Innovations

Public Sector Infrastructure Financing and Poverty Reduction in Nigeria: An ARDL Approach

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Abstract: *Nigeria's recent economic outlook has been replete with slow levels of economic growth that continue to impact the standard of living and quality of life of many households in Nigeria. Infrastructure deficits in power, transport facilities, water, and health services are identified in the literature as a major setback to Africa's industrialization, particularly in Nigeria, which continues to undermine policy efforts against poverty. In this study, historical public sector financing on infrastructure was explored to ascertain its effect on poverty levels in the country from the lens of per capita income. This study employed the ex post facto research design which enabled the utilization of secondary data extracted from 1986 to 2023 from the World Bank's WDI (2024) and CBN's Statistical Bulletin (2024), while bounds cointegration and the autoregressive distributed lagged (ARDL) modelwere employed in the analysis. Public sector infrastructure financing (PSIF) on roads, education, health, and housing were captured as the independent variables while per capita income was used as the proxy for poverty. The study hypothesis was tested at a5% level of significance. Overall, the study found that public sector infrastructure financing (PSIF) had a mixed and significant influence on per capita income(Adj.R^2= 0.65,$F(4, 33) = 9.56$, $p < 0.05$). Specifically, the study found thatonly PSIF on educationexhibited significant positive effects on per capita incomein the short run (β=0.18, p<0) and long run (β=0.07, p<0.03), while PSIF on road, health, and housing each exhibitednegative butinsignificant effects on per capita income both in the short and long run. The study concluded that investments in education have great potential for improved per capita income, improved well-being of the people, and reduction in the level of poverty.The findings led to recommendations of the necessity for the appropriate ministries to invest massively in education and prioritize the spending for this sector, to take benefit of economic growth associated with infrastructure development in Nigeria, to boost domestic expenditure, to improve the standard of living of the people, and ultimately reduce poverty.*

Keywords: *Economic growth, infrastructure financing, per capita income, poverty, public sector.*

Introduction

One of the biggest problems of the Nigerian State remains its rising poverty rate amidst a rising population and poorly performing macroeconomic variables such as unemployment, inflation, balance of trade, and foreign direct investment. A major recurring theme in previous studies has been the lack of sustained government policies targeted towards improving the standard of living in the country in a way that alleviates the large number of people below the poverty line. According to a 2022 multidimensional poverty survey, over 40% of Nigerians are poor when measured against the 2018/19 national monetary poverty line, while a whopping 63% of Nigerians are multidimensionally poor according to the same National MPI 2022 (NBS, 2022). Furthermore, 42% of the poor people are in urban areas, compared to the 72% in rural areas, and although poverty rates across States in the country may vary significantly, a State such as Sokotohasan over 90% multidimensional poverty rate.

Ingram and Liu (2022) argued that the estimated effects of infrastructure investment on economic growth vary significantly among countries and sectors, but are generally positive. These positive effects are larger in developing countries than in developed countries, and larger in electricity and telecommunications than in transportation. Studies suggest that the performance or efficiency of infrastructure is a very important determinant of its economic impacts. In the words of Ogunlana et al. (2016), infrastructure is an important economic driver as it helps to raise the quality of growth and reduces poverty. Direct investment in infrastructure can promote "positive externalities" through the availability of facilities that enhance production, which consequently lowers trade and production costs. This also creates or increases employment opportunities for the teaming population. Oyedokun (2023) further confirms that infrastructure also provides opportunities for consumption and helps improve production and capital formation factors.

Nigeria is currently passing through one of the most pressing crises in infrastructure development, despite the efforts by the government in the last few years(Edo, et al., 2022). There is a huge concern for the country on the state of its infrastructure, as this has affected productivity and the general well-being of the citizens. Companies and entrepreneurs are daily groaning for the cost of production owing to the non-availability of electricity, the high cost of diesel to power generators, and the high cost of transportation. This has imposed major constraints on the achievement of economic growth and development (Akuesodo et al., 2023).While many previous researchers such as Emenike, (2015), Owolabi, (2015), Kenny and Tooraj, (2020), Ekeocha (2021), Edo et al. (2022), Foster (2022), Anago (2023), Mohammed (2023), Akuesodo et al., (2023), Francis et al. (2023), and Snowden (2024) focused on different jurisdiction and regions on the subject of infrastructure financing and economic growth, they all agreed that its absence or gross inadequacy is a serious hindrance to economic growth and development

and that investment in different infrastructure sectors and areas has been in short supply over the years.

