FNAS Journal of Mathematical Modeling and Numerical Simulation
Print ISSN: 3027-1282
www.fnasjournals.com
Volume 1; Issue 1; March 2024; Page No. 29-39.

Modeling the Relationship between Infrastructure, Urbanization, and Poverty Dynamics in Nigeria

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Abstract
The present study utilised annual time series data from the Central Bank of Nigeria (CBN), the Statistical Bulletin, the World Bank, and the Debt Management Office (DMO) to investigate the impact of urbanisation and infrastructure on poverty in Nigeria. The data covered the period from 1990 to 2022. Urbanisation was represented by the Urban Population Growth (UPG) rate, whereas infrastructure was denoted by the number of cemented roads (PRD), electric power supply (EPS), and telecommunication infrastructure (TCI). The poverty headcount served as the dependent variable. The series underwent integration at orders zero (1) and one (1), as determined by an Augmented Dickey Fuller stationarity test on the variables. Indicating the existence of a long-run cointegration relationship, the Autoregressive method was utilised to verify the hypothesis; the bound cointegration was computed to ascertain the relationship's significance. In contrast, the provision of telecommunication infrastructure in Nigeria is the primary cause of poverty, as indicated by the study, which found that urbanisation hindered economic development in the short term by making a positive impact on poverty. In light of the study's findings, it is recommended that the government, private sectors, investors, corporate bodies, and stakeholders make concerted efforts to enhance the quality of road infrastructure, telecommunication facilities, and electric power supply in order to reduce the poverty rate in Nigeria, as the current level of infrastructure development in the country fails to meet the country's economic development objectives.

Keywords: Infrastructure, Urbanization, Poverty, Time Series, Development

Introduction

Sustainable economic growth in Africa has been attributed to infrastructure development, which is also recognised in the Millennium Development Goals (MDGs) for its role in reducing income inequality and poverty. Therefore, more than half of the recent rebound in economic development in Africa can be attributed to infrastructure investment, which also has the capacity to accomplish further (ADB 2022). In comparison to other developing continents such as Asia, Central America, the Caribbean, the Middle East, and Latin America, where water access rates range from 80% to 90%, Africa's freshwater resources consist of approximately 80% transboundary water resources (ADB, 2009). Access to water and sanitation is available to 38% and 65% of the population, respectively. While infrastructure makes up 11–16% of GDP in developing nations, it only makes up 1-3 percent in Nigeria. In comparison, Nigeria's per capita electricity consumption was 138KWH, or enough to run a lamp, whereas that of India, Brazil, and South Africa was 4,98kwh, 2,384kwh, and 4,803kwh, respectively. Nigeria has only 7 houses per 100 people, while South Africa, India, and Brazil have 17, 19, and 30 houses per 100 people, respectively. (AFDB 2018; Ndubisi 2018; World Bank 2018).

Infrastructure is the essential organisational and physical framework needed for society to function. It consists of things like industries, buildings, roads, bridges, health services, governance, security, and so on. In the end, government policy determines how social needs and economic growth are affected by this public good. According to O'Sullivan and Sheffrin (2007), it is the enterprise or the products, services, and infrastructure necessary for an economy to function. a general term that includes ports and airports, warehouses, pipelines for gas and oil, highways, railroads, irrigation, water supply, sanitary conditions, and electricity (The Punch, 2020). It describes "the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions" (Fulmer, 2009). Spending by the government on social services and material resources is

Cite this article as:
Nwikpugi, J.B. (2024). Modeling the relationship between infrastructure, urbanization, and poverty dynamics in Nigeria. *FNAS Journal of Mathematical Modeling and Numerical Simulation, 1*(1), 29-39.

included in the broad term "infrastructure." The world's population is undoubtedly growing faster than ever, especially in Asia, but there's also reason to believe that people are shifting from rural to urban areas in search of better job opportunities.

