Rail-Transportation and Economic Growth in Nigeria (1986-2021)

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Abstract
The study examines the impact of the rail-transportation sector on economic growth in Nigeria from 1986 to 2021. The autoregressive distributed lag (ARDL) model was used to estimate the parameters. According to the coefficient values, the results of the model's regression clearly demonstrate that rail transportation (RT) and agricultural output (AGR1) are positively related to and significant at the 5% level with economic growth in Nigeria. Furthermore, the coefficient value indicates a positive relationship between Gross Fixed Capital Formation (GFCF) and GDP growth. However, the relationship is insignificant in the long run. The findings indicate a causal association between rail transportation and Nigeria's economic growth. It is therefore recommended the need to put some development programmes with aimed of expanding the physical, managerial and operational capabilities of the rail - transport in order to meet the rail- transport demands in Nigeria and its neighboring countries such as, Republic of Niger, Benin Republic, Togo, and Ghana to mention a few.

Keywords: Rail –Transportation, Agricultural Output, Economic Growth.
JEL: L92, Q10, O40

Introduction

1.1 Background to the study

Nigeria is considered as the "Giant of Africa" for its progressive development in all aspects of life including socio-economic and technological development. Rail –Transportation as a means of movement has received greater attention over time since before Nigeria got her independence in 1960. The British colonialist had us rail-transport as a means of moving basic raw material needed for industrial development to their country. Rail-transportation can be viewed as a public utility because its relevance to the entire citizen of the country. It serves as a link for supplying all essentials services to the society. Rail- transportation is a critical subsector that must develop to facilitate investment in the other sector of the economy that is why development nations classifies rail as a social goods which is critical for the benefit and development their country.

Transportation network required huge investment, during its construction as its end results provides the essential service needed by the society for movement of goods within and outside the country. For many years' roads, canals, railway and later on airports have been considered as the most important ingredients, and they continue to be high policy maker's agenda until today. The accomplishments of the transport sector projects provide accessibility of link between state to state and countries to countries.

In developing nations, the extent to which the transportation infrastructure affects the local and national economies depends on the degree of economic development and differs for rural and urban

areas. The modern transportation system promotes the growth of businesses, lowers the cost of goods, opens up access to international suppliers and consumer markets, improves accessibility, and creates more efficient worldwide manufacturing processes. A more productive workforce can benefit from faster, more affordable, dependable, and flexible transportation options offered by an efficient transportation system. Long-term and short-term economic gains stem from investments in transportation, which generate jobs across several industries. It is impossible to overstate the significance of rail transportation as it is essential to any country's economic development.

According to Adegoriola et al. (2018), rail transportation continues to be a major catalyst for socioeconomic development and the movement of people and goods in many nations around the world. Hence, offering in situations of high traffic density, the most economical, accessible, energy-efficient, and ecologically beneficial mode of transportation.

Railway system is among the oldest and common type of transport system worldwide, it is said that the world first intercity passenger and cargo railway started in Great Britain during the 1830s. According to Olievschi (2013), since the colonial era, railways played appreciable roles in the developing the economy of African nations. The first African railway was constructed in Alexandria of Egypt by the British Colonialist in 1853; followed by many others such as the Kumasi railway line of Ghana, Nigeria built by British colonialist in 1910's. The railway lines during the colonial era in Africa were meant to serve the interest of the colonialists and boost their economic development that's why they were unevenly distributed (they were located in plantation, mining and colonial residence). After independence of African countries during the 1950's, 1960's the railway lines as one among the colonial properties were inherited by native's African leaders being the case also in Nigeria

As it is well known that transport system is the heart of economic development as it plays major roles in facilitating and boosting trade and various projects, movement of people, goods and services. That is to say, a modern transport system particularly the railway system speeds up fast the economic development of a country. The study explored the impact of rail-transportation on Nigeria's economy.

Empirical Review

Overtime various studies have established relationships between rail-transportation and economic growth with mixed results. Some empirical results proved positive relationship with economic growth, while others have proved an inverse relationship, making it difficult to arrive at a consensus, thus making this research an interesting one.