There is a close linkage between infrastructure spending and access to good and better infrastructure and high poverty rate in Nigeria.While a lot of studies (Akuesodo et al. 2023; Alutghe, 2023; &Anago, 2021) have been directed to Infrastructure financing and development, because of its importance to national development, most of the studies have focused on some sections of one or two infrastructures and some on the impact of infrastructure on economic growth with GDP as a major variable. Also, most of the studies have concentrated on Africa with less focus on Nigeria. . This study therefore sought to examine the effect of public sector infrastructure financing on poverty reduction in Nigeria, using per capita income as its proxy.

Research Objectives and Hypothesis

The objective of this study is to investigate the effect of public sector infrastructure financing on poverty in Nigeria.

Research Question

What influence does public sector infrastructure financing have on per capita income in Nigeria**?**

Research Hypothesis

H_0: There is no significant effect of public sector infrastructure financing on per capita income in Nigeria

The findings of the study have the potential to inform policy direction for government, contribute to the existing literature on public sector infrastructure financing, and provide the rationale for galvanizing public-private partnerships required for better infrastructure development and economic performance in the country. The rest of the paper consists of a literature review, methodology, presentation of the results, and discussions of the findings, and conclusion of the study.

Literature Review

Theoretical Perspectives

One of the first theories that brought about interest and increased discussion around the role of government spending on the economy, particularly economic growth and development, in the face of infrastructural development is the theory of public expenditure, postulated by Wagner (1883), which suggested that per capita income of a country rises, so also, the share of public spending to GDP will, signifying a direct positive relationship between the two. In other words, as industrialization increases and economic growth increases, this will drive the growth in per capita income which incentivizes the government to even increase

the level of spending subsequently. This increase in expenditure also results in or directly affects the development of social welfare like health, and education (Chijioke & Amadi 2020).

Keynesian's theory of public expenditure of 1936, after the great depression, believed that the government have a critical role to play after the wars especially that the government can spend out of the depression. Keynes believed that government expenditure can be used to effectively drive sectorial growth in the economy which will help drive economic growth and development. According to Keynes, when the government intervenes using the available fiscal policy instrument, government spending will be increased, and this will result in increased activities such as employment, production, and output. To Keynes, public spending is regarded as an exogenous factor that is capable of propelling economic growth (Edame 2015).

Despite theoretical evidences on the effect of government capital spending on economic growth, Nigeria's current spending on core infrastructure such as roads, education, health, and housing has proved to be inadequate, and has not had the intended multiplier effect on increasing aggregate demand within the economy, leading to growth in the economy, and by extension, an increase in per capita income. A study by Adebisi et al. (2020) examined government finance, budgetary allocation, and expenditure as key health development indicators toward achieving the universal health target and economic development in Nigeria and concluded that there was a low annual national health budget and infrastructure development, which has affected the level of poverty and health services in Nigeria, while studies like Dimuna (2023) showed that Nigeria has one of the lowest levels of access to improved basic infrastructure anywhere in the world, ranking 162 out of 186 countries and this lack of infrastructure has led to poverty and underdevelopment in Africa.

Empirical review of literature

Public Sector Infrastructure Financing and Per Capita Income

John and Moyaki (2015) investigated the impacts of road infrastructure spending on Kenya's overall economic growth rate, using data covering 1963 to 2014 using the Ordinary Least Squares method and the study found that investment in road infrastructure by the government will impact GDP per capita positively. Daniel et al. (2015) examined the effect of infrastructure financing on urban development in Nigeria, employing a theoretical review method and found that the lack of adequate infrastructure investment on health as a result of funding constraints was causing substantial gaps in infrastructure development and poverty levels. Azam and Abubakar (2017) investigated the role of road infrastructure in national economic development, based on Malaysia's experience, using the ordinary least squares method, and found that infrastructure development has a significantly positive impact on the level of poverty and development in Malaysia.

