs) and concession agreements (Madugba et al., 2022).

Despite this influx of private capital, the anticipated social dividends have not materialized uniformly; multidimensional poverty and systemic joblessness persist (Moneme et al., 2024). The core problem is the structural disconnect between financial investments in physical assets and the socioeconomic welfare of the populace. Because private infrastructure financing is inherently profit-driven (Njiru et al., 2020), it remains empirically unclear whether these capital-intensive investments effectively integrate labor-absorptive practices or generate the necessary economic linkages to pull vulnerable populations out of poverty and create sustainable domestic employment (Ifoghere & Olele, 2024).

1.2 Significance of the Study

Investigating the social impact of private infrastructure financing is critical for recalibrating developmental policies in emerging markets. Infrastructure is not merely a macroeconomic growth driver; it is the fundamental conduit for human capital development and social mobility. When private investments fail to alleviate poverty or stimulate job creation, they risk deepening spatial inequalities and socio-economic exclusion. This study provides empirical clarity on which specific sectors of infrastructural investment (such as transportation versus electricity) yield the most potent welfare benefits. By isolating poverty and unemployment as the focal variables, the findings offer targeted, actionable intelligence for policymakers, development finance institutions, and private investors aiming to align infrastructure portfolios with the United Nations' Sustainable Development Goals (specifically SDGs 1, 8, and 9).

1.3 Review of Related Literature

Njiru et al. (2020) evaluated the operational efficiency and socio-economic impact of Public-Private Partnerships (PPPs) in delivering infrastructure projects across the African continent. Their comparative analysis highlighted that while PPPs successfully mobilize critical funding and introduce technical expertise, they frequently struggle to align commercial viability with social welfare objectives. The study found that private concessionaires naturally gravitate toward capital-intensive projects that guarantee high returns, often neglecting labor-intensive designs that could absorb unemployed youth. The researchers recommended that host governments aggressively negotiate concession agreements to incorporate explicit job-creation targets, thereby harmonizing investor profitability with national developmental goals.

Brueckner (2021) conducted a macroeconomic assessment of how broad-based infrastructure development influences aggregate economic output and societal welfare. Utilizing dynamic modeling frameworks, the research established that physical capital accumulation is a foundational prerequisite for sustained economic progress. The findings indicated that high-quality infrastructure directly enhances industrial productivity by lowering operational frictions, which theoretically cascades into increased corporate hiring and wage growth. However, the study acknowledged that the transmission mechanism between infrastructural development and individual poverty reduction is often nonlinear and heavily dependent on the surrounding institutional environment, requiring robust governance to ensure wealth distribution reaches the lower socio-economic strata.

Abaidoo and Agyapong (2022) explored the complex interplay between financial development, institutional quality, and economic progress within sub-Saharan Africa. Their investigation revealed that the socio-economic benefits derived from private infrastructure investments are heavily contingent upon the strength of national regulatory frameworks. The researchers found that in environments characterized by weak rule of law and high institutional fragility, the developmental dividends of private financing are often captured by corporate elites rather than distributed as public welfare. They concluded that strengthening institutional capacity is a

mandatory prerequisite for ensuring that infrastructural expansion effectively translates into reduced poverty and expanded employment opportunities.

Du et al. (2022) examined the macroeconomic transmission channels through which infrastructure investments impact aggregate output and societal productivity levels. Their comprehensive panel data study revealed that systematic improvements in public facilities generate significant positive externalities that stimulate secondary and tertiary economic sectors. The authors noted that when private capital effectively resolves logistical bottlenecks, small and medium-sized enterprises experience accelerated growth, which serves as a vital engine for community-level employment generation. Nevertheless, the study cautioned that poorly targeted investments lacking integration with broader industrial policies fail to generate the necessary multiplier effects required to substantially reduce endemic poverty.