The study conducted by Yousif (2023) investigates the correlation between Saudi Arabia's economic growth and its transportation infrastructure. The analysis shows the long-term correlation between Saudi Arabia's economic growth and its transportation infrastructure. Additionally, it shows a unidirectional causal relationship between the expansion of the economy and the transportation system. The results show that economic expansion provides Saudi Arabia with the necessary financial and technical support for investments in and upgrades to its transportation infrastructure.

Leonce (2019) examines transportation and economic growth in Tanzania, using railway as a evidence. Primary data was sourced, sample size of 200 out of which 106 respondents filled the questionnaire properly who were employees of transport authorities. The study posits that, railway transport is the key accelerator of national development. The nation's economic competitiveness can be raised via railway transportation, if more money is allocated to infrastructure, repair, and resource rehabilitation. The efficient railway transportation will result in shifting back the transportation of bulky cargos via road transport to railways as most of respondents mentioned that, railway transport is cost effective and allow the freight of bulky cargo at once hence reduce the cost for production whether agro products, raw materials, industrial goods, or service industries.

Using a multiple ordinary least square (MOLS) model, Clinton et al. (2017) conduct a comparative analysis on the impact of Nigeria's transportation system on economic growth. The findings show that road transportation significantly boosted Nigeria's economic expansion. The contribution of road and rail transportation to GDP growth, demonstrate that these modes of

transportation significantly influenced Nigeria's economic expansion. The road transportation system has a favorable impact on Nigeria's economic growth, whereas the rail system has negative impacts. In comparison to rail transport, the road effect is greater, even though significant rail transit volumes significantly lessen the overall impact of land transport. The study went on to examine how the road and rail transportation networks support growth in the economy.

Achour and Belloumi (2016) look into the connection between Tunisia's economic growth, transportation energy use, and infrastructure between 1971 and 2012. The study analyzes the impact with variance decomposition techniques and granger causality approach. The findings demonstrate a long-term, unidirectional causality between road infrastructure, transportation value added, and gross capital formation. Furthermore, the study recommends that government should focus on building huge capital investment on transport infrastructure (road and railway) in other to grow the economy.

Otu and James (2015) used the ordinary least square estimate technique to analyze data related to transportation, investment and growing economy in Nigeria, for the period of 1980 to 2010. The findings showed that, over time, investment, transportation, and GDP in Nigeria are all positively correlated. Nonetheless, in contrast to predictions, rail transportation in Nigeria showed a negative relationship with economic growth. The model's statistical tests revealed that, at the 5% level of significance, the air and road transportation systems are statistically significant. However, the impact of water and rail transportation networks on Nigeria's economic growth does not have any considerable impact. The report suggests that the federal government provide the industry with sufficient support. The industry needs more investment, and cutting-edge rail systems like those seen in developed nations should be constructed.

Alexander et al. (2015) examine air transportation development and economic growth from 1980 to 2012. The study used ARDL model as estimation method and the result reveals a significant relationship between air transportation and economic growth in Nigeria. Mohmand et al. (2017) research into how Pakistan's transportation infrastructure affects the country's GDP growth. The study employed panel data and the Granger causality model for the analyses. The study finds the existence of unidirectional relationship between infrastructure investment and GDP growth. The study suggests that more light be shed on infrastructure investment to boost more economic activities in Pakistan.

Using an error correction modeling approach, Apanisile and Akinlo (2013) investigated whether rail transportation spur economic growth in Nigeria, covering a period between 1970 and 2011. The findings indicate a long-term relationship. Also, in the short run of analyses, the error correction models (ECM) show a negative connection between rail transit and economic growth in Nigeria, and they are both significantly and appropriately signed. The outcome demonstrates how the government's disregard for the industry contributed to its degeneration. The report suggests that the government implement development initiatives targeted at bolstering the economy's subsector in order to reach full operational capability and counteract the decadence that gradually becomes apparent in the subsector.

