ABUAD Journal of Social and Management Sciences (AJSMS),
Vol. 4, No. 1, 2023, pages 130-147 https://doi.org/10.53982/ajsms.2023.0401.08-j

Published by the College of Social and Management Sciences (SMS), Afe Babalola University, Ado-Ekiti (ABUAD), Nigeria.
E-mail: ajsms@abuad.edu.ng

ISSN: 2714-3740

Effects of Education and Health Infrastructure on Industrial Sector Performance: Empirical Evidence from Nigerian Economy

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Abstract

The purpose of this study is to empirically examine the impact of education and health infrastructure on industrial sector performance in Nigeria. In that vein, an annual time series dataset was generated from Central Bank Statistical Bulletin and World Development Indicators (WDI) for the period, 1980 to 2022. The study employed Autoregressive Distributed Lag Model to analyse the parameters. Ex-post facto research design was also adopted. The descriptive results suggest that all the variables have positive mean. The implication of the positive mean is that all the variables in the model recorded positive average growth rate during the period under review. The inferential analysis began with estimation of unit roots tests and the results revealed that variables were stationary at different orders of integration. Furthermore, the cointegration test shows that there is an evidence of cointegration among the variables. Based on the cointegration result, this study applied ARDL approach to generate the estimated short-run and long-run results. Based on the short-run estimate, this study reveals that there is positive but statistically significant relationship between education infrastructure and industrial sector performance. There is negative but statistically insignificant relationship between health infrastructure and industrial sector performance, while there is also a negative but statistically insignificant relationship between communication infrastructure and industrial sector performance.

Keywords: Cointegration, Development, Error Correction Model, Industrial Output, Infrastructure.

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Introduction

The lack of quality education and health infrastructure can negatively impact the performance of the industrial sector in Nigeria, which can be associated to skilled labour shortage, low productivity, high healthcare costs, inadequate technology transfer, and brain drain. The importance of infrastructural development gain ground during the East Asia economic miracle of the 1960s, of which huge investments in infrastructure were made as a universal template for achieving rapid sustainable economic growth and development (Taofik, 2019). The transformation and commercialisation of agriculture as well as the generation of surplus revenue for capital accumulation are usually enabled by the presence of adequate infrastructure, which serves as the foundation for increasing both local industrial production and the market for those goods (Srinivasu and Rao, 2013). UNDP's 2018 Human Development Report asserts a connection between a nation's industrial production and its infrastructure. Economic growth is directly impacted by infrastructure improvements.

Therefore, an increase in a country's capacity for producing goods - which implicitly implies the provision of more plant and machinery, good roads, reliable power supplies, water pipes, educational institutions, and healthcare facilities - is the only way to increase its productive potential and per capita income. The prosperity of countries depends largely on the development of their industrial sectors. Nevertheless, industrial sectors development require adequate power supply, transport facilities, credit facilities, etc. All these together constitutes the infrastructure of an economy (Srinivasu and Rao, 2013).

Regardless of the business cycle, industrial production - or, in certain situations, manufacturing production - provides significant information about a country's economic output. The three main economic sectors are industrial production, agriculture, and services. Many global economies have shifted to a services-oriented model in the last ten years, with the services sector now being the single greatest contribution to economic production; but this does not imply that industrial output has been neglected. Although industrial output's share of total economic production has decreased, its significance as a significant economic sector has not. Many thousands of individuals work in industries and manufacturing facilities as they generate a considerable quantity of jobs. An increase in industrial production for both local and international markets is indicative of a growing economy and of the industries that are placing more orders for durable products (Ashworth, 2015).

Conceptual Review

Infrastructure

Infrastructure is referred to as a collection of facilities that allow society to access products and services. Other than providing inputs for all other socio-economic activity, it does not directly produce commodities and services. Infrastructure is the stockpile of essential facilities and capital assets needed for a country to operate, such as the roads, bridges, rail lines, and other public works, which are essential to the operation of an industrial economy.

