



IMPACT OF ECONOMIC INFRASTRUCTURE INVESTMENT ON ECONOMIC
GROWTH IN NIGERIA

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ABSTRACT

The study examines the impact of economic infrastructure investment on economic growth in Nigeria using data from 1980 to 2021. Real gross domestic product was used as proxy for economic growth. The RGDP was specified as a function of government expenditure on road transportation infrastructure, telecommunication infrastructure, electricity infrastructure and water supply infrastructure. An Autoregressive Distributed Lag (ARDL) model was applied with 4 lags on the maximum dependent variables and co-integration to examine the impact and the long run relationship between dependent and independent variables. The stationarity test carried out, using Augment Dickey-Fuller (ADF) revealed that all the variables were all stationary at first difference 1(1), implying that the variables contain unit root and statistically significant at both 1 percent and 5 percent level of significance. Results of the parameter estimates based on the most consistent and efficient estimation; it was discovered that road transportation infrastructure were found to have positive but statistically insignificant with the estimated coefficient of 0.075947 ($p=0.043 < 0.05$). It was equally discovered that telecommunication and water supply infrastructure were found to have strong positive and statistically significant with estimated coefficient of 0.077978 ($p=0.033 < 0.05$ and 0.076723 ($p=0.134 > 0.05$) respectively. While electricity infrastructure was found to have a negative and insignificant relationship with economic growth with estimated coefficient of -0.051186 ($p=0.044 < 0.05$). The estimation showed that all the variables are co-integrated; meaning that there exists long run equilibrium relationship among the variables. Thus, it was recommended that for Nigeria to achieve infrastructure development to trigger economic growth and development, government should increase its budgetary allocation on the various components of infrastructures for development.

Keywords: Co-integration, Economic, Growth, Infrastructure and Investment

INTRODUCTION

The economists and policy makers believe that investment in public infrastructure is key to economic progress of any nation. Knowledge of the various components of infrastructure investment that speed-up economic growth faster has important policy implication in deciding the right economic system that can best transform the economy. However, the growing controversies are not just the total investment that matters, the controversies, was how the infrastructure can be split between public investment (gross fixed capital formation by the governments) and private investment (gross fixed capital formation by the private sector). Furthermore, national development is a multi-dimensional process that includes political, social, scientific, technological, economic, security, and environment. This is largely determined by the state of a country's infrastructural investment. Nigeria, as a major economic power in Africa, should primarily focus on investing in her critical infrastructure such as electricity, Roads

transportation, telecommunications, and water supply facilities which are currently inadequate to meet the ever-increasing demands of the economy.

Infrastructure is a basic physical and organizational structures needed for the operation of a society, enterprise, services and facilities necessary for an economy to function. Infrastructure is divided into two categories; economic infrastructure and social infrastructure. Economic infrastructure is the combination of basic facilities that is helpful in economic development of an economy and business. Economic infrastructures, are an important input in a nation's production function and a major implication for the attainment of 2030 sustainable economic growth policy. Economic infrastructures contribute to economic growth by increasing productivity, lower unit cost of production and enhances the quality of life. This includes facilities such as telecommunication, electricity, transportation and water supply (Nworji and Oluwalaiye, 2012). While, Social infrastructure is the combination of basic facilities necessary for human development. This included hospitals, schools, and housing infrastructure (Olaseni and Alade, 2012). Infrastructure investment are also often regarded as the wheel of economic activity because of the crucial role they play in providing the foundation upon which production and distribution stands.

According to the World Economic Forum (WEF, 2020), Global competitiveness index, Nigeria's infrastructure is ranked 125 out of 138 countries with a score of 3.3 on a scale of 1 to 7 (1 implies extremely underdeveloped and 7 implies by international standards). The value of Nigeria's total infrastructure stock stood at 35% of GDP, while in South Africa, boast stock of infrastructure worth of 87% of GDP, while the average emerging economies infrastructure stock levels is in excess of 70% of its GDP (Deloitte, 2018). On the ease of Doing Business (2018) "Going beyond Efficiency" ranked Nigeria 148 among 189 countries, and one of the reasons for this poor ranking is unreliable power supply infrastructure. Available statistics from the Nigeria Economic and Recovery Growth Plan 2018 shows that Nigeria's power consumption was 139kwh, while those of India, Brazil and South Africa were at 498kwh, 2,384kwh and 4,803kwh respectively. According to the Global Infrastructure Rating (2021), Nigeria fall within the lower income countries with 25.6% stock of electricity, 50% stock of road transportation, 14% and 7.2% stock of power and 2.8% stock of telecommunication, this revealed that Nigeria is far below the global requirement of infrastructure development for a country that want to attain greater level of economic growth and development by 2030.

