

RESEARCH ARTICLE

THE IMPACT OF INFRASTRUCTURE FINANCING ON INDUSTRIAL SECTOR PERFORMANCE IN NIGERIA 1986-2022

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Abstract: This study investigated the impact of infrastructure financing on industrial sector performance in Nigeria 1986-2022, the specific objectives of the study were to: investigate the impact of government economic infrastructure financing on the performance of the industrial sector in Nigeria; determine the impact of government social infrastructure financing on the performance of the industrial sector in Nigeria; and investigate the effect of government industrial loans on the performance of the industrial sector in Nigeria. The study adopted quantitative research using time series data and employed the autoregressive distributed lag (ARDL) to analyze the data. The series indicated to be stationary at 1(0) and 1(1). The ARDL Bounds test indicated evidence of long-run relation of the variables. The major findings of the study were: government economic infrastructure financing was positive but not significant, social infrastructure financing was positive and significant, and government industrial loan was positive and significant. The study concluded that infrastructure financing impacted significantly on industrial sector within the period reviewed. The implication of these findings for policy is that government infrastructure interventions are streamlined towards economic and social activities. Based on the findings, the study recommended that there is need for the government to embark on aggressive expansion programs on economic infrastructures; and also there is need to ensure that infrastructures provided are accompanied by proper maintenance mechanism to ensure optimal functioning and benefits.

Keywords: *Economic and social infrastructure, Finance, industrial sector, ARDL.*

Article Received: 30 March 2024

Revised: 18 April 2024

Accepted: 29 April 2024

INTRODUCTION

The impact of infrastructure financing in driving industrial transformation has been a subject of discourse in economic literature (Okolo, Edeme and Chinanuife 2018). There are arguments that the development of a modern nation to its full potential can never be attained without those critical infrastructure investments that generate huge capacities for the industrial sector. One of the many channels (although critical) through which industrial sector growth can be streamed is through enhanced and expanded infrastructure financing.

Much of the debate on ways to spur growth and performance of the industrial sector in Nigeria, reduce poverty and achieve other sustainable development goals (SDGs) is centered on the need to promote large increase in infrastructure investment (World Economic Forum, 2017).

The common argument for a large increase in infrastructure financing is that it has a strong growth-generating effect through the productivity of the industrial sector (Barro, 1990).

The industrial sector in Nigeria comprise economic activities of those businesses such as manufacturing, mining, and utilities. Industrial Production in Nigeria increased 1.60 percent in the fourth quarter of 2020 from its value during the same quarter in 2019 (CBN, 2020). The industrial Production in Nigeria averaged 1 percent from 2007 until 2020, reaching an all-time high of 25.10 percent in the fourth quarter of 2019 and a record low of -20.40 percent in the first quarter of 2016 (Nairametrics, 2020).

According to this source, the growth rate of the sector, on a quarter-on-quarter basis,

stood at 5.60%. However, in nominal terms, the sector's GDP growth at the end of the fourth quarter of 2020 was recorded at 24.60% (year-on-year), this is -1.69% points lower than 26.29% recorded in the corresponding period of 2019 but 11.06% points higher than the preceding quarter (13.54%).

The Nigerian industrial sector is a very key component in the country's drive for economic diversification. Over the past years, the sector has grown consistently at about an average of 2.6%. As at the first quarter of 2020, industrial sector accounted for about 9.7% of the Nigerian gross domestic product (GDP) compared to oil and gas (9.5%), financial services (3.8%) and trade (16.1%).

The industrial sector has been identified as one of the sectors that can help drive the Nigerian economy at this critical time that crude oil as a major source of revenue for the nation is falling at the international market.

To obtain improvements in industrial sector growth, the application of infrastructure financing is advocated. The stream of infrastructure financing comprise government expenditure on economic infrastructure like roads, railways, standardization of the airports for cargo services, and modernization of the seaports.

also government expenditure on the provision of social infrastructures which improve wellbeing and the social support necessary for industrial production; and then the offering of industrial loans which boost capital importation for manufacturers.