In order to situate the underlying "structures in the early days of the Marshall Plan, as preferable to Social Overhead Capital," and to avoid confusion with hospitals, schools, and other similar welfare type facilities, the term "infrastructure" was first used by the military during World War II in 1945. Since then, economists have used the word often, although it has never been given a meaning. Without abandoning the fundamental premise that it offers the foundation upon which the economy is constructed, many economists have used the phrase in a variety of ways. Therefore, attempts have been made to distinguish between various infrastructure components, such as social and economic infrastructure in order to encompass a variety of activities under the word infrastructure (Srinivasu and Rao, 2013). Thus, Hirschman (1958) distinguishes between social overhead capital and directly productive activity. Infrastructure that includes "those essential services without which primary, secondary, and tertiary productive activities cannot operate" is often included in the definition of social overhead capital (Hirschman, 1958).

Education Infrastructure

The facilitation of learning, or the development of information, skills, values, morals, beliefs, and habits, is what education is all about. Teaching, instruction, storytelling, group discussion, and guided study are all examples of educational practices. Although instruction is typically provided by teachers, students may also educate themselves. Education may occur in formal or informal settings, and it can refer to any event that has a formative impact on a person's thoughts, feelings, or actions. Pedagogy refers to the teaching approach (Etymology Dictionary, 2021).

The cornerstone and most vital component of our global civilisation is still education. Education and industrial production are fundamentally interconnected in a cycle that eventually leads to contemporary civilisation. Therefore, it is very productive and essential for development to invest in human capital.

A growing nation requires experts in the fields of agriculture and industry, as well as professionals in medicine, engineering, education, and administration, who can boost the flow of products and services and quicken the pace of progress. It is interesting to know that the Nigeria Education Research and Development Council (NERDC) with the approval of the National Education Council have introduced a revised and improved curriculum for secondary school students; who are now taught and trained in vocational skills via subjects such as computer studies, office practice, store management, insurance, salesmanship, painting and decoration, photography, plumbing and pipe fittings, bricklaying, fishery and indeed, some 39 different subjects that promote the education- for-life learning. (Babatunde and Seyifa 2017).

Since the middle of the 1980s, the quality of Nigeria's educational system has steadily declined. High failure rates have been a constant trend in students' performance in public examinations like the Joint Admissions Matriculation Board (JAMB), National Examination Council (NECO), and West African Examination Council (WAEC). For instance, a quick glance at the candidates' results from the NECO examinations in November/December 2010 reveals historically high failure rates. Prof. Promise Okpala, NECO Registrar said in 2011 that 256,827 of the 256,840 registered candidates actually showed up for the examinations. English Language was passed by no less than 51,781 of the 235,933 candidates (20.16%), while Mathematics was passed with credit by 87,508 of the 234,959 candidates (34.18%) (Bamidele, 2014)

The majority of schools do not have enough access to water, according to SER (2013). Only 5 States had a 60% provision of water supply in schools, while 21 states had more than 60%. 123 universities (36 federal, 36 state, and 51 private), 71 polytechnics, 47 monotechnics, and 79 colleges of education make up Nigeria's higher institutions. Another area that faces difficulties is infrastructure. Inadequate infrastructure lead to outdated laboratories and crowded classrooms. The workshops and many of the laboratories are dilapidated, overcrowded, and have damaged furnishings. A total of 109,509 beds are now available across all institutions, which is under 10% of what is needed. The typical bathroom usage ratio is 1:10, causing some students to utilise the nearby bushes or hostel complex as open toilets (Kabiru, 2016).

Health Infrastructure

The resources for living a full and happy life include mental, physical, and social well-being, which may be defined as being in good health. In addition to the absence of disease, being in good health also means having the strength and capacity to recover from illness and other physical or mental problems. A healthy person makes the most contribution to the overall growth and development of a nation. A country's ability to

produce goods and services with a robust and healthy labour force is also ensured by a sophisticated health infrastructure. Health infrastructure comprises cutting-edge equipment, specialised medical personnel, such as physicians and nurses, as well as established pharmaceutical enterprises (BYJUS, 2021).