There is a constant curiosity in if government expenditure on infrastructure has resulted in significant outcomes over time, given the poor quality of infrastructure in almost all developing countries. In the twenty-first century, Nigeria needs the bare minimum of infrastructure, particularly in urban areas, to be globally competitive. According to the NIIMP research, the global benchmark for core infrastructure is approximately 70% of GDP. With 20–25% of GDP allocated to infrastructure in 2012, Nigeria was able to compete with other growing economies like Brazil (47%), India (47%), China (47%), South Africa (47%), Indonesia (47%), and Poland (47%). The nation's infrastructure deficit is a result of the appalling condition of the majority of infrastructure facilities and their state of disrepair, as well as a lack of maintenance culture as seen in the energy, water, and security sectors and the social facilities that Nigerians use. These elements also cause a decline in population productivity, which drives up the nation's poverty rate. Considering that the poverty rate in Nigeria rose to 56.38 percent in 2013, maintaining the nation's current infrastructure has been one of the main obstacles throughout the previous 30 years. Following national foreign and domestic financing facilities that were expected to boost infrastructure development but turned out to be a letdown (Ojo, 2010), these terrible results have been revealed. The lack of continuity in projects by successive governments due to the typical length of time it takes to complete infrastructure projects, policy instability, the long-overdue long-term fund for infrastructure financing, and other factors all contributed to these financing facilities.

Evaluation of the effects of infrastructure spending on social and economic growth is difficult because academic literature lacks a unique methodology, as noted by Snieska and Simkunaite (2009) in their survey of the current scientific literature on the theoretical and practical effects. In contrast, a panel data approach was utilised by Chen et al. (2014), Taghizadeh-Hesary et al. (2021), and Shabu (2010) to demonstrate that there exist bidirectional linkages between urbanisation and economic development in the field of urbanisation and economic development studies. To combat these black drops, this study examines how Nigerian poverty is affected by infrastructure and urbanisation between 1981 and 2022. Other sections of this study is organized as follows. Immediately after the introduction is the second section which is the literature review. Section three is empirical estimation while section four is the summary and rrecommendations.

The word "infrastructure" was coined in the late 1880s and is used to describe anything that is utilised to produce another thing. The foundation of an economy can also be referred to as infrastructure. In an economy, tangible assets play a crucial role through many frameworks and methods. According to and Martini and Lee (1996), infrastructure refers to the supply of basic services to households and businesses. The word "infrastructure" has been used in English at least since 1927, according to the Online Etymology Dictionary. It used to refer to the installations that served as the foundation for any system or undertaking. Economic infrastructure is described by Gramlich (1994) as "large, enduring buildings such as transportation, electricity, communications, and utility networks that facilitate economic activity.

Urbanisation is a benefit directly associated with metropolitan areas that are integral to the industrial sector, according to Edwards et al. (2007). Benefits like abundant technology, easy access to specialised workers, and particular resources are all examples of how it reflects Marshall's externalities. Urbanisation, as defined by Wikipedia, is the movement of people from rural to urban areas, the corresponding decline in the number of people living in rural areas, and the mechanisms by which societies adjust to change. It is caused by a number of factors, including commercialization, industrialization, rural-urban change, changes in lifestyle, employment opportunities, and social benefits. The Environment Agency defines urbanisation as the shift in the population from rural villages to urban towns or from one rural area to an urban area (towns and

The World Bank (2000) and Addae-Korankye (2014) define poverty as a marked deprivation of well-being, which entails that an individual does not have access to the most basic resources required for them. There are several aspects to poverty, including poor income and the inability to purchase necessities for survival and self-worth. A number of factors contribute to poverty, including low income, insufficient resources for a dignified lifestyle, hunger, inadequate healthcare and worsening health, limited access to education, inappropriate housing conditions, and social discrimination, according to the United Nations (1995). Poverty is a complex phenomenon. Aku et al. (1997) assert

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that poverty is linked to physical deprivation in terms of health, nutrition, literacy, education, disability, and low self-esteem. Da Costa et al. (2008) asserts that the state of poverty is one in which every human right is violated. On the other hand, poverty is defined as a person's or a nation's inability to meet their fundamental social, economic, and standard of living needs (OECD 920010). The World Bank (2000) defined poverty as an unbearable denial of human well-being that encompasses psychological and socioeconomic hardships.