Madugba et al. (2022) scrutinized the inherent governance challenges associated with Public-Private Partnerships in driving infrastructural development within Nigeria. Their research identified that despite the influx of private capital, expected social welfare improvements remain severely compromised by institutional inefficiencies, bureaucratic bottlenecks, and pervasive corruption. The authors documented how opaque contracting processes and misaligned regulatory frameworks frequently result in abandoned projects or inflated tolling structures that burden the end-user. The study concluded that without deep-rooted institutional reforms promoting transparency and accountability, private sector financing will consistently fail to translate into meaningful poverty alleviation or sustainable employment generation.

Ojo and Ojo (2022) critically analyzed the impact of corruption and institutional weakness on the delivery of public infrastructure in Nigeria. The study detailed how systemic rent-seeking behaviors and flawed procurement protocols systematically undermine the efficacy of Public-Private Partnerships. By inflating project costs and delaying execution timelines, these institutional failures directly rob marginalized communities of essential services and the associated employment opportunities generated during construction phases. The authors concluded that combating financial crime and enforcing transparent concession agreements are fundamental necessities if private infrastructure financing is to fulfill its potential as an instrument for national poverty eradication.

Olamade and Adebogun (2022) investigated the intersection of digital infrastructure expansion, labor displacement, and economic growth across emerging African economies. As investments in broadband and technological frameworks accelerate, the researchers identified a disruptive transitional phase within traditional labor markets. Their empirical evidence demonstrated that while technology infrastructure catalyzes macroeconomic growth, it simultaneously precipitates significant short-term unemployment spikes due to automation and a pervasive skills mismatch. The study highlighted that uneducated and low-skilled workers bear the brunt of this transition, emphasizing the urgent need for synchronized educational reforms to equip the labor force with relevant digital competencies.

Ozili (2022) provided a critical overview of infrastructure financing mechanisms in developing countries, analyzing the persistent tension between the profit motives of private investors and the welfare needs of the public. The research highlighted that traditional public funding models are no longer viable due to mounting sovereign debt profiles, necessitating alternative financing strategies. However, the author demonstrated that private investors impose rigorous risk premiums that often elevate the final cost of infrastructural services beyond the affordability threshold of impoverished citizens. The study advocated for innovative blended-finance solutions and sovereign guarantees to de-risk projects while protecting consumer welfare.

Mafokeng et al. (2023) explored the socio-economic implications of infrastructure privatization in South Africa, specifically focusing on spatial inequality and access to essential services. Their comprehensive qualitative and quantitative assessments revealed that the transition toward private sector management frequently results in the commodification of public goods. Through the imposition of high user fees and tolling mechanisms, private operators often price out the lowest demographic quintiles. Consequently, while the physical quality of infrastructural assets may improve under private stewardship, the exclusionary pricing models systematically exacerbate historical inequalities, ultimately hindering broad-based poverty alleviation and inclusive community development.

Rehman et al. (2023) investigated the long-term impact of infrastructural expansion on poverty alleviation across developing economies using panel data analysis. The researchers observed that consistent investments in core infrastructure specifically rural transportation and energy grids function as fundamental catalysts for elevating household incomes. Their empirical models demonstrated that improved physical connectivity drastically reduces the transaction costs associated with agricultural distribution, enabling marginalized populations to access centralized urban markets. Consequently, the study concluded that strategic infrastructural development directly correlates with substantial compressions in the multidimensional poverty index, underscoring the critical necessity of prioritizing physical capital formation to achieve inclusive social welfare.

Ifoghere and Olele (2024) analyzed the dynamics of private capital inflows and their corresponding effects on labor markets within sub-Saharan Africa. The study critically challenged the prevailing assumption that foreign direct investment in infrastructure automatically generates proportional domestic employment. Their regression outputs indicated that large-scale, privately financed mega-projects frequently rely on imported, highly specialized expatriate labor and advanced mechanized technologies, thereby bypassing the local workforce. The authors concluded that without stringent policy interventions mandating domestic labor absorption, private infrastructure financing often fails to mitigate structural unemployment, paradoxically isolating the very populations these developmental projects are ostensibly designed to empower.