Inadequate capital investment, outmoded technology, poor infrastructure, such as lack of laboratory equipment and medical specialists, make Nigeria's healthcare system even more difficult to manage.

Communication Infrastructure

The process of conveying thoughts, opinions, information, facts, and understanding from one person to another is known as communication. Making sure the employees are aware of what the management wants from them requires this approach. Without the sender and the recipient, communication cannot take place. The recipient must be able to interpret the information that is being delivered by the sender. Communication has existed since the dawn of civilisation. Group life is a result of everyone needing protection. Forms of communication evolved with collective life. Codes, indicators, signs, and expressions are used as modes of communication. Language has to evolve gradually as a result of factors including the division of labour, trade economy, and population growth. Communication is a crucial component of every step in any industrial or commercial operation in the modern world.

Communication networks have overtime become instrumental in tourism development, especially in the face of globalisation and modern technological development. Their importance in tourism sector is notable and due to the nature of the industry, various high tech communication technologies (wireless communication networks, visual, audio, and print media) are employed in the sector around the world. They are used to advertise tourism products and create awareness of services, tourism product development, marketing, distribution, and training of tourism personnel. The increasing competitiveness in the global tourism market encourages tourism operators to invest more in the promotion of knowledge and quality in order to achieve satisfactory growth. Therefore, it is extremely important to be in touch with the latest technological trends and have the knowledge required to effectively respond to the challenges of global competition (Emeka, 2016).

Theoretical Review - The Endogenous Growth Theory

According to Romer (1986), the endogenous growth model entails growing returns to scale at the level of the whole economy and constant returns to scale at the level of the individual firms. In his view, increased growth in a country is accompanied by human capital role. Lucas (1988) in replacing physical labour in the production function

introduces investment on human capital as an additional education. Lucas argues that investment in human capital exhibits constant returns to scale in nature, which implies that the additional skills, knowledge, and ability that an individual acquires in the production process remains the same and add no value to the productive capacity of the economy.

A major critic of Lucas is the assumption of constant returns to scale. Theorists argue that the values added to individuals in terms of education and health are not constant in nature as they increase human ability and knowledge towards increased productivity to spur growth. Schultz (1961) argues that the acquisition of knowledge, skills and increase in health care services is a function of willing investment or deliberate investment. He argues that the difference between the incomes of individuals is a function of the additional value they add to their qualifications in terms of health quality and education (knowledge and skills), which determines the productive capacity of the individuals. He submits that the cost of acquiring these factors in the short-run is high and, but in the long-run, the cost is catered for through the returns accrued to the individuals involved.

Empirical Review

Taofik (2019) examined the impact of infrastructural development on industrial output in Nigeria, and found that infrastructural development impacted positively on industrial out with structural break. The results also showed that telephone density as a proxy to infrastructure impacted positively on industrial output but with existence of structural break; whereas there is no relationship between capital expenditure and industrial output in Nigeria. The study suggests that government needs to look for means of financing infrastructure deficits beside oil revenue such as the Sukuk means of financing.

In a study conducted by Rufus and Bufumoh (2017), they compared the importance of infrastructure to a country's overall growth. The study draws attention to the fact that Nigeria's key development difficulties are closely tied to vital infrastructure decline in Nigeria. The approach used for the research mostly consists of content analysis with secondary data being used for comparison analysis. The study looks for solutions to Nigeria's problems with critical infrastructure decay, including the country's epileptic power supply, poor road and transportation/communication systems, failing educational system, high unemployment rate, and the gap between the public and private sectors in terms of long-term infrastructure development. The analysis comes to the conclusion that if the country is to escape the dialectical cycle of development crises, vital infrastructure cannot be handled lightly or neglected.