The impact of transportation infrastructure on economic growth was examined by Pradhan and Bagchi (2013) in India between 1970 and 2010, utilizing the Granger causality and VECM. The findings show a connection between India's economic expansion and its transportation network. The result found a unidirectional causal relationship between rail transportation and gross capital formation and GDP growth, and a bidirectional relationship between road transportation and GDP growth. According to the research, real step should be taken to increase transportation infrastructure investment in order to boost India's growth.

Kayode et al. (2013) analyze transport infrastructure investment's impact on economic growth in Nigeria from 1977 to 2009, using Solow's growth theoretical model as a link to the modification of the mode. Transport infrastructure investment is seen as capital investment, which was decomposed into three type of infrastructure investment, as private capital, transport and other public capital investment. Public investment is classified as education, which is proxied by as secondary school enrolment, which account for the quality of labour. According to the findings, negligible positive

correlation exists between Nigeria's GDP growth rate and the increase in transportation investment. Economic growth and private capital variables are positively correlated, whereas public investment and economic growth are negatively correlated. The study suggests increased investment in public transport in other to drive the economy to the path of growth.

Nwakeze and Yusuff (2010) examine the impact of transportation and economic growth in Nigeria. Transport investment was proxied by physical stock of road, while congestation was proxied by automobile density, using Cobb Douglas production function theoretical model as linkage to the estimated variable. It was discovered that transportation investment, congestation and traffic-related accidents will cause the economy to grow in the long run. It was also found that transport investment contribute positively to economic growth, while traffic accidents contribute negatively. It was recommended that adequate step should be taken to increase the standard and number of road network in other to minimize road accident.

Using the Indian rail sector as a case study, Bogart and Chaudhary (2009) examine management challenges in the railway sector with the aim of determining whether state ownership and private operations offer stronger incentives to increase efficiency. The author makes the case, from their point of view, that the government must allow private investors to run the rail industry in order for it to grow and strengthen the national economy. This implies that the government should focus on concerns of maintaining the infrastructure and revenue collection from these private operators rather than getting involved in day-to-day service provision.

Thus, it is noteworthy that studies on rail transportation vis-à-vis economic growth are scanty. There is the need to improve on the study on that area, in other to provide a better insight on the importance of rail-transportation as a veritable means of economic growth in Nigeria.

Methodology

With a small modification to fit the aims of this study, Otu and James (2015)'s model was adopted. The functional model of the adopted work is stated as in equation 1.

GDP = F (ROADTRAN, RAILTRAN, WATERTRAN, AIRTRAN) ..... (1)

This study adopts a disaggregate method by isolating and regressing the effect of transport system using rail transport variable (RAILTRAN), specifically on economic growth by removing, road transport variable (ROADTRAN), water transport variable (WATERTRAN), Air transport variable (AIRTRAN). This study added gross domestic product, road transport while agricultural output, gross fixed capital formation are control variables, as seen in equation 2

$RGDP = \beta_0 + \beta_1 RT + \beta_2 AGR + \beta_3 GFCF + \mu_t$ ..... (2)

Where, RGDP = real gross domestic product; RT is road transport, AGR = agricultural output; GFCF is gross fixed capital formation; β_0 = constant term; $\beta_1 - \beta_3$ = slopes coefficients; μ = error term.

Short run Equation

$\Delta RGDP_t = \beta_0 + \ + \ + + - \emptyset ECM_{t-1} + \mu_t$ ..... (3)

Long run Equation

$RGDP_t = \beta_0 + \ + \ + + + \mu_t$ ..... (4)

Equation 3 and 4, are the main equations for the analysis

4.0 Presentation of Results

4.1 Unit Root Test:

Since most times series data often produce spurious result, it becomes imperative to conduct pre – estimation test using unit root test techniques. This is consistent with the arguments made by Granger and Newbold (1974) and Granger (1986) that any results that deviate from the standard theory are spurious and deceptive if time series variables are non-stationary. Consequently, it is advised that a stationarity test be performed. The degrees of stationarity and integration order of the variables are evaluated using the Augmented Dickey Fuller test. The ADF is preferable to because it accommodate small and large sample size and can be used in respective of order of difference.