Further studies have also found mixed results on the effect of public sector infrastructure financing and per capita income and poverty on the one hand, and via economic growth on the other hand. Edame (2015) investigated if public infrastructure spending has any effect on economic growth in Nigeria, using time-series data from 1970 to 2010 and through the use of an Error Correction Mechanism (ECM) approach, and found a significant positive relationship between infrastructure spending and economic growth. Aworinde and Akintoye (2019) examined the effect of institutions and infrastructure development on economic growth in Nigeria, focusing on health and education using ARDL,and concluded that the population and institutions have a positive effect on the level of poverty and economic growth, while the public infrastructure does not affect economic growth.

Sidiq (2019) examined the significance of road infrastructure and its effect on economic sustainability using OLS data analysis and showed that a higher road infrastructure investment will positively affect poverty and economic growth. Saadaoui et al. (2020) investigated housing infrastructure development and its effect on poverty in sub-Saharan Africa using the Generalized Method of Moments (GMM) and found a significant positive relationship between infrastructure development and poverty.Adegboyega et al. (2021) investigated the effect of water infrastructure development in Nigeria, its trend, size, and purpose on economic growth and found gross inadequacy of water infrastructure development and how it has affected the level of poverty and development among the populace, while Fagbemi et al. (2022) examined how sustainable infrastructure development can be enhanced and its effect on poverty reduction in Nigeria, concluding that a positive relationship exists between good infrastructure development and a reduction in the level of poverty

More recent studies have also found a link between infrastructure financing and economic growth, per capita income, and poverty reduction. Zuopeng et al. (2023) investigated how road transport infrastructure investment impacts the economy, with a focus on Changchun, using observation and narrative methods, and found that a negative relationship exists between the poor road infrastructure system and the urbanization landscapes, economic development, and GDP per capita. Francis et al. (2023) studied how infrastructure deficit can cause social challenges and its ripple effects on Sustainability in Ghana and revealed that poor infrastructure development was mainly responsible for the lack of inter and intra-continental trade integration in Africa., and further revealed poor and grossly inadequate investments in infrastructure, resulting in the inability of African countries to sustain growth while remaining backward in their infrastructure development.

Snowden (2023) examined how road infrastructure financing in Malawi can be enhanced for effective economic growth and development, combining qualitative

(review method) and quantitative techniques for its analysis. The study confirmed a wide perception gap in the road-funding model, particularly in the area of project delivery results and actual infrastructure development for quality and quantity among the stakeholders. It further confirmed that some stakeholders rated road conditions as poor despite the huge amount spent during the study.

Data, Variables, and Methodology

Research Design

This study employed an ex-post facto research design method and used yearly time series data covering the period from 1986 to 2023.Ex-post facto research designs help to identify a natural momentum for specific outcomes without the manipulation of the independent variable (Aladejana et al., 2021)

Data and Variables

This study used secondary data for the dependent and independent variables. The dependent variable, poverty, was proxied by percapita income while the independent variable,public sector infrastructure financing, was proxiedby government infrastructure financing on road,education, health, and housing. The data were extracted from the Statistical Bulletin of the Central Bank of Nigeria (CBN, 2024) and the World Bank's World Development Indicators (WDI, 2024).

Model Specification and Estimation Technique

This study adopted the theoretical framework of Keynesian's (1936) theory of public expenditure. Keynes in 1936 believed that government expenditure can be used to effectively drive sectoral growth in the economy, which would facilitate economic growth and development (Aluthge et al. 2021).

The model is specified below:

$PCI_t = f(RIF_t, EIF_t, HTIF_t, HSIF_t, CPI_t)$ (eqn. 1)

The econometric model below is specified in linear form:

$PCI_t = \rho_0+\rho_1 LnRIF_t+ \rho_2 LnEIF_t + \rho_3 LnHTIF_t + \rho_4 LnHSIF_t+\mu_t$(eqn. 2)

Where:

PCI_t = Per capita income at time t

$LnRIF_t$ = Log of the Road infrastructure financing at time t

$LnEIF_t$ = Log of the Education infrastructure financing at time t

$LnHTIF_t$ = Log of the Health infrastructure financing at time t

$LnHSIF_t$ = Log of the Housing infrastructure financing at time t

μ_t = Error term

To avoid the problem of heteroskedasticity, the variables were rescaled into ratios by logging them. It was re-specified in a log-linear form as follows:

$LnPR_t = \rho_0 + \rho_1 LnRIF_t + \rho_2 LnEIF_t + \rho_3 LnHTIF_t + \rho_4 LnHSIF_t + \rho_5 CPI_t + \mu_t$ (eqn. 3)

The long-run model with the error correction term is expressed as follows:

$$\Delta PR_t = \alpha_1 + \sum_{i=1}^{N1} \alpha_2 \Delta UNPR_{t-1} + \sum_{i=1}^{N2} \delta_3 \Delta LnRIF_{t-1} + \sum_{i=1}^{N3} \rho_4 \Delta LnEIF_{t-1} + \sum_{i=1}^{N4} \lambda_4 \Delta LnHTIF_{t-1} + \sum_{i=1}^{N5} \varphi_4 \Delta LnHSIF_{t-1} + \Upsilon_1 LnPR_{t-1} + \Upsilon_2 LnRIF_{t-1} + \Upsilon_3 LnEIF_{t-1} + \Upsilon_4 LnHTIF_{t-1} + \Upsilon_5 LnHSIF_{t-1} + +\pi ECT_{t-1} + \mu_t$$

(eqn. 4)

Based on the Keynesian theory of public expenditures in 1936, which believed that government expenditure, particularly spending on infrastructure development, is a fiscal measure that will propel the economy to expand and enable economic growth and development, it is shown that a relationship exists between public sector infrastructure financing and economic performance. Hence, the a priori expectation is given as:

$\alpha_1 > 0$; $\alpha_2 > 0$; $\alpha_3 > 0$; $\alpha_4 > 0$; $\alpha_5 > 0$

Table 1: Variables, Description, Measurement, and Sources

Variables	Measurement	Source(s)
Poverty Rate	Percentage change of population living below the national poverty line	World Bank Development Indicator, 2024
Per capita income	Measured as GDP divided by the number of population OR average income per person.	World Bank Development Indicator, 2024
Road infrastructure financing	Actual government capital expenditure on road and transport system	Central Bank of Nigeria (CBN) Statistical Bulletin, 2024
Education infrastructure financing	Actual government capital expenditure on education facilities	Central Bank of Nigeria (CBN) Statistical Bulletin, 2024
Housing infrastructure financing	Actual government capital expenditure on housing facilities	Central Bank of Nigeria (CBN) Statistical Bulletin, 2024
Health infrastructure	Actual government capital expenditure on health and medical	Central Bank of Nigeria (CBN)

financing	facilities	Statistical Bulletin, 2024

Source: Researcher's compilation, 2025

3.3 Methodology

The analysis of the data was anchored on the long-run Autoregressive Distributed Lag (ARDL) models that were specified to express the functional or dependency relationships between the proxy of poverty (per capita income (PCI)) and the proxies of public sector infrastructural financing (road infrastructure financing (RIF), education infrastructure financing (EIF), health infrastructure financing (HTIF), and housing infrastructure financing (HSIF)). The coefficients of the model were estimated and evaluated for statistical significance of the effects of infrastructural financing on poverty reduction. The evaluation of the coefficients provided the basis for the decisions about the research hypotheses and the attainment of the research objective.

Using the ARDL model, the unit root was used to test the stationarity of the time series variable. The Augmented Dickey-Fuller (ADF) was employed for the unit root test, and based on the outcome, a cointegration analysis was carried out to examine variables and determine if there were long-run relationships between them, using the bound test method, while an error correction term (ECT) model was estimated to provide insight into the speed of adjustment from disturbance in the short-run equilibrium to the long-run equilibrium state.

1.0 Results and Discussion

The analysis begins with an examination of the natural characteristics of the variables as shown in the descriptive statistics table below:

4.1 Descriptive Statistics

Table 2 - The Result of the Descriptive Statistics

	Mean	Maximum	Minimum	Std. Dev.	Skewness
RIF	165.4607	763.4600	12.27000	176.0571	1.804024
EIF	57.12931	232.1500	4.650000	51.36260	1.700874
HTIF	34.09828	144.4900	1.220000	32.78037	1.659847
HSIF	35.19517	163.4300	0.500000	39.50115	1.511227
PCI	385284.6	1457217.	28512.82	346533.0	1.162844

Source: Author's Computation (2025)

The mean Per capita income (PCI) was ₦385,284.60, ranging from ₦28,512.82 to ₦1,457,217, with a high standard deviation of ₦346,533. This large range and variability indicate significant income disparities, possibly due to unequal

economic development or resource allocation. Positive skewness (1.16) suggests infrequent periods of unusually high income, while kurtosis (4.22) points to sharp peaks in income data. The Jarque-Bera test (p = 0.0154) confirms deviations from normality, highlighting uneven income distribution trends.