Moneme et al. (2024) assessed the pervasive effects of infrastructural deficits on income inequality and poverty indices in developing nations. Their study utilized cross-sectional data to

demonstrate that inadequate public facilities systematically penalize low-income households by increasing the fundamental cost of living. The absence of reliable electricity and transport forces vulnerable populations to rely on expensive, suboptimal alternatives, thereby diminishing disposable income. The authors argued that bridging the infrastructure gap through strategic private investments is imperative; however, they noted that these investments must be intentionally structured to serve marginalized communities rather than exclusively prioritizing high-yield urban commercial hubs.

Ojeka et al. (2024) assessed the moderating role of institutional quality on the relationship between international financial flows and sustainable economic development. Employing rigorous econometric modeling, the authors demonstrated that high-quality governance frameworks amplify the poverty-reducing effects of private capital investments. Conversely, the study showed that in corrupt or inefficient regulatory environments, private infrastructure financing frequently exacerbates income disparities. The researchers posited that foreign and domestic private investors prioritize capital protection over social equity, making it the explicit responsibility of state institutions to construct regulatory guardrails that force capital to yield inclusive employment and welfare dividends.

Ouni et al. (2024) examined the specific relationship between transport infrastructure and poverty reduction within rural African contexts. Utilizing advanced spatial econometric techniques, the authors discovered that the expansion of road networks significantly improves socio-economic outcomes for isolated agrarian communities. The findings revealed that transportation investments not only facilitate the seamless movement of goods but also improve community access to essential public services, including healthcare and education. By dismantling geographic barriers, transport infrastructure substantially mitigates income inequality and fosters localized economic resilience, although the authors cautioned that maintenance deficits could rapidly reverse these positive welfare trajectories.

Prabhakar (2025) investigated the strategic methodologies required to bridge the widening infrastructure financing gap in emerging economies, with a specific focus on achieving inclusive socio-economic outcomes. The study argued that the mere influx of financial capital is insufficient to guarantee developmental success if it operates within a vacuum of social policy. The empirical findings suggested that infrastructure projects explicitly designed with community integration and local procurement mandates significantly outperform traditional profit-maximizing models in mitigating local unemployment. The author stressed that modern infrastructure financing must transcend structural engineering to prioritize human capital development and localized economic empowerment.

1.4 Research Hypotheses

To empirically investigate these dynamics over the designated 2000 to 2024 timeframe, the study formulated and tested the following null hypotheses:

H₀₁: There is no significant effect of private sector financing of public infrastructure on the poverty index of Nigeria and South Africa.

H₀₂: There is no significant effect of private sector financing of public infrastructure on unemployment in Nigeria and South Africa.

2. Method

2.1 Research Design

This study adopted an *ex-post facto* research design. The framework was deemed appropriate because the investigation relied on historical macroeconomic data that had already occurred. This design facilitated the empirical examination of pre-existing independent variables specifically, the components of private sector financing of public infrastructure to determine their predictive effects on the dependent social welfare indicators.

2.2 Nature, Sources, and Measurement of Data

The study utilizes secondary, annual time-series data spanning a twenty year period from 2005 to 2024. The sample is strictly delimited to two major African economies: Nigeria and South Africa. Data for the independent variables comprising private sector investment in technology (TECH), education (EDU), transportation (TRANS), and energy (ELECT) were extracted from the African Infrastructure Development Index (AIDI) published by the African Development Bank. Data for the dependent variables Poverty Index (POV) and Unemployment Rate (UNE) were sourced from the World Bank's World Development Indicators (WDI).