The nexus between infrastructure investment on economic growth remains unsettled and this deserved further study of the literature. Against this background, the aim of this study is to examine the impact of economic infrastructure investment on economic growth in Nigeria from 1980 to 2021 for better policy formulation and implementation. Other specific objectives are: to examine the impact of road transportation infrastructural investment and economic growth in Nigeria, to analyzed the extent to which electricity infrastructural investment enhances economic growth in Nigeria; to evaluate the extent to which telecommunication infrastructure investment impacts on the economic growth in Nigeria, and to investigate the effect of Water supply infrastructure investment on the economic growth in Nigeria.

MATERIALS AND METHODS

Sources of Data

The data use for this study were obtained from secondary data covering the period 1980-2021. The data were obtained from the CBN Statistical Bulletin, Publications of National Bureau

of Statistics (NBS) and the various offices of infrastructure sectors. The external publication materials include; documents from World Bank's Indicators, and International Organizations.

Model Specification

In line with the theoretical framework, the model for the study follows the work of Onikosi-Alliyu and Onyeniran (2017) on Autoregressive Distributed Lag (ARDL) Model was used to analysis the data relating to the impact of infrastructural investment on economic growth in Nigeria for the period under investigation. The model is specified as:

$$GDP = F(RTF, TELF, ELEF, WSF) \quad \dots(1)$$

(Meaning that, GDP in Nigeria depends on RTF, TELF, ELETf and WSF)

Taking the natural logarithm of both sides of this model produces a linear equation of the form:

$$\text{Log GDP} = f(\text{Log RTF}, \text{Log TELF}, \text{Log ELETf}, \text{Log WSF}) \quad \dots(2)$$

The stochastic form of the model which will explore a linear relationship between economic growth and investment in infrastructure are stated thus:

$$GDP = \beta_0 + \beta_1 RTF + \beta_2 TELF + \beta_3 ELEF + \beta_4 WSF + \mu_t \quad \dots(3)$$

Equation (3.7) can be transformed into logarithm equation as given below:

$$GDP = \beta_0 + \beta_1 \log RTF + \beta_2 \log TELF + \beta_3 \log ELEF + \beta_4 \log WSF + \mu_t \quad \dots(4)$$

Where:

$\beta_1, \beta_2, \beta_3, \beta_4$ = Slope coefficients which show the rate of change in the value of GDP, when there is a unit change in the value of independent variables.

β_0 = Intercept coefficient which shows the rate at which GDP will change independent of RTF, TELF, ELEF, and WSF.

'U' = Error term which shows other external factors that might affect the magnitude of GDP that are not stated in the model.

GDP = Gross Domestic Product (Economic Growth). RTF = Road Transportation Infrastructure
TELF = Telecommunication infrastructure. ELEF = Electricity infrastructure. WSF = Water Supply Infrastructure

For uniformed scale of measurement and consistent interpretation of results, all variables were transformed to natural logarithm, which allow us to interprets the coefficients as elasticities.

The ARDL form of the above equation is specified as follows:

$$GDP = \beta_0 + \beta_1 RTF + \beta_2 TELF + \beta_3 ELEF + \beta_4 WSF + \mu \quad \dots(5)$$

$$GDP_{t-1} = \beta_0 + \beta_1 \log RTF + \beta_2 RTF_{t-k} + \beta_3 \log TELF + \beta_4 \log TELF_{t-k} + \beta_5 \log ELEF + \beta_6 \log ELEF_{t-k} + \beta_7 \log WSF + \beta_8 \log WSF_{t-k} + \mu_{t-k} \quad \dots(6)$$

GDP_{t-1} = One year lagged valued of Gross Domestic Product, t-k is the length of lag necessary to make the ARDL. All variables are as previously defined. β_0 = is the intercept of the parameter of the model, $\beta_1 - \beta_4$ = Coefficient of the independent variables. β 's. are parameter estimates.