The impact of infrastructure investments on industrial emissions in Portugal was studied by Alfredo and Rui (2017). Using factual data on the financial impacts of twelve different infrastructure investment types at the industry level, taking into account twenty-two different sectors and their individual CO2 emission rates, the research found that practically all sorts of infrastructure improvements reduce the economy's emissions intensity given the present emission parameters for each sector. Such favourable benefits are only missing when investments are made in airports and healthcare facilities. Secondly, a key factor in assessing the total impacts on emissions is the importance of the economic consequences of the various forms of infrastructure expenditures on the electrical power sector. Given that electric power accounts for around 35% of Portugal's CO2 emissions and that the industry's exceptionally high emissions factor magnifies even minor economic consequences, which is not unexpected. Thirdly, the study also finds that the majority of infrastructure investments results in a decrease in the CO2 emissions intensity under an alternative scenario in which emissions from the electric power industry have been eliminated – due to the use of renewable energy in production, – or are otherwise ignored.

However, in this instance, expenditures in national roadways virtually maintain the emissions intensity, but investments in health infrastructure have a negative impact on emissions. When considering infrastructure investment options that are conscious of their CO2 emission consequences, these conclusions have a number of significant policy implications. Infrastructures for transportation readily come to mind. From an environmental standpoint, investments in national roadways would be a suitable policy proposal given the current electric power producing mix; but expenditures in airport infrastructure should be avoided. However, in a situation where renewable energy sources are aggressively used to produce power, the optimum investments would be in railways and airports, which are two sectors that rely heavily on the consumption of electricity.

Ebuh, Ezike, Shitile, Smith, and Haruna (2019) used a quarterly time series dataset ranging from 1997 Q1 – 2017 Q4 to assess the effect of infrastructure on industrial production growth in Nigeria. To estimate the parametres, the research used the Vector Autoregressive Distributed Lag Model (VECM). Evidence suggests a long-term and short-term positive and statistically significant link between industrial production growth and infrastructure improvement in Nigeria. The study recommended that corruption be reduced, funds allocated for infrastructure development, and the distribution of infrastructure in the areas of transportation, communication, and power be monitored to ensure that the project for which funding was allocated is carried out. It also recommended that sufficient infrastructure be built and properly maintained to promote higher levels of industrial experience and performance.

Akereke, Oniore, Ogbenebrume, and Stephen (2017) examined the effect of infrastructure improvement on industrial production in Nigeria, using yearly time series data collected from 2000 to 2016. For the examination of the parametres, the research used the Ordinary Least Square (OLS) and Generalised Method of Moment (GMM) estimators. According to the empirical results of the regression, there was a consistently negative and statistically significant association between industrial production and infrastructure development in Nigeria during the course of the sample period. According to the report, policy should be directed at addressing the invasive infrastructure gap in a manner that promotes economic expansion. In particular, the government should seek for other funding options for Nigeria's infrastructure deficit, such as the most recent Sukuk offering aimed at financial inclusion and infrastructure development.

Methodology

Ex-Post Facto research design was used in the study, which essentially enables inquiry to be conducted independently of the researcher after the event. Ex-post facto research shares some of its fundamental logic of inquiry with experimental research design. Because secondary data were utilised in this study, the researcher believes that this design is more acceptable. The unit root test (using ADF) was used to test for stationarity, the co-integration test (using Johansen cointegration) was used to look for long-term correlations between the variables in the model, and descriptive statistics were used to identify trends. Data utilised in the research include:

- Industrial Value Added: proxy for the performance of the industrial sector;
- Expenditure on Communication Infrastructure;
- Expenditure on Education Infrastructure and
- Expenditure on Heath infrastructure.

The equation used in model expression, was:

$IVA = f(EXED, EHLTH, EXCM)$

Where, IVA= Industrial Value Added, EXCM = Expenditure on Communication Infrastructure, EXED =Expenditure on Education Infrastructure, EHLTH = Expenditure on Heath infrastructure.