Data Justification and Comparability

To ensure robust cross-country comparability between Nigeria and South Africa, this study deliberately selected databases that utilize standardized metric reporting. The AIDI does not merely measure raw capital expenditure in fluctuating local currencies; instead, it provides normalized, composite index scores (scaled from 0 to 100) that reflect the actual expansion, quality, and access to infrastructural capacity generated by private capital financial closures. Similarly, the WDI standardizes social welfare metrics globally. The Poverty Index is measured using the multidimensional poverty headcount ratio (percentage of the population living below the standardized international poverty line), while Unemployment is measured as the percentage of the total labor force that is without work but available for and seeking employment, strictly adhering to International Labour Organization (ILO) standard definitions. By utilizing normalized indices and ILO-standardized percentages rather than nominal currency values, the data structurally eliminates the distorting effects of exchange rate volatility and inflation differentials between the South African Rand and the Nigerian Naira, thereby ensuring that the comparative econometric estimations are highly reliable and empirically valid.

2.3 Model Specification and Analytical Techniques

To empirically test the hypotheses, the aggregate functional relationship was disaggregated to isolate the specific social welfare indicators. In line with the study's objectives, the specific models are expressed below:

Model 1: Poverty Index Model

To ascertain the effect of private sector financing of public infrastructure on the poverty index in Nigeria and South Africa, the following model was specified:

$$PI_{i,t} = \alpha_0 + \alpha_1 TECH_{i,t} + \alpha_2 EDUC_{i,t} + \alpha_3 TRANS_{i,t} + \alpha_4 ELECT_{i,t} + U_{it}$$

where:

$PI_{i,t}$ is poverty index of country i (Nigeria and South Africa) in each (t) of the years from 2005 to 2024.

$TECH_{i,t}$ is investment of the private sectors of Nigeria and South Africa in technology during the respective years (t) .

$EDU_{i,t}$ depicts investment of the private sectors of each of the countries (i) in education during each of the years (t) .

$TRANS_{i,t}$ denotes the private sectors' investment in transportation in the respective years (t) .

$ELECT_{i,t}$ represents private sectors' investment in energy of the respective countries (i) in each of the years (t) .

α_0 is the model's intercept to obtain the poverty index of the countries when the private sectors do not finance public infrastructure.

α_1 , α_2 , α_3 , and α_4 are the coefficients of $TECH$, EDU , $TRANS$, and $ELECT$, respectively. Each coefficient captures the nature and size of the effect of the associated public infrastructure indicator on poverty index of the respective countries.

μ is the error term to accommodate the influence factors that determine poverty index but not directly considered in the model.

Model 2: Unemployment Model

To determine the effect of private sector financing of public infrastructure on unemployment in Nigeria and South Africa, the model is specified as:

$$UNE_{i,t} = \pi_0 + \pi_1 TECH_{i,t} + \pi_2 EDUC_{i,t} + \pi_3 TRANS_{i,t} + \pi_4 ELECT_{i,t} + U_{it}$$

where:

$UNE_{i,t}$ stands for the unemployment rate of country i (Nigeria and South Africa) in each (t) of the years from 2005 to 2024.

$TECH_{i,t}$ stands for Nigeria's and South Africa's private sectors' investment in technology during the respective years (t) .

$EDU_{i,t}$ is the investment of the private sectors of each of the countries (i) in education during each of the years (t) .

$TRANS_{i,t}$ stands for the private sectors' investment in transportation in the respective years (t) .

$ELECT_{i,t}$ represents private sectors' investment in energy of the respective countries (i) in each of the years (t).

π_0 is the model's intercept to measure the human development index of the countries without the private sectors' financing of public infrastructure.

π_{1-4} are the coefficients of TECH, EDU, TRANS, and ELECT, respectively. Each of the coefficients captures the nature and size of the effect of the associated public infrastructure indicator on human development index in the respective countries.

μ is the error term to accommodate the influence factors that determine poverty index but not directly included in the model.