The Unbalanced Growth Model

Hirschman (1981), one of the foremost development theorists, is well-known for both his economic development strategy and his groundbreaking ideas on unbalanced growth (UG), a natural path of economic development in which a nation's present conditions are a reflection of its prior development and investment decisions. In Hirschman's view, creating instabilities inside the system is the best way to promote growth. Because they are few in number, the limited resources of the LDCs must be used wisely. Therefore, vital economic sectors should be prioritised over others in terms of income. Since no LDC can realistically invest in every economic area at once to attain balanced growth, attractive investment programme packages in specific and important sectors may nevertheless enhance well-being. Investments that are not balanced may worsen already-existing imbalances or improve them. Hirschman contends that intentionally offsetting the economy in line with the plan is the best course of action for development if the economy is to keep expanding. Instead of aiming for balanced growth, the objective should be to sustain the current imbalances, which are obvious in profit and loss.

Deliberate steps must be taken to unbalance the economy in order for progress to take place. "This may be accomplished by investing in either social overhead capital (SOC) or directly productive activities" (DPA). Investment in SOC is encouraged because it permits and even welcomes DPA to enter the market, and because some SOC investment is required for DPA investment, rather than because it directly affects final production." India, Russia, and Nigeria, to mention a few countries, have embraced this growth model of large investments in SOCs including power, irrigation, transportation, communications, energy, education, and health. This study is relevant because it offers planners practical applications, emphasises the development of industries with the highest level of interconnectedness, and encourages the effective use of finite resources, such as labour and money.

Empirical review

Stungwa and Daw (2021) examined the relationship between infrastructural development, urbanization and economic growth in South Africa. The study used annual panel data gathered from nine provinces for the period 2006–2019 to analyse the association between infrastructure development and population increase on economic growth using cross-sectional seemingly unrelated regression. The findings demonstrated that infrastructure is a poor tool for promoting economic expansion. It was discovered that there was a substantial and positive correlation between provincial government spending and economic growth. According to the study, there is a substantial and negative correlation between unemployment and economic growth. Stungwa and Daw (2021) used annual panel data gathered from nine provinces for the period 2006–2019 to analyse the association between infrastructure development and population growth on economic growth using cross-sectional seemingly unrelated regression. The findings demonstrated that infrastructure is a poor tool for promoting economic expansion. It was discovered that there was a substantial and positive correlation between provincial government spending and economic growth. According to the study, there is a substantial and negative correlation between unemployment and economic growth. Furthermore, the findings demonstrated that population expansion positively and statistically influences economic growth. According to the Granger causality test, there is a unidirectional causal relationship between population increase and infrastructure, indicating that infrastructure development in South Africa is influenced by population expansion.

Ahuja and Pandit (2020) revisit the connection between government spending and economic advancement using a larger panel data set of 59 nations from 1990 to 2019. The hypothesis that there is a unidirectional causal relationship between GDP growth, government spending, and economic growth is supported by the empirical evidence. The Keynesian worldview, which maintains that government spending is crucial for promoting economic growth, is generally supported by the data. The study also shows that, even after taking into consideration all other variables, such as trade accessibility, investment, and inflation, public spending has a beneficial effect on economic growth. It was demonstrated that, in terms of regulating factors, investment had a considerable and positive impact on economic growth.

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Ebuh et al. (2019) conducted a study to provide guidance and support policy by examining the correlation between infrastructure development and Nigerian output growth. The study reinvestigated the relationship between infrastructure investment and economic development using quarterly data from 1997; Q1 to 2017;Q4, based on the Granger causality test based on the time series Vector Error Correction Model (VECM). Revenue, financial infrastructure, and infrastructure stock were found to have a unidirectional causal relationship. A long-term link between the model's variables was also demonstrated, indicating that changes in long-term aggregate revenue may be positively explained by them. In order to better understand the spillover effects among the different infrastructure components, these findings imply that social planners should concentrate more on disaggregated assessments of infrastructure.