With the independent variables, the result shows the high standard deviation of across the measures of public sector infrastructure financing (RIF at ₦176.06 billion, EIF at ₦51.36 billion, HTIF at ₦32.78 billion, and HSIF at ₦39.50 billion) indicates significant variability in public sector infrastructure investments in Nigeria, likely due to fluctuating fiscal priorities or external funding. All the variables are positively skewed suggesting periods of particularly high investment, while the absence of zero skewness further shows that the distributions of the variables are closer to symmetry. Furthermore, the individual kurtosis values of the variables (UNPR = 6.08; RIF = 6.08; HTIF = 5.88; and HSIF = 5.11) shows that the distributions of the variables have more heavier tails than a normal distribution, hinting at the occurrence of extreme outliers. The Jarque-Bera test also showed that with the p-values of the Jaque-Bera statistic each less than 0.05, the time series of the variables do not follow a normal distribution, hence, confirming the results of the skewness and kurtosis.

4.2 Test for Multicollinearity

The presence of multicollinearity in a regression model renders it as unreliable in predictions related to an economic phenomenon. Hence, we check to see if the independent variables are highly correlated using the correlation text matrix in the table below:

Table3 – Correlation Matrix of the Independent Variables

	LNEIF	LNRIF	LNHTIF	LNHSIF
LNEIF	1			
LNRIF	0.555274	1		
LNHTIF	0.689368	0.491714	1	
LNHSIF	0.303499	0.389925	0.240930	1

Source: Author's Computation (2025)

The rule of thumb for checking for the presence of multicollinearity is that the independent variables in a model should not be highly correlated as evidenced by a correlation coefficient greater than 0.7. From the table above, there is no evidence of high correlation amongst the independent variables, hence we rule out the presence of multicollinearity in our model.

4.3 Unit Root Test

Most times, time series data of variables are non-stationary in levels due to changes in an economy that make predictions more difficult (Oziengbe, 2013). As such, it is standard practice to test for stationarity to avoid yielding spurious results in the model which can be misleading. For the study, both the Augmented

Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were utilized to determine the stationarity of the variables as shown in the table below:

Table 4 - Result of Unit Root Tests using Augmented Dickey Fuller (ADF)

Augmented Dickey-Fuller (ADF) Unit Root Test Result							
LEVEL				**FIRST DIFFERENCE**			
	None	**Constant**	**Constant and Trend**	**None**	**Constant**	**Constant and Trend**	**Order of Integration**
LnRIF	0.8158	-1.4812	-2.8577	-6.5786***	-7.0576***	-6.9673***	I(1)
LnEIF	0.9794	-1.5725	-2.6112	-6.3760***	-7.0618***	-7.0522***	I(1)
LnHTIF	0.9548	-1.8122	-1.7624	-9.1737***	-10.9894***	-11.1498***	I(1)
lnHSIF	0.2244	1.2089	-3.2460*	-6.2202***	-6.9704***	-6.9656***	I(1)
LnPCI	5.2207	-2.9352**	-1.9154	-1.6088	-5.7004***	-6.0696***	I(0), I(1)

Source: Author's Computation (2025)

The findings reveal a mixed order of integration among the variables, with some being stationary at levels and others achieving stationarity after first differencing.The results showed that LnPCIwas stationary at level. The results, however, for the remaining variables such as those of the independent variables (LnRIF, LnEIF, LnHTIF, and LnHSIF) were all found to be non-stationary at level. It was observed that their test statistics were higher than the critical value, giving an indication of the presence of a unit root. These variables, however, became stationary after first differencing, as their test statistics turned lower than the critical levels. In summary, the test results showed that LnPCIis stationary at level (I(0)), and other variables became stationary at first differencing (I(1)). The inference is that a long-run equilibrium technique like co-integration analysis or an autoregressive distributed lag (ARDL) model is appropriate as the variables become stationary after first differencing as it can accommodate variables with different integration orders.