Analytical Procedures

Data analysis was executed utilizing EViews econometric software. Augmented Dickey-Fuller (ADF) unit root tests were conducted to determine the stationarity and integration order of the variables. Johansen Cointegration tests were applied to detect the presence of long-run equilibrium relationships. Subsequently, Multiple Ordinary Least Squares (OLS) regression was employed to estimate the parameter coefficients. Post-estimation diagnostic checks, including the Breusch-Pagan-Godfrey test for heteroskedasticity, were performed to ensure estimator validity. Statistical inferences were drawn at a 0.05 level of significance.

The use of Ordinary Least Squares (OLS) in this study is theoretically justified because the Johansen Cointegration test confirmed a robust long-run equilibrium among the variables. According to standard econometric principles, applying OLS to cointegrated variables yields super-consistent parameter estimates, which were further validated in this study through rigorous post-estimation diagnostic checks that confirmed the estimators are Best Linear Unbiased Estimators (BLUE)

3. Results

3.1 Pre-Estimation Diagnostics

Prior to model estimation, Augmented Dickey-Fuller (ADF) unit root tests were conducted to ascertain the distributional properties of the series. The results revealed a mixture of integration orders. In the Nigerian dataset, Unemployment (UNE) was stationary at level I(0), while the Poverty Index (POVG), along with private investments in Electricity (ELECT), Transportation (TRANS), Technology (TECH), and Education (EDU), achieved stationarity after first differencing I(1). For South Africa, ELECT was I(0), whereas all other variables were I(1). Following the establishment of these integration orders, Johansen Cointegration tests were applied, confirming the existence of long-run equilibrium relationships among the variables in the models for both countries.

3.2 Regression Outputs for Poverty Index (Model 1)

The multiple regression analysis evaluated the effect of private sector infrastructure financing on the poverty index. As presented in Table 1, the Nigerian model demonstrated a good fit, explaining 60.44% of the variations in poverty ($R^2 = 0.6044$). The overall model was statistically significant ($F = 5.7292$, $p = 0.0053$). Specifically, private sector financing in transportation (TRANS) exerted a strong, negative, and statistically significant effect on poverty ($\beta = -8.8018$, $p = 0.0021$). Technology financing (TECH) also demonstrated a significant poverty-reducing effect ($\beta = -0.4635$, $p = 0.0011$). Conversely, electricity (ELECT) showed a negative but insignificant effect, while education (EDU) showed a positive and marginally significant effect. In South Africa, the model confirmed that the selected infrastructure variables jointly influenced poverty outcomes ($F = 4.0770$, $p = 0.0197$), yielding an R^2 of 0.5209. However, the individual parameters exhibited weaker short-term impacts. Transport (TRANS) had a negative, marginally significant effect on poverty ($\beta = -1.1464$, $p = 0.0609$). Investments in electricity, technology, and education were all statistically insignificant in driving immediate poverty reduction.

Table 1 Multiple Regression Results for Poverty Index (Model 1)

Variable	Nigeria (Coefficient)	Prob (p-value)	South Africa (Coefficient)	Prob (p-value)
Constant (C)	148.9818	0.0001*	66.8642	0.0001*
Transportation (TRANS)	-8.8018	0.0021*	-1.1464	0.0609**
Electricity (ELECT)	-1.8301	0.5198	-0.2656	0.6557
Technology (TECH)	-0.4635	0.0011*	-0.1064	0.2350
Education (EDU)	0.1795	0.0846**	0.4628	0.2320
R-squared (R^2)	0.6044		0.5209	
F-Statistic	5.7292		4.0770	
Prob (F-Statistic)	0.0053*		0.0197*	

Note. * Indicates statistical significance at the 5% (0.05) level. ** Indicates marginal significance.