The association between road infrastructure investment and economic growth was examined by Moeketsi (2017) in addition to macroeconomic variables like labour input and ICT investment. This PhD thesis makes use of annual time series data from 1960 to 2013. The vector autoregressive model was applied in this study. The importance of labour input, ICT stock, and improvements in road infrastructure was demonstrated by the study's conclusions. Ogbaro and Omotoso (2017) investigated how Nigeria's economic growth between 1980 and 2015 was supported by the country's infrastructural development. Infrastructure is treated as a stock variable, and the ordinary least squares method is used to specify and estimate a Cobb-Douglas production function. The analysis shows that the entire infrastructure of air transport, communication, power, and rail lines all has a positive and considerable influence on economic growth, with estimated elasticities of 0.035, 0.016, 0.141, and 0.132, respectively. The report's conclusion is that the Nigerian government and policymakers would gain by putting infrastructure development plans into action. Furthermore, favourable conditions for public-private partnerships in infrastructure development must be formed, since the government cannot accomplish the task on its own.

Methodology

This study used time series data from the Nigerian Central Bank Statistics Bulletin and followed the expose factor research design. In order to determine whether there is a long-term link between the variables in the model, the autoregressive distributed lag approach (ARDL) based bounds cointegration test is the estimation method used for the study. To make sure that the estimated model does not depart from the fundamental tenet of the classical least squares, the study used a post estimation test.

Model Specification

In the analysis framework of this study on infrastructure, urbanisation, and economic development in Nigeria, the Aik model will be utilised to further alter and depart from the work of Ebuh et al. (2019). Ebuh et al.'s 2019 study looked at the consequences of infrastructure nexus. Time series data from 1997Q1 to 2017Q4 were used in the analytical framework of the study on infrastructure, urbanisation, and economic development. The Granger causality test was performed using VECM based on the time series. The model's specifications were as follows:

Y=f(IINV, ISTK,FINI, IINFL, HC).

Where;

Y =income or output growth proxied by GDP per capita

IINV = infrastructure investment proxied by total government spending across transport, communication, power, water, sanitation and education.

ISTK = infrastructure stock proxied by gross domestic capital formation

FINI = financial infrastructure proxied by domestic credit to private sector,

IINFL =infrastructure inflation proxied by transport composite price index

HC = human infrastructure proxied by domestic population growth rate

However, the present study deviated from these scholars by investigating the influence of infrastructure and urbanization on poverty in Nigeria, this study disaggregate infrastructure by sectors in the model and instead of GDP per capita in place of development, introduced poverty as the dependent variables in distinct models. Hence the functional relationship is presented thus;

The functional form of the model is expressed as thus.

POV= F(TCI, INFL, PRDI,EPSI, UPG) 1

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The mathematical form of the structural equation above is stated as thus:

$POV_t = \alpha_0 + \alpha_{1Ln}TCI_t + \alpha_{2Ln}INFL_t + \alpha 3LnPRDI_t + \alpha_{4Ln}EPS_t + \alpha_{5UPGt}$ 2

The Econometric form of the structural equation above is stated thus;

$POVt = ao + a1LnTCIt + a2LnINFLt + a3LnPRDIt + a4LnEPSt + a5UPGt + \mu t$ 3

Where;
POV_t= Poverty at time t.
TCI_t=Transportation and Telecommunication Infrastructure at time t.
$INFL_t$=Inflation Rate at time t.
$PRDI_t$=No of Paved Roads Infrastructure at time t.
$EPSI_t$=Electric Power Supply Infrastructure at time t.
UPG_t= Urban Population Growth Rate at time t.
$\alpha_{0=}$ constant term
α_1 to $\alpha_{6=}$ unknown parameters to be estimated.
Ln=
t= Time period
α_1 to $\alpha 4_{<0}$ while $\alpha 5_{>0}$
The study's a priori expectation is that while measures of urbanisation have a positive impact on the measures of economic development, increases in all infrastructure components will decrease the study's measure of economic development, which serves as an indicator of economic development.