4.4 Bounds Testing

Given the mixed order of integration observed among the variables in the series, the study proceeded to test for the possibility of a long-run relationship among them. This was achieved through the application of the bounds testing approach under the ARDL framework, which is well-suited for analyzing datasets with variables integrated at different levels (I(0) and I(1

Table 5 – Bounds Cointegration Test

Level of Significance	Critical Values		F Statistic
	Lower Bound	Upper Bound	
10%	2.45	3.52	10.45367 (k = 4)
5%	2.86	4.01	
2.5%	3.25	4.49	
1%	3.74	5.06	

Source: Author's Computation (2025)

The result indicates the presence of along run cointegrating relationship between the public sector infrastructure financing variables and per capita income in Nigeria. This is shown by the high F-Statistic value of 10.4537 which is significantly greater than both the lower (2.86) and upper (4.01) critical value bounds at 5% level of significance. Next, we employs the ARDL model to analyze both the short-run and long-run dynamics.

Table 4.3: Estimates on the effect of public sector infrastructure financing on poverty rate in Nigeria

Dependent Variable: PR				
Short Run Estimates (Error Correction Model)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LNRIF)	-0.161355	0.138682	-1.163490	0.2541
D(LNEIF)	-0.086458	0.082407	-1.049159	0.3028
D(LNHTIF)	-0.199304	0.150467	-1.324572	0.1957
D(LNHSIF)	-0.118615	0.086364	-1.373432	0.1801
Ect	-0.920474	0.144760	-6.358622	0.0000
Long run Estimates				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LNRIF	0.478262	0.163886	2.918252	0.0067
LNEIF	-0.093928	0.092185	-1.018906	0.3167
LNHTIF	-0.448491	0.187674	-2.389728	0.0236
LNHSIF	-0.128863	0.093528	-1.377800	0.1788
C	3.755642	0.283758	13.235380	0.0000
Evaluation Tests		Statistics		Prob
R-squared		0.692555		-
Adjusted R-squared		0.618344		-

F-statistic		9.332260		0.000005

Source: Author's Computation (2025)

4.8 Discussion of Results

The pre-estimation tests showed

Short run effect of PSIF variables on Poverty

In the short-run results presented in Table 4.4.5, the Error Correction Term (ECT) has a coefficient of -0.920474, with a t-statistic of -6.358622 and a p-value of 0.0000, indicating that it is statistically significant. This suggests that the model is correcting for disequilibrium from the previous period, and the negative sign indicates that any deviation from the long-run equilibrium will lead to a reduction in the poverty rate (PR) over time. Specifically, a 1% deviation from equilibrium results in a 0.92% adjustment towards the long-run equilibrium, indicating a rapid speed of adjustment and a strong correction mechanism in the model.

For the independent variables, D(LnRIF) (road infrastructure finance) has a negative coefficient of -0.161355, with a t-statistic of -1.163490 and a p-value of 0.2541, suggesting that it is not statistically significant in the short run. The negative sign implies that a 1% increase in road infrastructure finance results in a 0.16% decrease in the poverty rate (PR), but since the p-value exceeds the 0.05 threshold, the effect is not robust or reliable in the short term. Similarly, D(LnEIF) (education infrastructure finance) has a negative coefficient of -0.086458, with a t-statistic of -1.049159 and a p-value of 0.3028, also indicating that the relationship is not statistically significant. A 1% increase in education infrastructure finance leads to a 0.09% decrease in the poverty rate, but, like road infrastructure, the result is not statistically meaningful in the short run.

Furthermore, D(LnHTIF) (health infrastructure finance) has a coefficient of -0.199304, with a t-statistic of -1.324572 and a p-value of 0.1957, suggesting that the negative effect is not statistically significant either. A 1% increase in health infrastructure finance leads to a 0.20% decrease in the poverty rate, but the effect is not significant enough to draw reliable conclusions in the short run. Lastly, D(LnHSIF) (housing and social infrastructure finance) also has a negative coefficient of -0.118615, with a t-statistic of -1.373432 and a p-value of 0.1801, indicating that the relationship is statistically insignificant. A 1% increase in housing and social infrastructure finance leads to a 0.12% decrease in poverty rate, but, like the other variables, the result lacks statistical significance.