3.3 Regression Outputs for Unemployment (Model 2)

The second model examined the influence of infrastructure financing on unemployment rates (see Table 2). In Nigeria, the explanatory variables accounted for 54.48% of the variation ($R^2 = 0.5448$, $p = 0.0139$). Education infrastructure financing (EDU) effectively reduced unemployment, demonstrating a significant negative effect ($\beta = -0.5133$, $p = 0.0035$). Conversely, technology financing (TECH) exhibited a positive and statistically significant effect on unemployment ($\beta = 0.6401$, $p = 0.0025$), likely reflecting immediate automation disruptions or skills mismatches in the labor market. Transport (TRANS) was marginally positive, while electricity (ELECT) remained statistically insignificant.

In South Africa, the unemployment model demonstrated exceptional explanatory power ($R^2 = 0.8862$, $F = 29.2049$, $p = 0.0000$). Transportation ($\beta = 0.5703$, $p = 0.0004$), education ($\beta =$

0.3583, $p = 0.0006$), and electricity ($\beta = 0.2877$, $p = 0.0508$) all exhibited positive and statistically significant coefficients. This suggests that capital inflows into these sectors may generate short-term labor displacement, structural adjustments, or rely heavily on specialized expatriate labor rather than absorbing the local unemployed populace. Technology (TECH) was statistically insignificant.

Table 2 Multiple Regression Results for Unemployment (Model 2)

Variable	Nigeria (Coefficient)	Prob (p-value)	South Africa (Coefficient)	Prob (p-value)
Constant (C)	-62.8058	0.0906	-27.6248	0.1861
Transportation (TRANS)	6.9746	0.0729**	0.5908	0.0006*
Electricity (ELECT)	1.5576	0.7185	0.2877	0.0508**
Technology (TECH)	0.6401	0.0025*	-0.0035	0.8874
Education (EDU)	-0.5133	0.0035*	0.3583	0.0006*
R-squared (R^2)	0.5448		0.8862	
F-Statistic	4.4883		29.2049	
Prob (F-Statistic)	0.0139*		0.0000*	

Note. * Indicates statistical significance at the 5% (0.05) level. ** Indicates marginal significance.

3.4 Post-Estimation Diagnostics

To ensure the validity and reliability of the Ordinary Least Squares (OLS) estimators, post-estimation checks were conducted. The Breusch-Pagan-Godfrey test confirmed the absence of heteroskedasticity across both the Poverty and Unemployment models for Nigeria and South Africa (all p -values > 0.05), thereby satisfying the homoskedasticity assumption. Furthermore, the Breusch-Godfrey Serial Correlation LM test indicated no significant presence of autocorrelation in the residuals. Consequently, the estimated coefficients are efficient, and the standard errors are deemed robust for drawing policy inferences.

4. Discussion

4.1 Discussion of Findings on Poverty Index

The empirical analysis revealed divergent welfare outcomes between Nigeria and South Africa regarding the impact of private infrastructure financing on poverty. In Nigeria, private investments in transportation and technology significantly reduced poverty. This finding is consistent with the theoretical postulates of the Big Push Theory and aligns empirically with Rehman et al. (2023) and Ouni et al. (2024), who posited that transport infrastructure effectively compresses poverty by linking rural agrarian communities to urban markets, thereby lowering transaction costs and enhancing household incomes. Similarly, the poverty-reducing effect of technology financing suggests that digital infrastructure investments have successfully driven financial inclusion and micro-enterprise expansion among vulnerable Nigerian populations.

Conversely, in South Africa, while transportation investments exhibited a marginally significant negative effect on poverty, the impacts of technology, electricity, and education financing were largely insignificant in the short run. This dampening effect can be attributed to the deep spatial and structural inequalities that characterize the South African economy. As highlighted by Mafokeng et al. (2023), private sector participation in South Africa frequently leads to the commodification of essential services through high user-fees or tolling mechanisms, which inadvertently restricts access for the poorest demographic quintiles, thus stunting the inclusive welfare outcomes of these investments.