Infrastructure financing is therefore mainly threefold. Improving electricity infrastructure for instance is critical manufacturing activities, good road infrastructure is a precondition for enhance mobility and transportation logistics of industries, the railway, seaports and airport infrastructure serve to enhance import-export trade by industrial producers. The implication of the foregoing is that infrastructure financing debate is no misplaced.

The growing need for expansions in infrastructural projects (hence infrastructure financing) has seen a correspondingly

geometric growth in capital expenditure of government.

The increase in capital expenditure is accompanied by the need for financing solutions. Available data show that the option of deficit operations entered government financing strategy in 2003 where federal government held a bond-debt obligation to the tune of ₦72.56 billion which by the year 2005 had more than tripled to ₦250.83 billion (CBN 2016).

Infrastructure financing by the Nigerian government comprises of those expenditures that provide critical infrastructures that are necessary for industrial production and sustainable growth. According to the broad classification of infrastructure financing presented by Wale (2013), it includes economic or hard infrastructure financing; and social or soft infrastructure financing.

Statement of the Problem

Available data (NBS, 2020) show that the industrial sector output grew by 0.77 % in 2019 and 2.09% in 2018. It is essential to understand that in nominal terms, without factoring in the change in prices in 2020, the Nominal GDP of the sector recorded a growth rate of 16.44 % at the end of the year, compared to 34.73 % in 2019.

However, the real GDP of the industrial sector contracted by -2.75% in 2020 (Nairametric, 2020). This signaled the end of a two-year run of real growth in the sector. The contraction in the real GDP of the sector, leaves the sector in a vulnerable position. From forecasts by NBS (2020) industrial Production in Nigeria was expected to be 12.00 percent by the end of the first quarter of 2022; Trading Economics global macro models and analysts have also aligned with this expectation.

However, present assessment of sectoral performance of the sector suggests otherwise. In the long-term, the Nigeria Industrial Production was projected to trend around 3.00 percent in 2022 and 2.70 percent in 2023, according to their econometric models.

However, these have been far from realization due to the problem of infrastructure deficits in the country despite various efforts by government to bridge the infrastructure-industry gap.

Hence, the objective of this study was to determine the impact of government infrastructure financing on the performance of the industrial sector in Nigeria for the period 1986-2022. The specific objectives are: specifically, the study:

- Investigated the impact of government economic infrastructures financing on the performance of the industrial sector in Nigeria
- Determined the impact of government social infrastructure financing on the performance of the industrial sector in Nigeria
- Investigated the effect of government industrial loans on the performance of the industrial sector in Nigeria

LITERATURE REVIEW

Infrastructure

Oshikoya, Jerome, Hussein and Mlambo (1999) defined infrastructure as social (or soft-core), or physical (or hard-core) infrastructure. They contended that soft-core infrastructure had to do with healthcare, governance, education, and accountability, as well as property rights, which are the driving forces of economic activities; whereas, hard-core infrastructure had to do with physical structures such as transport facilities, telecommunication facilities, power, water, and sewage, which they characterized as wheels of economic activities.

Infrastructure is the general term for the basic physical systems of a business, region, or nation- transportation systems, communication networks, sewage, water, and electric systems. These systems tend to be capital intensive and high-cost investments, and are vital to a country's economic development and prosperity. Projects related to infrastructure improvements may be funded publicly (government spending), privately, or through public-private partnership financing models.

In economic terms, infrastructure often involves the production of public goods, hence it is the foundation upon which the structure of the economy is built. Because infrastructure very often involves the production of public goods, it is very typical to see public financing, control, supervision, or regulation of infrastructure.

Infrastructure Financing

Infrastructure financing relates to the commitment of financial resources towards the provision of infrastructural facilities (both economic and social infrastructures). Infrastructure finance frequently involves Public-Private Partnerships, or PPPs, where government entities call upon private lenders to help finance the construction of essential national infrastructure such as fiber-optic networks, water treatment plants, or high-speed rail lines. The stream of infrastructure financing in Nigeria is threefold.

These are classified under financing solutions that are directed towards provision of economic infrastructures (those which enable business and economic activities; roads, railway, electricity, communication, seaports, airports, bridges, dams etc), and social infrastructures (those require to run institutions). Financing infrastructure is theorized to boost industrial sector performance, therefore infrastructure financing is growth-enabling.