Results

Table 1: Descriptive Statistics

	POV	UPG	INFL	EPS	PRDI	TCI
Mean	54.46515	39.35061	4.924498	47.41799	21.45089	18.72394
Median	54.90000	39.07000	5.317285	48.00000	19.44706	18.51000
Maximum	66.90000	49.50000	5.743439	59.30000	30.90000	90.03000
Minimum	40.00000	28.84000	3.020501	27.30000	15.00000	0.240000
Std. Dev.	7.356663	6.791065	0.866097	7.869398	5.251630	19.46694
Skewness	-0.589759	0.035896	-0.877883	-0.548170	0.837081	1.901854
Kurtosis	2.932560	1.562890	2.373235	2.503315	2.258189	7.370865
Jarque-Bera	1.919238	2.846853	4.778875	1.991908	4.610511	46.16240
Probability	0.383039	0.240887	0.091681	0.369371	0.099733	0.000000
Sum	1797.350	1298.570	162.5084	1564.794	707.8794	617.8900
Sum Sq. Dev.	1731.856	1475.794	24.00396	1981.678	882.5477	12126.77
Observations	33	33	33	33	33	33

During the study period, the POV, UPG INFL, EPS, PRDI, and TCI series in Nigeria had average values of 54.46515, 39.35061, 4.924498, 47.41799, 21.45089, and 18.72394; the median values were 54.90000, 39.07000, 5.317285, 48.00000, 19.44706, and 18.51000. The fact that the mean value of the variables in question is very near to the median value indicates that they did not deviate from the mean. It is hence capable of withstanding outside attack. 66.90000, 49.50000, 5.743439, 59.30000, 30.90000, 90.03000, and 40.0000, 28.84000, 3.020501, 27.30000, 15.00000, and 0.240000 are the maximum and minimum numbers, respectively. The skewness values of 0.035896, 0.837081, and 1.901854 demonstrate that UPG, PRDI, and TCI have long right tails, while POV, INFL, and EPS have long-left tails, as indicated by the values of -0.589759, -0.877883, and -0.548170. As can be seen from the kurtosis values of 2.932560, 2.373235, 2.503315, and 2.258189, the distributions of INFL, EPS, and PRDI are mesokurtic (normal). In comparison to a normal distribution, the UPG value of 1.562890 is plytokurtic while the TCI value of 7.370865 is leptokurtic. All variables in the study had a normal distribution, with the exception of TCI, which had a substantial probability value.

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Table 2: Stationarity Test (ADF)

S/N	Variables					Order
		T.Stat	Crt.Val	T.Stat	Crt.Val	
1	LOG(EPS)	-5.896708	3.557759	-----	-----	I(0)
2	INFL	-2.150729	-2.960411	-3.920864	-2.960411	I(1)
3	POV	-2.604747	-3.557759	-6.509497	-3.562882	I(1)
4	LOG(PRDI)	-2.680158	-3.562882	-9.545970	-3.622033	I(1)
5	TCI	-3.514333	-3.562882	-3.562882	-3.562882	I(1)
6	UPG	-3.092666	-3.568379	-5.128358	-3.580623	I(1)

Source: Author compilation from EViews 10.05

The stationarity test summary for each time series data set used for the 2022–2021 research of poverty, urbanisation, and infrastructure is presented in Table 1. Test results utilising the Augmented Dickey Fuller (ADF) instrument indicated that all time series data included in the analysis were stationary following first differences, with the exception of the electric power supply infrastructure (EPS). This suggests that although other variables remained stationary following the initial differencing, the infrastructure supporting the electric power supply either went back to its initial state or became stationary at level. Thus, the combination of variables with different orders of integration (I(0) and I(1)) is one of the requirements for using the autoregressive distributed lag (ARDL) approach. The autoregressive distributed lag (ARDL) method estimate is more complex than the ordinary least squares (OLS) estimation because it is a dynamic estimation model that separates the output into its long- and short-term impacts, provided that the variables are cointegrated.

Table 3: Bounds Test for Cointegration

Test Statistic	Value	K
F-statistic	4.713379	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

The above table displays the results of the bounds cointegration test for evaluating the influence of infrastructure and urbanisation on poverty in Nigeria. The result indicates that the variables in the model have a long-term cointegrating relationship. Support for this conclusion is provided by the F-statistic value of 4.713379, which is higher than the critical value of 3.79 at 5%. Based on the information supplied, we verify that there is a long-term cointegrating relationship between the variables used in the estimation. After that, since there is a long-term relationship, we estimate the production in both the short and long terms.