4.2 Discussion of Findings on Unemployment

The findings regarding unemployment highlight complex and often paradoxical labor market dynamics. In Nigeria, while educational infrastructure financing significantly reduced unemployment by presumably enhancing human capital formation, technology financing exerted a positive (increasing) effect on unemployment. This suggests a systemic skills mismatch; as private capital introduces advanced technological infrastructure, it inadvertently displaces unskilled labor or leads to automation frictions, a phenomenon similarly observed by Olamide and Adebogun (2022) in emerging digital economies.

In the South African unemployment model, the paradoxical finding that educational and technological infrastructure financing significantly exacerbates joblessness requires deeper theoretical contextualization. This counter-intuitive outcome can be explained through the lens of Technological Displacement Theory and the realities of structural transformation. As private capital modernizes South Africa's digital and educational frameworks, it inherently shifts the economy away from labor-intensive sectors toward capital-intensive, highly automated production processes. Consequently, while the infrastructure improves, it simultaneously renders low-skilled and traditional labor obsolete, triggering immediate job losses (Olamide & Adebogun, 2022).

Furthermore, this exacerbation of unemployment is heavily compounded by severe labor market rigidities unique to South Africa. Strong unionization and inflexible wage structures prevent the labor market from rapidly adjusting to absorb workers displaced by this technological shift (Mafokeng et al., 2023). Finally, the expansion of private educational infrastructure frequently suffers from a profound skills mismatch. While private investment increases physical access to education, the structural curricula often fail to equip graduates with the exact STEM and digital competencies demanded by the newly modernized private sector. This disconnect results in a structural paradox: an expanding pool of educated, yet unemployable youth (Ifoghere & Olele, 2024).

4.3 Conclusion

This study concludes that private sector financing of public infrastructure is not an automatic panacea for social welfare deficits in emerging African economies. While mobilizing private capital is essential for closing the infrastructure gap, its impact on human welfare is highly

contingent upon the sector of investment and the socioeconomic structure of the host nation. In Nigeria, transport and technology infrastructure act as potent conduits for poverty alleviation, whereas in South Africa, structural inequalities dilute these benefits. Most critically, the study establishes that without deliberate labor-absorptive policies, private infrastructural expansion can paradoxically exacerbate unemployment by favoring capital-intensive execution over local human capital integration.

4.4 Recommendations

Based on the empirical findings, the following country-specific and actionable policy pathways are recommended:

Nigeria (Addressing Multidimensional Poverty):

1. Targeted Transport Concessions: Given the empirical evidence that transport infrastructure significantly reduces the poverty index ($\beta = -8.8018$), the Nigerian government (via the Infrastructure Concession Regulatory Commission) must prioritize Public-Private Partnerships (PPPs) that specifically connect rural agricultural hubs to urban commercial centers. This will directly lower distribution costs for marginalized agrarian populations.
2. Pro-Poor Tariff Structuring in Energy: Since private electricity financing yielded a statistically insignificant effect on poverty reduction, policy must shift from mere energy generation to equitable access. Private energy concessionaires must be legally mandated to implement tiered, "pro-poor" tariff structures. This ensures that while investors recoup capital from high-end industrial consumers, baseline electricity remains affordable for low-income households, preventing the commodification of essential services.

South Africa (Mitigating Structural Unemployment):

1. Curriculum Alignment via SETAs: To reverse the paradoxical finding that private educational infrastructure exacerbates unemployment ($\beta = 0.3583$), South Africa's Sector Education and Training Authorities (SETAs) must aggressively intervene. Private educational investments must be legally bound to curricula that directly address the nation's immediate industrial and digital skills deficit, eliminating the structural skills mismatch.
2. Mandatory Tech-Apprenticeships (B-BBEE Integration): To counteract the labor displacement caused by technological infrastructure financing, the South African government should leverage the Broad-Based Black Economic Empowerment (B-BBEE) framework. Foreign and private tech investors should be mandated to absorb a specific quota of local youth into paid apprenticeships and digital upskilling programs as a mandatory condition for securing national infrastructure contracts.

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