Theoretical Framework

The theoretical underpinning for this study follows the theory of Increasing State Activities by Wagner. This theory is ascribed to the German economist Adolph Wagner (1835-1917). Wagner advanced the theory of rising public expenditures by analyzing trends in the growth of public expenditure. It is postulated that:

- The extension of the functions of the states leads to an increase in public expenditure on administration and regulation of the economy.
- The development of modern industrial society would give rise to increasing political pressure for social progress and call for increased allowance for social consideration in the conduct of industry.
- The rise in public expenditure will be more than proportional increase in the national income (income elastic wants) and will thus result in a relative expansion of the public sector through economic units (industrial sector). Musgrave and Musgrave (1988), in support of Wagner's law, opined that as progressive nations industrialize, the share of the public sector in the national economy grows continually.

Empirical Literature

Abiodun and Kehinde (2020) examined the dynamic impact of capital inflows on manufacturing exports and economic growth in Nigeria between 1981 and 2017 using annual data. Data collected were analyzed using Autoregressive Distributed Lag (ARDL) econometric techniques and the results revealed that capital inflows have significant and positive impact on economic growth ($t= 4.42884$, $p< 0.005$) both in the short and long run; and positive but statistically insignificant impact on manufacturing exports ($t= 0.73$, $p> 0.05$).

Therefore, the study concluded that capital inflows have significant impact on economic growth but no impact on the manufacturing exports in Nigeria; and we recommend that the government and monetary authorities' in Nigeria should formulate economic policies that will promote manufacturing exports through adequate and efficient infrastructural facilities that would encourage the needed capital inflows to the manufacturing sector and increase the production of goods for local consumption and export.

Babatunde (2018) investigated the impact of government spending on infrastructure and economic growth in Nigeria using both primary and secondary data. Findings from the study indicate that government spending on transport and communication, education and health infrastructure has significant effects on economic growth while spending on agriculture and natural resource infrastructure has adverse effect on economic growth. Umofia, Orji, and Worika (2018) analyzed the effects of infrastructure on the industrial sector performance of Nigerian economy.

Descriptive statistics to establish the trends, the unit root test (using Augmented Dickey-Fuller) to test for stationarity, co-integration test (using Johansen co-integration) to check for long-run relationships between the variables in the model, and the dynamic ordinary least squares were adopted, using time series data spanning from 1980 to 2016. Industry valueadded was used as an indicator of Nigeria's industrial sector performance, while electricity supply, gross capital formation, and federal government spending on transport and communication

were used as indicators for infrastructural development.

The results of showed that electricity supply exerted a positive but insignificant impact on industry value-added; gross capital formation and federal government spending had a positive but significant impact on industry value-added (on a 5% confidence level). The study recommended that measures to revamp and maintain the power sector of Nigeria must be taken seriously to ensure better supply of power.

It was also recommended that corruption be curbed and funds disbursed to infrastructural development, and be monitored to ensure that the project it was allocated for is carried out and that adequate infrastructure will be built and properly maintained to encourage greater level of industrial experience and performance.

Similarly, Ogbaro and Omotoso (2016) examined the role of infrastructure development in promoting economic growth in Nigeria over the period 1980-2015. A Cobb-Douglas production function which model infrastructure as a stock variable is specified and estimated using the ordinary least squares method. The study finds positive and significant effects of total air transport infrastructure, communication infrastructure, power infrastructure and total rail lines on economic growth with estimated elasticities of 0.035, 0.016, 0.141 and 0.132, respectively.

The study recommends that it will be worthwhile for the Nigerian government and policymakers to implement policies geared towards the development of infrastructure. Also, since the government cannot do it alone, an enabling environment should be created to encourage Public-Private Partnership in infrastructure development.

METHODOLOGY, MODEL AND DATA

Since the data used for this study are secondary source time series data, the research design adopted is the *ex post facto* which combines theoretical consideration with empirical observation (Baghebo and Atima, 2013). This type of design has proved some more than satisfactory level of accuracy in enabling researchers to observe the effects of the explanatory variables on the explained

variable. The data employed in this work which covers the period 1986-2022, will be subjected to unit root, co-integration, and error correction.