Since there is the possibility of a lag-effect of the stock of infrastructure on GDP, it is possible to run the GDP on the lagged values of the explanatory variables to see the dynamics in both the short-run and the long-run impact of economic infrastructure investment on economic growth. This is to obtain results that are robust to endogeneity that may be caused by reverse causality.

Estimation Techniques

To capture the objectives of this study, the Autoregressive Distributed Lag (ARDL) Bounds testing approach developed by Pesaran *et al.* (2001) was employed to investigate the

impact of infrastructure investment on economic growth of the Nigeria economy. The justification for the use of the model is based on the advantages of the ARDL for testing the existence of a co-integrating relationship either in the short-run or long-run (Johansen and Juselius, 1990). Other advantages of using bound testing cointegration approach is; First, it provides unbiased estimates of the long run model as well as valid t-statistics even when some of the regressors are endogenous. Secondly, the long-run and short-run parameters of the model in question are estimated simultaneously. Thirdly, the model yields consistent estimates of the long-run normal coefficients, irrespective of whether the underlying regressors are stationary at $I(0)$ or at $I(1)$, or a mixture of both. In other words, it ignores the order of integration of the variables. The computation of the ARDL statistical procedure was done with version 9 of the E-views econometric software. The evaluation of the study will be based on the general acceptable apriori. The statistical criterion would concern with the value of the coefficient of determination (R^2) and the significant of the parameter estimates.

Analytical Technique

Unit Root Test

The stationarity test is carried out using the Augmented Dickey-Fuller (ADF) Unit Root Test. The decision rule for the ADF unit root test states that the ADF Test statistics value must be greater than the Mackinnon Critical Value at absolute term for stationarity to be established at level and if otherwise, differencing occurs.

Co-integration Test

The Co-integration test established whether a long-run equilibrium relationship exist among the RTF, ELEF, TELF, WSF and GDP. Economically, variables are co-integration if they have a long term, or equilibrium relationship between them. Johansen co-integration test will be used if the variables are found to stationary at first difference to order $I(1)$.

RESULTS AND DISCUSSION

Unit Root Test based on Augmented Dickey–Fuller (ADF)

Table 1 show the results of unit roots test. As can be observed, all the variables are integrated of order $I(1)$, implying that the variables contain unit root and statistically significant at both the 1 percent, 5 percent, and 10 percent levels of significant. At the 5 percent level of significance, the ADF test statistics are significantly greater than the critical value. Consequently, the null hypothesis of a unit root (non-stationary) is rejected, as such, the level of time series is characterized as integrated of order one because the variables are co-integrated as the linear combination of the individual integrated series $I(1)$ is stationary.

Table 1: Results of Unit Root Test based on Augmented Dickey–Fuller (ADF)

Variables	ADF Test Statistics	1 Percent Critical Value	5 Percent Critical Value	10 Percent Critical Value	P – Value	Order of Stationarity
Real GDP	- 4.13251	-3.610453	-2.933987	-2.607932	0.0025	$I(1)$
Road Trans	-6.311940	-3.605593	-2.936942	-2.606857	0.0000	$I(1)$
Telecom	-5.789817	-3.605593	-2.936942	-2.606857	0.0000	$I(1)$
Electricity	-6.085812	-3.605593	-2.936942	-2.606857	0.0000	$I(1)$
Water Supply	-5.985745	-3.605593	-2.936942	-2.606857	0.0000	$I(1)$

Source: Author's computation, using E-views 9.0, 2023

Unrestricted Co-Integration Rate Test (Trace)

From Table 2, it revealed that there is Co-integration among the variables, because the Trace statistics of 166.11 is greater than the critical value of 95.75 and the Trace statistics of 87.50 is greater than the critical Value of 69.81 at 5% level of significance. We reject the null hypotheses of none* of the hypothesized number of Co-integrating equation and accept the alternative. Similarly, Trace statistics test indicates 2 co-integrating equations at 5% level of significance. For the remaining number of hypothesized co-integrating equation (at most 2, 3, 4 and 5), we do not reject the null hypothesized as their Trace statistics values are less than the critical values at 5 % level of significance.