Long run effect of PSIF variables on Poverty

In the long run, the coefficient for LnRIF (road infrastructure finance) is 0.478262, which is statistically significant with a t-statistic of 2.918252 and a p-value of 0.0067, indicating that a 1% increase in road infrastructure finance leads to a 0.48% increase in the poverty rate (PR). This positive relationship suggests that, contrary to expectations, an increase in road infrastructure finance is associated

with higher poverty in the long term. The significance of the coefficient supports the reliability of this finding. On the other hand, LnEIF (education infrastructure finance) has a coefficient of -0.093928, but with a t-statistic of -1.018906 and a p-value of 0.3167, which is not statistically significant. A 1% increase in education infrastructure finance leads to a 0.09% decrease in the poverty rate, but since the p-value exceeds the 0.05 threshold, this effect is not statistically robust.

For LnHTIF (health infrastructure finance), the coefficient is -0.448491, with a t-statistic of -2.389728 and a p-value of 0.0236, which indicates that it is statistically significant. A 1% increase in health infrastructure finance results in a 0.45% decrease in poverty rate, suggesting that improved health infrastructure has a beneficial effect on reducing poverty in the long run. This finding is both statistically significant and economically meaningful. Lastly, LNHSIF (housing and social infrastructure finance) has a coefficient of -0.128863, with a t-statistic of -1.377800 and a p-value of 0.1788, which is not statistically significant. A 1% increase in housing and social infrastructure finance leads to a 0.13% decrease in the poverty rate, but the lack of significance implies that this effect is not reliable in the long run.

The **R-squared** value of 0.692555 indicates that approximately 69.26% of the variation in the poverty rate (PR) is explained by the model, suggesting a good fit. The **Adjusted R-squared** of 0.618344 further confirms the robustness of the model, as it accounts for the number of predictors and provides a more accurate assessment of fit. The **F-statistic** of 9.332260, with a p-value of 0.000005, strongly rejects the null hypothesis, indicating that the model is statistically significant and the independent variables collectively have a significant impact on poverty rate (PR).

Post Estimation Diagnostic Tests

Several post-estimation tests were conducted on the residuals of the model to ascertain if the model was properly specified in line with the assumptions of the classical linear regression model. The results are shown in the table below:

Post Estimation Diagnostics Test				
Serial Correlation LM Test		0.2449		0.1603
Heteroskedasticity Test:		0.5578		0.5069
Normality Test		6.374818		0.051279

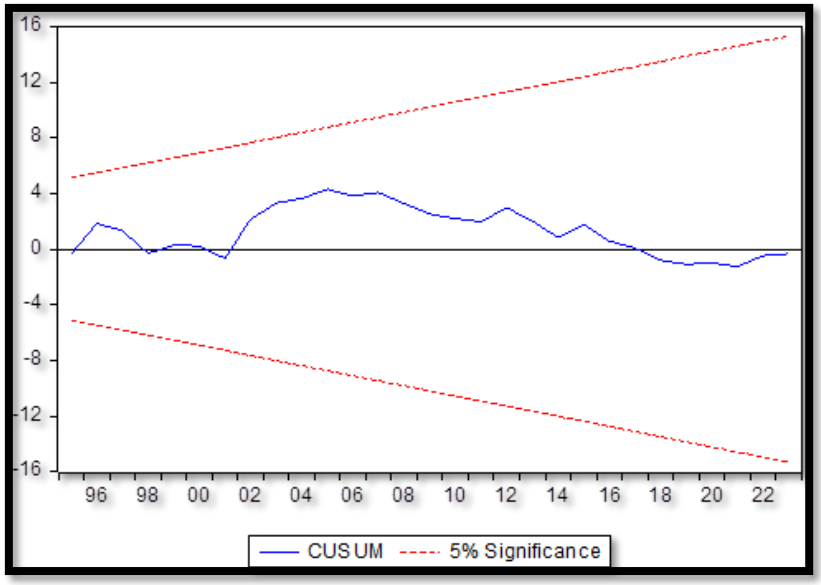
Source: Author's computation (2025)

The **Serial Correlation LM Test** has a p-value of 0.1603, suggesting no significant serial correlation in the residuals, indicating that the error terms are not correlated over time, which is desirable for model validity. The

Heteroskedasticity Test shows a p-value of 0.5069, implying that there is no evidence of heteroskedasticity, and the variance of the residuals is constant across observations. Finally, the **Normality Test** with a p-value of 0.051279 indicates that the residuals are approximately normally distributed, supporting the validity of the model's estimates and confirming that the assumptions of the classical linear regression model are largely met.