Model Specification

The model explains industrial sector performance as a function of government economic infrastructure financing, government social infrastructure financing, and government industrial loan. The model below is specified for this study:

$$ISGDP = f(GSEI, GSSI, GIL)$$

$$RGDP = \beta_0 + \beta_1GSEI + \beta_2GSSI + \beta_3GSSI + \mu t,$$

where: ISGDP = Industrial Sector Gross Domestic Product which represents industrial sector performance; GSEI =

government spending on economic infrastructure; GSSI = government spending on social infrastructure; and GIL= government industrial loans; U_t = error term with zero mean and constant variance; and β_0 = parameters to be estimated. The specified model implies that industrial sector performance is influenced by government expenditure in the provision of economic infrastructure (GSEI), government expenditure on the provision of social infrastructures (GSSI), and government credit interventions to the industrial sector in form of loans. The μt is a stochastic white noise error term with zero mean and constant variance, while β_0 are parameters to be estimated.

RESULTS AND DISCUSSIONS

Unit Root Test for Stationarity

Table 1: Summary of unit root test results

Variables	@level	@1 st diff	C.V	Order remark
ISGDP	5.615363	-	3.53	1(0) stationary
GSEI	1.402578	5.640419	3.54	1(1) stationary
GSSI	1.776202	5.907791	3.540	1(1) stationary
GIL	1.891026	4.910271	5.54	1(1) stationary

Source: Authors' computation using E-views

The test for stationarity (the Augmented Dickey Fuller approach) showed that the dependent series (ISGDP) and the independent series (GSEI, and GSSI) did not all achieve stationarity @ level. While ISGDP became stationary @level, others were stationary after being subjected to first differencing. Differencing is done when the series fail to be stationary @ level; stationarity was concluded where the ADF statistic was found to be greater than the 5% critical value or where the probability value

(P-value) was observed to be less than (0.05). Hence, stationarity and integration was achieved at order 1(0) and 1(1) respectively.

Test of Long-run Relationship

The series were not all stationary and integrated of the same order. As a consequence and in following the standard econometric estimation procedure the Johansen cointegration test is not suitable. The most suitable long run test is the Bounds test of long run relationship, the result is presented below.

Table 2: Cointegration test result

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	109.8313	2
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

Source: Author's computation using E-views

As seen in table 4 above, the test statistic of the Bounds test of long run relationship indicates the presence of a long-run relationship among the variables at 5% level of significance, thereby leading to the

rejection of the null hypothesis of no long-run relationship and acceptance of the alternative. There are three options for the decision criteria when using the Bounds approach to cointegration: if the F-stat is

greater than the critical value for the upper bound 1(1) then we can conclude that there is long-run relationship; if the f-stat falls below the critical value for the lower bound 1(0), there is no cointegration, hence no long-run relationship; and the test is considered inconclusive if the f-stat falls between the

lower bound 1(0) and the upper bound 1(1). The obtained f-stat of 109.8313 is greater than the critical value for the upper bound 1(1) at 5% level of significance (109.8313 > 4.85), hence it is concluded that the variables show evidence of long-run relationship.

Regression Result

Table 3: Summary Test ARDL Result

Dependent variable: ISGDP				
Variable	Coefficient	Std. Error	T-statistic	Prob.
GSEI	0.839326	3.053738	0.274852	0.7851
GSSI	30.44326	10.15584	2.997611	0.0051
GIL	11.971024	2.017131	3.014681	0.0010
R-squared	R-squared			
F-stat	138.8170			
Prob (F-stat)	0.000000			

Source: Authors' computation using E-views

The table above indicates that the infrastructure spending variables (government spending on economic infrastructure) and (government spending on social infrastructure) conformed to their a priori predicted sign (GSEI > 0, and GSSI > 0). An increase in both spending streams and the loans extended to the sector increases the output of the sector by (0.839 billion naira), (30.44 billion naira) and (11.97 billion) respectively. The empirical value of the coefficient of determination ($R^2 = 0.799185$) shows that 79.92% of the additions to aggregate output of the economy (economic growth) is streamed from concerted efforts in

the provision of the necessary infrastructure needed to run businesses and the economy. Economic theories and empirical evidence have supported the notion that infrastructures are the basic foundations upon which the economy is run, these structures support businesses, provide jobs and income and ultimately create growth enabling indices which trigger rapid expansions in the aggregate economic out of the economy.