Table 1
Results of Augmented Dickey Fuller (ADF) Test

Variables	ADF at Level	ADF At 1st Difference	Mckinnon 5% Critical Value	Order Of Integration
RGDP	-4.104877	-	-2.936942	1(0)
RT	-1.807514	-7.017468	2.938987	1(1)
GFCF	-2.392524	-3.704128	-2.938987	1(1)
AGR1	-1.655272	-5.853415	-2.951125	1(1)

Source: Researchers' computation using E-views 10.0

The ADF test indicates that the variables have different orders of integration. For instance, variable such as real GDP is stationary at level. On the other hand, variables such as rail transport (RT), gross fixed capita formation (GFCF) and agriculture (AGR1) are stationary at first difference. The combinations of I(1) and I(0) provide a justification for the usage of the ARDL model as a technique of estimation.

4.2 Co-integration Test Results (BOUND TEST)

After confirming that the series in the model have mixed order, the co-integration test was done. The Bounds Test, which was introduced by Pesaran et al. (2001) to ascertain whether long-term relationship exists is used to do this. For a given degree of importance, Pesaran et al. (2001) computed upper limit 1(1) and lower bound 1(0) as the critical values. The null hypothesis can be rejected on the ground that the computed F-statistic is greater than the upper bound at 5 per cent, if otherwise, accept. Ultimately, the test is deemed inconclusive if the calculated F-statistic falls within the range of the lower and higher threshold values. The performance of the test is reported in Table 2.

Table 2
Bound Test Results

Test Statistic	Value	K
F-statistic	7.577930	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
5%	3.23	4.35

Source: Researchers' computation using E-views 10.0

Based on the result in Table 2, the computed F statistic (7.577930) is higher than the upper bound at 5% significance level, indicating the rejection of the null hypothesis. The outcome verified that real gross domestic product, rail transportation, gross fixed capital formation, and agriculture had a long-term relationship.

4.4. Autoregressive Distributed Lag

Given that the variables are co-integrated, estimates of the ARDL model are presented in Table 3.

Table 3
Estimated Long run and Short Run Result

Long run Model			**Short run Model**		
Dependent variable: RGDP			**Dependent Variable: RGDP**		
Regressor	Coefficient	P Value	**Regressor**	Coefficient	P. Value
RT	7.868911	0.0012	ΔRT	4.142326	0.0039
AGR1	0.440352	0.0456	ΔAGR1	0.220192	0.3201
GFCF	0.016709	0.9574	ΔGFCF	0.960449	0.0070
C	7.265921	0.0361	ECM (-1)	-0.526417	0.0055
			R-Square	0.635763	-
			Adjusted R-Square	0.462317	-

Source: Researchers' computation using E-views 10.0

Table 3 presents the long and short run coefficients. It is evident that rail transport (RT) has a positive and significant relationship (at the 5% level) with Nigeria's economic growth, both in the long and short terms. This suggests that, in the long run, rail transport will contribute 7.8689% and 4.1423% of an increase in economic growth, respectively, for every 1% increase in the rate of economic growth. This suggests that rail travel is a direct cause of Nigeria's economic expansion. Over time, rail transit contributes to economic growth.

Agricultural output (AGR1) in Nigeria is favorably correlated with economic growth over the long term but not significantly so in the short term. This suggests that, in the long term, a 1% rise in the economic growth rate results in an increase of 0.440352%, but in the short run, it results in an increase of 0.220192%. Thus, in order to facilitate the easy transportation of Nigeria's agricultural produce, the railway service must be expanded to rural and urban areas. Leonce (2019), which looks at Tanzania's transportation system and economic expansion, lends support to this.

Furthermore, the coefficient value indicates a positive correlation between RGDP and GFCF both in short and long term. However, the long term relationship is insignificant. This suggests that in the long run, a 1% rise in gross fixed capital formation and transportation sector, respectively results in 0.016709% and 0.960449% units of economic growth rate.