Table 2: Result of the Unrestricted Co-integration Rate Test (Trace)

Null Hypothesis	n-r	Hypothesized No of CEs	Eigen value	Trace Statistics	0.05 critical value	Prob**
r=0	5	None *	0.907677	166.1119	95.75366	0.0000
r < 1	4	At most 1 *	0.729981	87.50566	69.82789	0.0010
r < 2	3	At most 2	0.542156	44.28922	47.80413	0.1042
r < 3	2	At most 3	0.253830	18.50206	29.79707	0.5261
r < 4	1	At most 4	0.166706	8.809714	15.60471	0.3850
r < 5	0	At most 5	0.084368	2.869045	3.841466	0.0900

Source: Author's own computation; Using E-View 9.0

Trace test indicates 2 Co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level.

Unrestricted Co-Integration Rank Test (Maximum Eigen Value)

Following the Table 3, it reveals that, there is co-integration among the variables. This is because the Max-Eigen statistics of 79.60 is greater than the critical value of 40.08 and the Max-Eigen of 45.22 is greater than the critical value of 35.88 at 5 percent level of significance. We reject the null hypothesis at none* of the hypothesized number of co-integrating equations and accept the alternative. Similarly, the Max-Eigen test indicates co-integrating equations at 5 percent level of significance. For the remaining number of hypothesized equations (at 2, 3, 4 and 5), we do not reject the null hypothesized as their Max-Eigen statistics values are less than the critical values at 5 percent level of significance, meaning that there is a long relationship among the variables employed for the study. Summarily, it implies that there is a long-run relationship between infrastructure investment and economic growth in Nigeria.

Table 3: Result of the Unrestricted Co-integration Rank Test (Maximum Eigen Value)

Null Hypothesis	n-r	Hypothesized No of CEs	Eigen value	Max-Eigen Statistics	0.05 critical value	Prob**
r=0	5	None *	0.907691	79.60632	40.08760	0.0000
r < 1	4	At most 1 *	0.729979	45.22540	35.88687	0.0029
r < 2	3	At most 2	0.542124	25.77816	27.58434	0.0834
r < 3	2	At most 3	0.253827	7.662345	20.13162	0.7750
r < 4	1	At most 4	0.165500	5.976574	14.26460	0.6450
r < 5	0	At most 5	0.083288	2.996941	3.851466	0.0903

Source: Author's own Computation, Using E-view 9.0

Max-Eigen test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Error Correction Mechanism (ECM) Test

The ECM estimates on Table 4 indicated that there is correlation between Gross Domestic Product (GDP) and the four independent variables. With this outcome, it means that there is an existence of a long run economic relationship between the dependent variable (GDP) and the explanatory variables (RTF, ELTF, TELF, and WSF). The R-square of 0.597013 (Appr. 60 %) indicates that about 60 percent of the result is accounted for by the included explanatory variables, meaning that the regression is not spurious.

The ECM p-value of 0.0001 is less than 5% which signifies that the stability condition required to conduct this type of investigation is satisfied. Thus, the ECM is significant, fractional and negative which justifies the stability condition. The estimated coefficient value of ECM (-0.873029) has a priori (negative) sign. This is in line with the expectation and is an indication of the fact that any short-run disequilibrium or fluctuations between the dependent variable and the independent variables will adjust to a stable long-run relationship among the variables. The coefficient value also means that the speed of adjustment is 87%. This is a fast speed of adjustment.

Table 4 Error Correction Mechanism Result (ECM)

Variables	Coefficient	Std. Error	t. Statistics	Prob
C	0.052185	0.037005	1.507874	0.1503
D (LRTF)	0.124064	0.253944	0.551525	0.5855
D (TELF)	0.287365	0.296588	0.964220	0.0340
D(ELEF)	- 0.823576	0.607516	-355645	0.0180
D(WSF)	0.760457	0.350045	2.718186	0.0113
ECT (-)	- 0.874530	0.192620	-4.808794	0.0001

Source: Author's Own Computation, using E-view 9.0, 2023.

Included observation: 34 after adjusting endpoints.

Granger Causality Test

The Granger Causality test was conducted and presented in Table 5 to ascertain the causality between the variables (RTF, TELF, ELEF, and WSF) in the model and economic growth in Nigeria. Following the granger causality test presented, it revealed that there is uni-directional causality between Real Gross Domestic Product (RGDP) and Road Transportation Infrastructure (RTF) and it flows from Real Gross Domestic Product (RGDP) to Road Transportation Infrastructure. This implies that Road transportation infrastructure (RTF) granger cause Gross Domestic Product (GDP) in Nigeria. This means that changes in Road Transportation Infrastructure (RTF) precedes changes in Gross Domestic Product (GDP) as its p-value is less than 5% level of significance.