Table 4: Short-Run Error Correction Regression

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POV(-1))	0.660486	0.236653	2.790950	0.0191
D(POV(-2))	-2.557315	0.557063	-4.590707	0.0010
D(UPG)	13.537966	3.356131	4.033801	0.0024
D(UPG(-1))	21.686915	5.076333	4.272161	0.0016
DLOG(EPS)	-12.284391	18.781833	-0.654057	0.5278
DLOG(EPS(-1))	45.696843	21.019111	2.174062	0.0548
DLOG(EPS(-2))	-36.380580	13.590132	-2.676985	0.0232
DLOG(TCI)	-0.755898	1.171380	-0.645305	0.5333
DLOG(PRDI)	28.465845	10.802772	2.635050	0.0249
DLOG(PRDI(-1))	-32.154115	11.131471	-2.888577	0.0161
D(INFR)	-0.374849	0.128153	-2.925005	0.0152
D(INFR(-1))	0.226549	0.105428	2.148841	0.0572
D(INFR(-2))	-0.353471	0.100724	-3.509314	0.0056
CointEq(-1)	-0.481298	0.205174	-2.345806	0.0409

R-squared	0.815585	Mean dependent var	-0.546333
Adjusted R-squared	0.465197	S.D. dependent var	4.921761
S.E. of regression	3.599294	Akaike info criterion	5.634074
Sum squared resid	129.5492	Schwarz criterion	6.568205
Log likelihood	-64.51110	Hannan-Quinn criter.	5.932910
F-statistic	2.327663	Durbin-Watson stat	2.34595
Prob(F-statistic)	0.006041		

0.815585 is the R-square, and 0.465197 is the corrected value. This means that in Nigeria, the interaction between infrastructure and urbanisation accounts for almost 46% of the variation in poverty. In terms of the dependent variable (poverty head count), the coefficient of urban population growth (UPG) has a long-term negative and inconsequential influence because it is statistically insignificant at five percent. demonstrating that Nigeria's growing urbanisation has no impact on the country's poverty. Likewise, the electric power supply coefficient (EPS) has a negative, albeit insignificant, long-term impact on poverty. his suggests that Nigeria's improved access to electrical infrastructure has no long-term impact on poverty. In the near term, however, poverty is positively impacted by the percentage of paved roads. Thus, it's probable that the country's continuous road construction hasn't fulfilled the public's expectations for a decline in poverty. The telecom infrastructure (TCI) parameter has a positive and statistically significant impact on the dependent variable over an extended period of time. Therefore, an increase in the availability of telecommunication infrastructure will lead to a 28.2306 (28.23%) unit rise in poverty if all other parameters stay the same. Implicitly, Nigeria's poverty rates have decreased in tandem with improvements in telecommunications investment. This description, however, differs from the apriori expectation, and it is possible that insufficient control of investments made in Nigeria's telecommunications sector accounts for this situation. It's also conceivable that Nigeria lacks the personnel and material resources required to encourage telecom industry development. That may be the reason for the high cost of telecommunications facilities in the country.

Therefore, an increase in Nigeria's paved road network will lead to a 29.782685 unit rise in poverty if everything else stays the same. It is implicit that the development of paved road networks makes poverty in Nigeria worse. This presentation falls short of the appriori expectation. Since more paved roads are anticipated to encourage the distribution of goods and services across the country, its expected that poverty rate among the people will reduce in the long run.

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The degree of poverty will decrease as a result of enterprises having simple access to markets for the selling of their completed goods and raw resources, which will cause prices to drop. The roads were constructed with subpar materials, which left them in poor condition six months after they were built, which is a reasonable explanation for the current state of affairs. The unsustainable nature of the roads tends to increase people's poor status. Finally, over time, the inflation rate coefficient has a major and detrimental effect on poverty. As a result, a rise in inflation will eventually cause poverty to decline by 0.163448. Stated differently, the rate of poverty rises in tandem with inflation, or the general level of prices.