The model for this study is based on the Autogressive Distributed Lag Model adopted by Babatunde and Seiyefa (2017), Taofik (2019), Shobande and Etukomeni (2016)

and modified by Akereke et al., (2017). One of the most significant and trustworthy models in econometrics is the autoregressive distributed lag (ARDL) model. Numerous econometric issues, including misspecification and autocorrelation, may be solved with ARDL.

$$S\,IVA = f\left(EXED,\ EHLTH,\ EXCM\right) \quad \text{.....4.1}$$

Setting up equation (4.2) in a linear stochastic form (or econometric form) is expressed as:

$$IVA = f(\beta_0 + \beta_1 EXED + \beta_2 EHLTH + \beta_3 EXCM + \mu_t) \quad \text{.....(4.2)}$$

Where;

IVA = Sustainable Development

EXED = Expenditure on Education Infrastructure

EXCM = Expenditure on Communication Infrastructure

EHLTH = Government Expenditure on Health infrastructure

β_o = Intercept or autonomous parameter estimates

$\beta_1 - \beta_2$ = Parameter estimates

μ_t = The white noise error terms

The a priori expectations, which relate to the anticipated link between the explanatory variable and the exogenous variables, are dictated by the tenets of economic theory. The following are a priori predictions for the model's coefficients:

$\beta_1, \beta_2, \beta_3, \beta_4, > 0; \beta_5 < 0.$

Results and Discussion

Results

Table 1: *Descriptive Statistics*

	IVA	EXED	EHLTH	EXCM
Mean	7.342674	2.868825	2.075606	0.999087
Median	7.688280	3.775301	2.811736	2.084616
Maximum	10.59362	6.385755	5.961951	4.500120
Minimum	3.883400	-1.819208	-3.186541	-3.449110

Std. Dev.	2.233588	2.801340	2.976544	2.539902
Jar. Bera	3.197534	3.861017	3.704677	3.670763
Prob.	0.202146	0.145074	0.156870	0.159553
Obs.	39	39	39	39

According to Table 1, the mean (average rates) of the infrastructures for education, health, and communications as well as the industrial value added all have positive values. This indicates that the changes among the variables are increasing more often than decreasing. Infrastructure on health has the highest standard deviation, which suggests that government spending on health is higher than spending on all the variables in the distribution.

On the other hand, industrial value added has lower standard deviation, which shows that, industrial sector performance experience minimal rate of fluctuations. The Jarque-Bera coefficients show that the data are normally distributed. This is due to the fact that the probability values of all the variables are statistically insignificant even at 10% level.

Table 2: *Unit Root Test Results (Augmented Dickey Fuller, ADF)*

Variables	Augmented Dickey- Fuller		Phillips-Perron	
	Level	First Diff.	Level	First Diff.
LIVA	-1.472057	-4.358313***	-1.760598	-4.688582***
LEXED	-3.094696	-5.865020***	-3.041329	-13.97392***
LEHLTH	-0.010136	-5.408311***	-3.782466**	-21.47284
LEXCM	-2.440897	-8.114825***	-2.300990	-11.19667***

Note: ****,** and * indicate significant at 1%, 5% and 10% respectively.*

From Table 2 above, it could be seen that all the series are stationary at first difference; hence, we proceeded to cointegration test.

Table 3: *Co-integration Result ARDL Bounds Test*

Test Statistics		
F-Statistics	7.16	
Critical Value Bounds		
Significance levels	I(0) Bounds	I(1) Bounds
10%	2.08	3.00
5%	2.39	3.38
1%	3.06	4.15

The result of the bound test in Table 3 indicates that there is an evidence of cointegration among the variables because the F-statistics value (7.16) is greater than

the critical value bounds even at 1% level of significance. Therefore, the null hypothesis of no cointegration cannot be accepted, while the alternative hypothesis is accepted. This is also permitting the study to generate the long run and short run coefficients of the ARDL model.