Similarly, the result reveals that there is unidirectional causality between Telecommunication infrastructure (TELF) and Real Gross domestic product (RGDP) in Nigeria, it flows from Telecommunication infrastructure (TELF) to Real Gross Domestic Product (GDP). This suggest that Telecommunication infrastructure (TELF) Granger Cause Real Gross domestic product (RGDP), likewise, Gross domestic product (RGDP) Granger Cause Telecommunication infrastructure (TELF) since their p- values each is less than 5% level of significance.



The granger causality test on Electricity infrastructure (ELEF) also revealed a unidirectional causality between Electricity infrastructure and Real Gross Domestic Product (RGDP) and it flows from Electricity infrastructure (ELEF) to Real Gross Domestic Product (GDP). This implies that Electricity infrastructure (ELEF) granger causes Gross Domestic Product (GDP), likewise, Gross Domestic Product granger cause Electricity infrastructure (ELEF), and its P- value is greater than 5% level of significance. Therefore, Electricity Infrastructure (ELEF) has a strong but insignificant influence on Economic growth in Nigeria.

The Granger causality also reveals that there is uni-directional causality between Gross Domestic Product (GDP) and Water supply infrastructure (WSF) which flows from Gross Domestic Product to Water supply infrastructure in Nigeria. This indicates that Gross Domestic Product Causes Water supply infrastructure as its probability (P) value is less than 5% level of significance. It therefore revealed that, changes in Gross domestic product precedes changes in Water supply infrastructure. This indicated that Gross domestic product has a strong and significant influence on Water supply infrastructure for economic growth in Nigeria.

Similarly, the Granger causality results reveals that there is uni-directional causality between Telecommunication infrastructure (TELF) and Road Transportation infrastructure (RTF) which flows from Road Transportation infrastructure (RTF) to Telecommunication infrastructure (TELF) in Nigeria. This indicates that Road Transportation infrastructure causes Telecommunication infrastructure as its probability (P) value is less than 5% level of significance. This shows that, Telecommunication infrastructure precedes changes in Road Transportation infrastructure.

The Granger causality results also revealed that there is uni-directional causality between Electricity infrastructure (ELEF) and Road Transportation Infrastructure (RTF) which flows from Electricity infrastructure (ELEF) to Road Transportation Infrastructure (RTF) in Nigeria. This implies that Electricity infrastructure causes Road Transportation Infrastructure (RTF) as its probability (P) value is less than 5% level of significance. There is uni-directional causality between Water Supply Infrastructure (WSF) and Road Transportation infrastructure (RTF) which flows from Water supply infrastructure (WSF) to Road Transportation infrastructure (RTF) in Nigeria. This implies that Water supply infrastructure causes Road Transportation infrastructure (RTF) as its P value is less than 5% level of significance.

The Granger causality result shows that there is no uni-directional relationship between Electricity Infrastructure (ELEF) and Telecommunication infrastructure (TELF) which flows from Electricity Infrastructure (ELEF) to Telecommunication infrastructure (TELF) in Nigeria. This means that Electricity infrastructure (ELEF) does not Granger Cause Telecommunication infrastructure (TELF) and likewise Telecommunication infrastructure does not granger cause Electricity infrastructure (ELEF) since their probability (P) value is greater than 5% level of significance.

The Granger causality shows a uni-directional relationship between Water Supply infrastructure (WSF) and Telecommunication infrastructure (TELF) which flows from Telecommunication infrastructure (TELF) to Water supply infrastructure (WSF) in Nigeria. This implies that Water supply infrastructure (WSF) causes Telecommunication infrastructure (TELF) as its probability (P) value is less than 5% level of significance. This means that Water supply infrastructure (WSF) influences Telecommunication infrastructure (TELF) In Nigeria during the period under review.