Table 6: Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UPG	-0.039255	0.292357	-0.134271	0.8959
LOG(EPS)	-9.366534	15.534458	-0.602952	0.5600
LOG(TCI)	0.282306	0.577586	0.488769	0.6355
LOG(PRDI)	29.782685	2.735897	10.885894	0.0000
INFR	-0.163448	0.055251	-2.958273	0.0143
C	-2.774950	50.719303	-0.054712	0.9574

Urban population growth (UPG) has a long-term negative and insignificant effect on the dependent variable (poverty head count), although its statistical significance is under 5%. suggesting that there is little correlation between poverty and Nigeria's increasing urbanisation. Based on the probability value of 0.8959 exceeding the 0.05 threshold, the series is deemed negligible. In a similar vein, poverty is negatively impacted over time by the coefficient of electric power supply (EPS), but very slightly. proving that Nigeria's enhanced provision of electrical infrastructure has no long-term impact on poverty. This argument deviates from economic reality despite its shaky relationship, as more efficient energy delivery has the ability to improve living standards and reduce poverty. The dependent variable, poverty, is positively impacted by the total paved road coefficient in a statistically meaningful way. This shows that Nigeria's ongoing road construction has no impact on the country's long-term poverty. This may be the reason why the country's continuous road construction hasn't brought about the decrease in poverty that the people had hoped for.

In the long run, the communications infrastructure (TCI) parameter has a positive and statistically significant impact on the dependent variable. This means that, in all cases, an increase in the availability of telecommunications infrastructure will lead to a 28.2306 (28.23%) unit increase in poverty. It follows that Nigeria's poverty rates have increased in tandem with an increase in telecommunications investment. This answer, however, deviates from the apriori expectation, and one reasonable explanation for this situation could be the improper tracking of investment in Nigeria's telecommunications sector at all economic levels. Nigeria could not have the personnel or material resources needed to support developments in the telecom industry. It can be the reason behind the astronomical expenses of the country's telecommunications infrastructure.

The PRDI, Nigeria's coefficient of paved roads, has a long-term positive and statistically significant impact on the dependent variable (poverty head count). Given this, increasing the number of paved roads in Nigeria will always lead to a 29.782685 unit increase in poverty. Therefore, poverty in Nigeria is exacerbated by the country's expanding network of paved roads. This argument departs from the appriori expectation since, in accordance with economic theory, more paved roads should increase the nation's distribution of goods and services. As a result of entrepreneurs having easier access to markets for the sale of their completed items and raw materials, which will drive down prices, there will be a decrease in poverty. But, it's possible that subpar materials were utilised in the building process, causing the roads to sustain significant damage just six months after they were constructed. This would explain why things are the way they are.

This means that for every percentage point increase in inflation, poverty will eventually decrease by 0.163448. Therefore, Nigeria's poverty rate or level falls as inflation—the general level of prices—rises. This interpretation or attitude is incompatible with economic theory because it is anticipated that the rate of poverty will rise in tandem with the expansion in the general price level.

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Post Estimation Test.