Table 4: *Estimated Short-Run Coefficients of the ARDL Model*

Dependent Variable: ΔIO				
Variables	Coefficients	std. Error	t-Statistics	P-value
D(LEXED)	0.202936	0.073699	2.753572	0.0102
D(LEHLTH)	-0.213781	0.072639	-2.943048	0.0065
D(LEXCM)	-0.008578	0.033365	-0.257087	0.7990
ECM (-1)	-0.093796	0.012110	-7.745162	0.0000

In the short run, the outcomes presented in Table 4 acknowledges that expenditure on education infrastructure has significant positive effect on industrial sector performance in Nigeria at 5% level of significant. This shows that in the short-run, infrastructure on education and health is the main determinant of industrial sector performance in Nigeria. Furthermore, the result shows that there is a significant negative relationship between expenditure on health infrastructure and industrial sector performance in Nigeria in the short-run. Additionally, the result shows that expenditure on communication infrastructure has no significant influence on industrial sector performance in the short-run in Nigeria.

Consequently, the error correction term has the needed sign, negative, less than one and statistically significant at 1%. This also confirms the evidence of long run relations among the series. The result also shows that in case of any distortion in the economy, the error correction term will correct itself from the disequilibrium toward the equilibrium at the rate of 9.3% every year.

Table 5: *Result of the Estimated Long-Run Coefficients of the ARDL*

Dependent Variable: IO				
Variables	Coefficients	std. Error	t-Statistics	Prob.
L(EXED)	2.014821	1.773480	1.136083	0.2656
L(EHLTH)	-2.198554	2.217218	-0.991582	0.3299
L(EXCM)	0.044714	0.349010	-0.128116	0.8990
C	6.497149	1.110240	5.852022	0.0000

The estimated long run results of the ARDL presented in Table 5 show that there is a positive relationship between expenditure on communication infrastructure and industrial sector performance in Nigeria. As shown by the result, 1% increase on

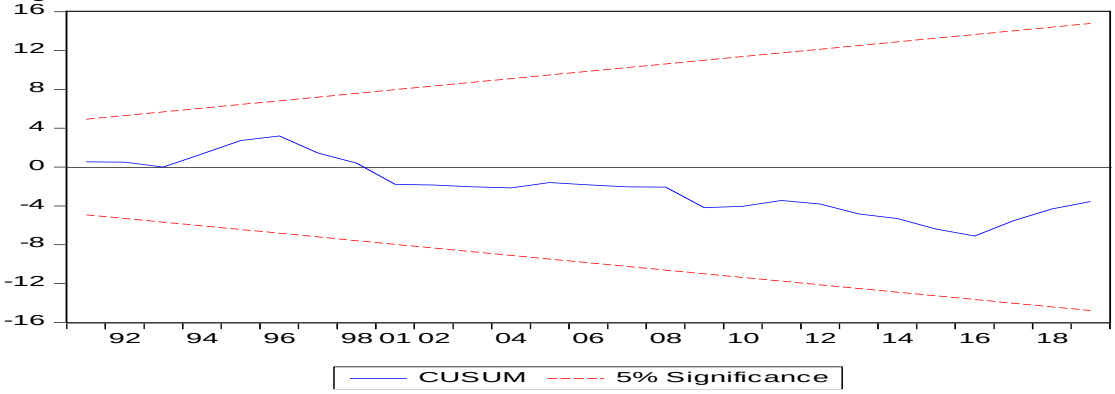
communication infrastructure will lead to 0.045% increase in industrial sector performance. The result also is not significant statistically.