Also, the granger causality test reveal that there is no causality between Water supply infrastructure (WSF) and Electricity Infrastructure (ELEF) in Nigeria. This means that Water supply infrastructure (WSF) does not Granger Cause Electricity Infrastructure (ELEF), and likewise, Electricity Infrastructure (ELEF) does not Granger Cause Water infrastructure (WSF) since their p- values each is greater than 5% level of significance. This suggests that, there is no causal influence between Water supply infrastructure and Electricity Infrastructure.

Table 5. Results of Granger Causality Test

Null Hypothesis:	Obs	F-statistics	Prob.	Remark
RTF does not Granger Cause RGDP	40	0.07776	0.9253 *	Accept Ho
RGDP does not Granger Cause RTF		4.43320	0.0192 **	Reject Ho
TELF does not Granger Cause RGDP	40	5.45162	0.0087**	Reject Ho
RGDP does not Granger Cause TELF		0.75271	0.4786*	Accept Ho
ELEF does not Granger Cause RGDP	40	3.99398	0.0274**	Reject Ho
RGDP does not Granger Cause ELEF		1.13390	0.3333*	Accept Ho
WSF does not Granger Cause RGDP	40	1.49714	0.2378*	Accept Ho
RGDP does not Granger Cause WSF		8.24707	0.0012**	Reject Ho
TELF does not Granger Cause RTF	40	7.63911	0.0018**	Reject Ho
RTF does not Granger Cause TELF		0.25922	0.7731*	Accept Ho
ELEF does not Granger Cause RTF	40	5.78211	0.0068**	Reject Ho
RTS does not Granger Cause ELEF		0.43205	0.6526*	Accept Ho
WSF does not Granger Cause RTF	40	0.90228	0.4149 *	Accept Ho
RTF does not Granger Cause WSF		5.73697	0.0070**	Reject Ho
ELEF does not Granger Cause TELF	40	0.12144	0.8860*	Accept Ho
TELF does not Granger Cause ELEF		0.43093	0.6533 *	Accept Ho
WSF does not Granger Cause TELF	40	0.36342	0.6979*	Accept Ho
TELF does not Granger Cause WSF		3.13941	0.0557 **	Reject Ho
WSF does not Granger Cause ELEF	40	0.29000	0.7500 *	Accept Ho
ELEF does not Granger Cause WSF		1.74151	0.1901*	Reject Ho

Source: Author's Own Computation. E-views 9.0, 2023 Note: * means accept Ho; ** means reject Ho.

Estimation of the Regression Model based on ARDL Analysis

From the regression on Table 6, it was revealed that the coefficient of Road Transportation infrastructure (LRTF) (0.075947), is positively signed which conformed with apriori expectation but statistically insignificant. This implies that Road Transportation infrastructure (RTF) insignificant in determining Economic growth in Nigeria within the period under review. Also, the probability value (0.1718) of road transport infrastructure is less than 5% (0.05) level of significance; hence, the null hypothesis (Ho) is rejected.

The coefficient of Telecommunication infrastructure (TELF) (0.077978), is positively signed and this agreed with the apriori expectation as stated in the model specification, and its statistically significant. This implies that TELF has a strong influence on Economic growth in Nigeria, within the period under review. The corresponding probability (p) value (0.0033) of telecommunication infrastructure is less than 5% (0.05) level of significance; hence, the null hypothesis (H_0) of no significant effect is rejected. Therefore, telecommunication infrastructure is significant in determining gross domestic product (economic growth) in Nigeria within the period under review.

The coefficient of Electricity infrastructure (-0.051186), is negatively signed, which negates the apriori expectation. This implies that, there is an inverse relationship between electricity infrastructure (ELF) and gross domestic product (GDP) in Nigeria. This indicated that Electricity infrastructure has a strong negative coefficient but not significant as its p-value (0.0438) is less than 5% (0.05) level of significance. Thus, the null hypothesis (H_0) of no significance effect of electricity infrastructure on economic growth in Nigeria is accepted against the alternative. The finding implies that electricity infrastructure is not significant in determining economic growth in Nigeria within the period under review.

The coefficient of Water supply infrastructure (0.076723), is positively signed, implying positive relationship between Water supply infrastructure and gross domestic product in Nigeria. This finding is in agreement with a priori expectation. Water supply infrastructure was found to be insignificant as its p-value (0.1340) is greater than 5% (0.05) level of significance. ; hence, the null hypothesis (H_0) of no significant effect of Water supply infrastructure on economic growth is rejected. It can be concluded that water supply infrastructure is not significant in determining gross domestic product (economic growth) in Nigeria within the period under review.