Figure 4.1 illustrates the CUSUM test, used to assess the stability of the regression model's parameters over time. The blue line represents the cumulative sum of recursive residuals, while the red dashed lines mark the 5% significance bounds. As the CUSUM line stays within these limits, the model's parameters are considered stable.

Figure 4.1 - CUSUM Plot



Source: Author's computation (2025)

Discussion of Findings

The findings from the study showed that public sector infrastructure financing had a significant influence on per capita income (Adj.R^2= 0.65,F(4, 33) = 9.56, $p < 0.05$)

The short-run estimates of the impact of infrastructure financing on the per capita income revealed a negative and statistically insignificant coefficient for road infrastructure finance suggesting that short-term investments in roads do not yield immediate benefits for income growth. This aligns with the findings of Ng et al. (2019), who argue that road infrastructure investments tend to have long gestation periods, making their short-term effects on income negligible. Conversely, the estimated result showed that education infrastructure financing

has a significant and positive impact on per capita income (PCI) supporting the argument by Emenike (2015) that human capital development through education spending enhances productivity and wage growth in the short run.

The estimated result showed that health and housing infrastructure finance have negative but insignificant effects on PCI suggesting that higher investment in these sectors may cause a reduction in the PCI as a result of inefficiencies in spending, delayed project implementation, or lack of immediate economic spillovers. This finding contrasts with Adebisi et al. (2020), who argue that health infrastructure when effectively managed, should have a positive impact on income levels by improving workforce productivity and reducing healthcare costs.

In the long run, the estimated result revealed that education infrastructure financing hasa positive and significant effect on the per capita income, and remains the only sector with a significant contribution to per capita income, reinforcing the argument that sustained investment in human capital is essential for economic prosperity. This supports the findings of Foster et al. (2022), who emphasize the importance of education infrastructure in fostering long-term economic growth. The estimated result however showed that road infrastructure financing has a negative relationship with PCI, though insignificant. This suggests that road investments may not be translating effectively into income growth, possibly due to corruption, inefficiencies, or misallocation of resources, as noted by Dimuna (2023).

The estimated result showed a negative long-run impact of health and housing infrastructure finance, on per capita income, although not statistically strong. This raises concerns about the effectiveness of public sector investments in these areas. This result contradicts the work of Okwu et al. (2017), who found that housing infrastructure positively influences economic growth in the long run when efficiently managed. These findings suggest the need for better governance and oversight in infrastructure financing to ensure that investments in roads, health, and housing contribute meaningfully to per capita income growth.

Conclusion and Recommendations

The estimated result for objective four on the impact of public sector infrastructure financing on per capita income (PCI), revealed that public sector infrastructure financing had a significant influence on per capita income (Adj.R^2= 0.65,$F(4, 33) = 9.56$, $p < 0.05$). The findings showed that in the short run, road, health, and housing infrastructure financing have a negative but statistically insignificant effect on per capita income. Only education infrastructure financing has a significant and positive impact on PCI, which indicates that spending on education infrastructure will increase the per capita income and the general well-being of the citizens. In the long run, road, health, and housing infrastructure

financing continued to exhibit negative but insignificant effects on PCI. The consistent positive and statistically significant effect of education on per capita income emphasizes the importance of education infrastructure in fostering long-term economic growth.

The Federal Government of Nigeria (FGN) through the appropriate Ministries and Departments (MDAs) should invest massively in education and prioritize the spending for this sector, to take benefit of economic growth associated with such investment. This is in line with the estimation result where education infrastructure financing has a significant and positive effect on per capita income, indicating that spending on education infrastructure can significantly reduce poverty level in Nigeria.

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