The result also indicates that there is positive relationship between expenditure on education infrastructure and industrial sector performance in Nigeria. When there is increase in spending on education sector by 1%, the industrial sector performance will increase by 2.01%. This implies the power of education sector in feeding industrial sector with manpower. Subsequently, the result shows that there is negative nexus between expenditure on health infrastructure and industrial sector performance in Nigeria. Based on the result, 1% increase in spending on health sector will reduce the performance of industrial sector by 2.19%. The result portrays the true picture of health sector in Nigeria. This is due to the fact that over the years, government spent unspecified funds for the development of the health sector. Notwithstanding, the sector failed to prove positive results.

Stability Tests (Cumulative Sum of Recursive Residual)

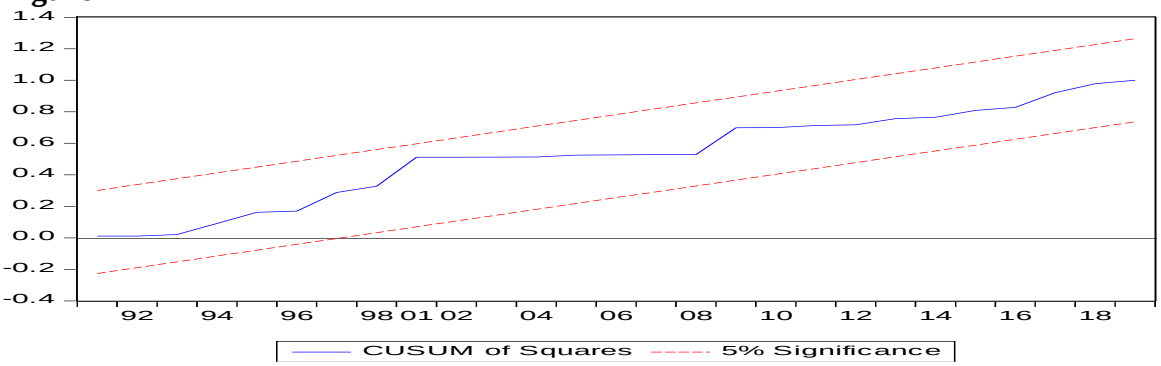
To determine the stability of the estimated coefficients of the relationship between infrastructure and industrial sector performance in Nigeria, the cumulative sum of recursive residual test developed by Brown, Durbin, and Evans (1975), was adopted as shown in the figures below.

Figure 1



From the CUSUM test, the outcome testified that the model and estimated parameters are stable because the recursive line falls within the 5% critical lines.

Figure 2



From the CUSUM of square test presented above, the result shows that the model and estimated parameters are stable because the recursive line falls within the critical lines. Therefore, the regression coefficients are reliable for policymaking.

Table 6: *Regression Analysis Results Selected Model ARDL Results*

Variable	***Coefficient***	***t-Statistic***	***Prob.****
IVA(-1)	*0.332219***	*1.924533*	*0.0638*
D(EXED)	*0.254211*	*2.286522*	*0.0234*
D(EHLTH1)	*-0.667781**	*2.427661*	*0.0001*
D(EXCM)	*4.196859***	*1.982163*	*0.0241*
R-squared	*0.99*		
Adjusted R-squared	*0.98*		
F-statistic	1241.75		
Prob(F-statistic)	1241.75		
Durbin-Watson stat	1.65		

Notes: ****, ** and * indicate statistical significance at 10%, 5% and 1% levels, respectively*
Source: *Authors computations (2021), using Eviews Version 9*

The R^2 0.99 show that the explanatory variables has explained about 99% of the total Variations in the dependent variable which is good fit.

The Dubin Watson is 1.5 which shows that there is presence of serial correlation which implies that some other factors affecting industrial output in Nigeria are omitted in the model. The F-statistic result of 1241.75 with probability value of 0.0000 shows that these explanatory variables are jointly significant in explaining the variation in the dependent variable which is a good fit.

Capital expenditure on education infrastructure has a positive influence on industrial sector performance in Nigeria and this also confined with our a priori expectation that an increase in education infrastructure will lead to an increase in

industrial sector performance in Nigeria. The result is strong and statistically significant.