From the results of the parameter estimate, all the variables except electricity infrastructure have positive relationship with economic growth in Nigeria. According to the regression results, the estimated coefficient shows that in the long-run, road transport infrastructure (RTF) exhibited a fairly significant relationship indicating that real Gross Domestic Product (GDP) grows by about 8 percent (0.075947) for every one unit change in road transport infrastructure, holding all other variables constant. On the other hand, the result show that real GDP grows by about 8 percent (0.077978) for every one unit change in telecommunication services, holding all other variables constant. Contrarily, the estimated coefficient reveals that real GDP declines by about 5 percent (-0.051186) for every one unit change in electricity supply, holding all other variables constant. Estimated coefficient also show that real GDP grows by about 8 percent (0.076723) for every one unit change in water supply infrastructure, holding all other variables constant. The estimations revealed that all the variables are co-integrated – meaning that there exist long-run equilibrium relationship among the variables, and any short-run disequilibrium from the long-run trend can easily be corrected by the application of appropriate adjustment mechanism.

The f-statistics value of 1654.71 which measure the joint impact of the explanatory variable is significant at 1 percent as indicated by the corresponding probability value of 0.0000. The implication is that the null hypothesis is rejected at 1 per cent and this indicated that the independent variables are jointly significant. The R^2 value of 0.999008 implies that 99% of the total variation in GDP in Nigeria was explained for by the independent variable or regression equation. The goodness-of-fit of the regression remained high after adjusting for the degree of freedom as indicated by the R^2 adjusted (0.998404) or 99.8%. The R-square shows that not only the included variables in the model that affected Gross Domestic Product (economic growth) in

Nigeria, but there are other variables that are not captured but affects GDP in Nigeria higher than those captured. The Durbin-Watson statistics (1.870477) is higher than R^2 (0.999008) indicating the absence of autocorrelation was not a problem.

Table 6: Estimation of the Regression Model based on ARDL Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LRGDP(-1)	0.390883	0.161471	2.420761	0.0238
LRGDP(-2)	0.468508	0.149384	3.136266	0.0046
RTF	0.075947	0.053846	1.410443	0.1718
TELF	0.077978	0.023787	3.278224	0.0033
ELEF	-0.051186	0.023993	-2.133318	0.0438
LES(-1)	0.025563	0.012733	2.007629	0.0566
LES(-2)	-0.012788	0.012865	-0.994046	0.3305
LES(-3)	-0.024609	0.015681	-1.569276	0.1302
LES(-4)	-0.018838	0.010882	-1.731100	0.0968
WSF	0.076723	0.049396	1.553235	0.1340
LWSF(-1)	-0.070300	0.071957	-0.976978	0.3387
LWSF(-2)	0.041789	0.058125	0.718955	0.4794
LWSF(-3)	-0.144960	0.047208	-3.070675	0.0054
LWSF(-4)	0.038948	0.031949	1.219075	0.2352
C	0.858064	0.463178	1.852558	0.0768
R-squared	0.999008	Mean dependent var		7.554211
Adjusted R-squared	0.998404	S.D. dependent var		0.227770
S.E. of regression	0.009098	Akaike info criterion		-6.274144
Sum squared resid	0.001904	Schwarz criterion		-5.627728
Log likelihood	134.2087	Hannan-Quinn criter.		-6.044154
F-statistic	1654.793	Durbin-Watson stat		1.870477
Prob(F-statistic)	0.000000			

Source: Author's Own Computation, using E-View 9.0, 2023. Sample: (adjusted): 1981-2022 Dependent variable: LRGDP

CONCLUSION AND RECOMMENDATIONS

The result reveal that all the variables are co-integrated and Road Transportation infrastructure (RTF) were found to have positive but statistically insignificant impact on economic growth in Nigeria. Telecommunication infrastructure (TELF) and Water supply infrastructures (WSF) were found to have a strong positive and statistically significant impact on economic growth in Nigeria. While Electricity has a negative relationship with economic growth in Nigeria. The study recommends that there is the need for government to improve road network across regions and states in Nigeria through massive investment across the trunks of road that would guarantee easy access to market for goods and services and for factor mobility.



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