Again, the goodness of fit statistics was impressive with R^2 value of 0.635763. The ECM (-1) must be negative and significant for it to perform the role of adjustment. Table 4 shows that the ECM (-1) was significant at the 5% level and rightly signed. It demonstrates that the probability value is 0.0055 and the coefficient of ECM (-1) is -0.526417. The model's coefficient of ECM (-1) shows that any previous divergence will adjust to long-term equilibrium at a rate of 53%. This expresses how quickly the dependent variable is adjusted in relation to the independent factors.

4.5 Granger Causality Test

Table 4

Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
RT does not Granger Cause RGDP	34	1.83836	0.0071
RGDP does not Granger Cause RT		0.14390	0.0066
AGR1 does not Granger Cause RGDP	34	0.45334	0.6399
RGDP does not Granger Cause AGR1		3.45442	0.0451
GFCF does not Granger Cause RGDP	34	2.09019	0.1419
RGDP does not Granger Cause GFCF		0.75791	0.4777
AGR1 does not Granger Cause RT	34	1.78248	0.1862
RT does not Granger Cause AGR1		0.65556	0.5267
GFCF does not Granger Cause RT	34	1.04783	0.0036
RT does not Granger Cause GFCF		0.39873	0.6748
GFCF does not Granger Cause AGR1	34	1.11583	0.3413
AGR1 does not Granger Cause GFCF		0.82074	0.4501

In the analysis of the causality test in Table 4, rail transport (RT) has a bi-directional relationship with RGDP. AGR1 has no causality with RGDP, but RGDP causes agricultural output to grow. GFCF shows no directional relationship with economic growth. The same result applies with agricultural output and rail transports. Gross fixed capita formation exhibit a unidirectional with rail transport and significant 5% level, unlike gross fixed capita formation that exhibited no directional relationship agricultural product.

5.1 Summary

The ultimate aim of this paper is to explore how Nigeria's rail transportation industry affects the country's economic growth. Real GDP is stationary at level, even though the variables have varying orders of integration, according to the ADF test result, which was adopted to test the variables' stationarity. On the other hand, variables such as rail transport (RT), gross fixed capita formation (GFCF) and agriculture (AGR1) are stationary at first difference. More so, economic growth was found to be co-integrated with the other variables of the study. Using the bound test procedures, a long-term connection amongst the variables is established. The findings from the regression result of the model shows that, rail transport (RT) and agricultural output (AGR1) are found to be positively related and significant at 5% level with economic growth in Nigeria. Similarly, Gross fixed capital formation (GFCF)

exerts a positive impact on economic growth. The goodness of fit is however impressive. The error corrections were rightly signed with negative signs, which show the level of equilibrium that has to be reformed in the transportation sector to achieve growth in Nigerian economy. Finally, causality results reveal that economic growth granger cause transportation sector and transport sector granger cause economic growth which supports the bi-directional relationship between the variables.

5.2 Conclusion

Nigeria is expected to generate huge potential benefit if adequate attention is play on transportation. Transportation sector leads way for wealth creation, employment, agricultural outputs, food sufficiency, and easy access to other essential needs of the society. This is the reason transportation is seen as public investment in a country that drive economic growth. With rail-transportation accessibility of hinterland, urbanization, availability of goods and services are guaranteed with least cost. It is imperative for government to always encourage the growth on this public infrastructure such as rail-transportation in other to achieve the desired growth in the economy.

5.3 Recommendations

The following recommendations are outline to make to support this study;

Government should give rail-transportation a high priority because it provides the most effective and efficient mean of transportation. Rail-transport is the most safest means of movement with less stress and time –bound with speed of light. Rail-transportation has the capacity of reducing the traffic volume, which had risen continuously over time.

There is need to develop more rail- transports system to allow easy movement and faster transportation. This will help to solve the issues related to traffic jams, pollution, and reduces traffic volume in the city.

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