Post Estimation Tests

The Standard Error Test of Significance of the Parameter Estimates

Table 4: Standard Error Test result

Variable	Coefficient	Std. Error	T-statistic	Prob
GSEI	0.839326	3.053738	0.274852	0.7851
GSSI	30.44326	10.15584	2.997611	2.997611
GIL	11.971024	2.017131	3.014681	0.0010

Source: researcher's computation using E-views (version 10, see appendix 3)

Based on the hypotheses for the standard error test, the observations and decisions are summarized in the table above. The result indicates that only the government spending on social infrastructure is a significant variable in the model. The variable on government spending on the provision of economic infrastructure was found not to be significant.

This should not come as a surprise because it only has emboldened the evidence that there is infrastructure deficit especially those that support businesses and create growth enabling activities.

The F-test of joint influence and overall significance

To test for the joint influence of the explanatory variables (government spending on both economic and social infrastructures) on the explained (real gross domestic product), the hypotheses are stated thus:

H_0 : the overall regression is not statistically significant

H_0 : the overall regression is statistically significant

To reject the null hypotheses, the p-value of the *f*-statistic must be less than 0.05. The p-value of the *f*-statistic obtained (0.000000) is less than 0.05 i.e, $0.000000 < 0.05$.

Therefore, the study hereby rejects the null hypothesis and conclude that the overall regression is statistically significant.

Test of Serial Correlations

Table 5: Autocorrelation test result

F-statistic	F-statistic	Durbin-Watson stat	2.402437
Prob (F-statistic)	0.000000		

Source: Authors' computation using E-views

In checking for autocorrelation and serial correlation in a model, and among the independent variables of a model, the goal is to enforce model reliability of the model. To this effect, the Durbin Watson statistic is used under the following hypotheses:

H₀: there is no serial correlation in the model

H₁: there is serial correlation in the model

The null hypothesis of no serial correlation is accepted if the *Durbin Watson* statistic is greater than or equal to 2.0. As indicated by the result in the table above, the *Durbin Watson statistic* is greater than 2.0 (2.402437 > 2.0), hence the null hypothesis cannot be rejected. The study thereby concludes that the model is not defective and is without serially correlated explanatory variables.

Summary, Conclusion and Recommendation

The policy implication of the results is that the need for infrastructure development is indeed crucial for developing countries, especially Nigeria as opined by Ogbaro and Omotoso (2017).The lack of modern infrastructure is regarded as an impediment to economic development and a major constraint not only on poverty reduction but on expansion of incomes and welfare.

This study focused on investigating the impact of government infrastructure spending on industrial sector gross domestic product in Nigeria. The study reviewed relevant conceptual, theoretical and empirical submissions. The estimation test proceeded from the unit root test intended to ensure model reliability for policy and forecasting purposes; the variables were not all initially stationary at level, but at first differencing; they were integrated of order 1(0) and 1 (1), hence the result of the regression analysis can reliably be employed in forecasting and predictions regarding aggregate economic outcomes.

The result of the cointegration test using the ARDL Bounds approach confirms a long run sustainable relationship between infrastructure spending by government and economic growth. The entire regression plane is statistically significant as shown by the F-test, indicating joint influence of the model explanatory variables. From the regression result, the coefficient of multiple determination (the R²) shows that 79.92% of the total variations in the aggregate economic output of Nigeria (RGDP) could be streamed by great additions to the stock of both economic and social infrastructures in the economy.

The research analysis so far leads to the conclusion that spending activities of government in the provision of social infrastructure have positive and significant impact on industrial sector performance in Nigeria. Based on the outcome of the various tests carried out and the hypothesis evaluated, this research therefore makes the following recommendations:

- There is need for the government to embark on aggressive expansion programs on economic infrastructures.
- There is need to ensure that infrastructures provided are accompanied by proper maintenance mechanism to ensure optimal functioning and benefits.

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