Capital expenditure on health infrastructure has a negative influence on industrial sector performance in Nigeria. The result does not confine with the a priori expectation, which shows that spending on health sector will lead to decrease the performance of industrial sector. Thus, the result is strong and statistically significant.

Capital expenditure on communication infrastructure has a positive influence on industrial sector performance in Nigeria and this confined with our a priori expectation that an increase in communication infrastructure will lead to increase in performance of the industrial sector. This was captured by the t-ratios and probability values were found to be less than 0.05 level. The result is strong and statistically significant.

H_{01}: There is no significant relationship between expenditure on education infrastructure and industrial sector performance in Nigerian.

Result from the study analysis reveals that the t statistics 2.28 and the probability value of 0.023 are strong and statistically significant. Therefore, we are to reject the null hypotheses. By rejecting the null hypotheses, we have to accept alternative hypotheses and conclude that expenditure on education infrastructure has influence on industrial sector performance in Nigeria.

H_{02}: There is no significant relationship between expenditure on health infrastructure and industrial sector performance in Nigerian.

Result from the study analysis reveals that the t statistics 2.42 and the probability value of 0.0001 are also strong and statistically significant. Therefore, we are to reject the null hypothesis and accept the alternative hypotheses and conclude that expenditure on health infrastructure has influence on industrial output in Nigeria.

H_{03}: There is no significant relationship between expenditure on communication infrastructure and industrial sector performance in Nigerian.

The estimated regression result observes that the t statistics 1.98 and probability value of 0.02 are also statistically significant. Therefore, we are to reject the null hypotheses and accept the alternative hypotheses. The conclusion here is that expenditure on communication infrastructure has influence on industrial sector performance in Nigeria.

Discussion of Findings

This section discusses the findings of this study in relation to the findings in the literature reviewed and explains the extent to which the findings are similar or otherwise. The result shows that in the short run, expenditure on communication infrastructure has negative but insignificant impact on industrial sector performance. This does not agree with the findings of Taofik (2019), which reveal that capital expenditure on transport and communication infrastructure have positive influence on industrial output. The result also is not in line with the findings of Kabiru (2019), which reveal that capital expenditure on transport and communication infrastructure has no significant influence on industrial output.

The study reveals that expenditure on education infrastructure has positive but insignificant effect on industrial sector performance. The finding is contrary to the finding of Kabiru (2019), which finds no significant relationship between expenditure on education infrastructure and industrial output. Finally, this study also shows that expenditure on health infrastructure has negative but insignificant effect on industrial sector performance. This finding also contradicts the work of Kabiru (2019), which finds no significant relationship between capital expenditure on health infrastructure and industrial output.

Conclusion and Recommendations

Based on the findings, this study concludes that in the short-run, expenditure on education infrastructure have significant positive influence on industrial sector performance, while expenditure on health infrastructure has significant negative influence on industrial performance in Nigeria. More so, expenditure on communication infrastructure also has a negative influence on industrial sector performance. Additionally, in the long run, expenditure on communication and education infrastructure has a positive influence on industrial sector performance in Nigeria. Subsequently, the result shows that there is negative nexus between expenditure on health infrastructure and industrial sector performance in Nigeria.

In line with the findings, the study recommends the following:

i. Since expenditure on education infrastructure has significant positive influence on industrial sector performance, government in collaboration with relevant stakeholders should increase the spending on education sector so as to produce qualified manpower that will work in the industrial sector.

ii. Although, both in the short and long-run estimates, expenditure on health infrastructure has significant negative influence on industrial sector performance, there is still need for the government and relevant stakeholders in the management of the health sector to provide the needed infrastructure that will help to revive the standard of health institutions in Nigeria.

iii. Finally, the expenditure on communication infrastructure needs to be increased so as to realise the better performance of the industrial sector in Nigeria.

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