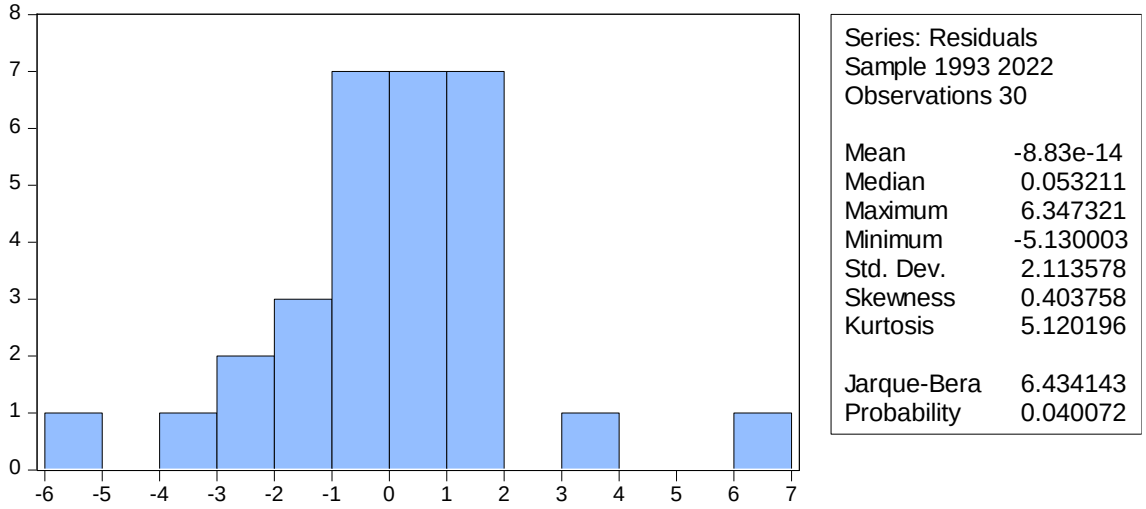

Figure 1: Normality of the Residual Test

To evaluate the validity of the regression, researchers look at the regression residual's normality. Using this exact post estimation test, the researcher will be able to ascertain whether the estimated equation is consistent with the core idea of the ordinary least square. Given the probability value of 0.040072 and the Jarque-Bera statistic of 6.434143, we assert that the residuals are normally distributed.

Table 7: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.614397	Prob. F(2,8)	0.1465
Obs*R-squared	16.06983	Prob. Chi-Square(2)	0.9873

To ascertain whether the error term was serially independent, we performed the Breusch-Godfrey Serial Correlation LM Test. The observed R-square value of 16.06983 and the F- statistic value of 4.614397 are statistically insignificant, with probability values of 0.4154 and 0.9873, respectively. We conclude that the computed equation is BLUE and proclaim that the study's residual exhibits no signs of serial correlation.

Table 8: Heteroskedasticity Test: Breusch-Pagan-Godfrey
Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.265130	Prob. F(19,10)	0.3613
Obs*R-squared	21.18618	Prob. Chi-Square(19)	0.3266
Scaled explained SS	4.849513	Prob. Chi-Square(19)	0.9995

The Breusch-Pagan-Godfrey heteroskedasticity test allowed us to confirm whether the residual variance was equal, which was required by the basic assumption of classical least squares. The accuracy of the classical least squares assumptions can be evaluated using this test. The homoskedasticity test is reversed by it. We find that the residual shows evidence of homoskedasticity, and the estimated equation is BLUE given the F statistic value of 1.265130, the Obs*R-squared value of 21.18618, the Scaled explained SS value of 4.849513, and their probability values of 0.3613, 0.3266, and 0.9995.

Cite this article as:
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Discussion

The test statistic shows that, while urbanization increases poverty in Nigeria, the provision of public infrastructure will reduce the rate of poverty. This exposition is consistent with economic appriori because, economic theory predicted that increased economic activities will reduce the level of poverty. The economic implication of such a causation is that, the continued inflows of migrant into Nigeria is responsible for the growing poverty rate and that, the noticeable fight against poverty is due to the provision of socio-economic infrastructure by the government and private sectors. On the basis of the above, we reject the null hypothesis and accept the alternative hypothesis. This assertion contradicts the views of scholars like Stungwa and Daw (2021).

Conclusion

The current state of Nigeria's infrastructure deficit, which coincides with rising rates of unemployment, poverty, and income inequality, served as the impetus for the study of infrastructure, urbanisation, and poverty in the nation. One major factor that has affected Nigeria's poverty rate, aside from the country's lack of infrastructure, is the population's steady increase in cities. The autoregressive distributed lag (ARDL), as suggested by Pesaran, Shin, and Smith (2001), was used in the investigation. The stationarity condition of the time series data, which reported the presence of mixed order of integration I(1) and I(0), is the foundation for the selection of ARDL as the estimate process. The study concludes that urbanisation and infrastructure, through their impact on poverty, have a major influence on Nigeria's economic advancement. Urbanisation, or the process of more people living in metropolitan regions, has a favourable influence on poverty in particular, while fully paved roads continue to have a positive long- and short-term impact on poverty. In addition, the long- and short-term detrimental effects of poverty have been sustained by the lag values of inflation and the availability of electricity.

Recommendations

The study offered the following recommendations:

(i) Efforts should be made to improve Nigeria's electric power supply in order to foster economic development through the anticipated decrease in poverty.

(ii) In order to reduce production costs and improve accessibility for corporate investment, a concentrated effort should be undertaken to improve the standard of road infrastructure delivery.

(iii) Given that Nigeria's inadequate telecommunications infrastructure has a long-term negative impact on income inequality, steps should be made to improve it.

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