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The Impact of Road Transportation Infrastructure on Economic Growth in Nigeria

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Abstract: **This paper examined the impact of road transportation on economic growth in Nigeria. Both primary and secondary data were used as sources of data. Probit model was used to analyze the primary data while multivariate model was used for analyzing the secondary data to determine the long run relationship between growth and road transportation in Nigeria. The result shows that the transport sector positive impact on the economic growth in Nigeria. Based on the findings, it was suggested that the government should come up with sustainable and implementable road development and maintenance policies that will ensure good access and flow in Nigeria. Also, economic growth in Nigeria depended on the level of good and accessible road transportation and facilitates business activities.**

Keywords: **Road transportation, government expenditure, economic growth and probit model.**

I. INTRODUCTION

The relationship between transport infrastructure and economic growth has attracted a lot of research effort and attention from economists, policy makers and politicians since the early 1990s. (Gramlich, 1994) said it remains essentially unclear whether the direction of causation is from transport infrastructure to economic growth or vice-versa or both. (Kessides, 1996) notes that one of the main shortcomings of research on the economic impact of transportation infrastructure is that it has so far not adequately accounted for simultaneity effects on which economic growth can lead to development of the transport system as well as result from it. Several previous studies could not confirm the direction of causation between the development of the transport sector and economic growth. In addition, most of these studies have typically relied on cross-sectional or panel data regressions. A general problem associated with such studies is that they implicitly impose or assume cross-sectional homogeneity on coefficients that in reality may vary across countries because of differences in geographical, institutional, social and economic structures. Hence, the overall results obtained from these regressions represent only an average relationship, which may or may not apply to individual countries in the sample (Bloch and Tang, 2003).

The adequacy of road transport infrastructure determines a country's success and another; failure in diversifying production, expanding trade, coping with population growth reducing poverty, or improving environmental conditions. A good road transport infrastructure raise productivity especially in the agricultural sector of the economy and lowers production costs. In Nigeria, the link between where the major production activities take place and where it is needed for final consumption need good road transportation that will bridge the gap, although the precise linkages between infrastructure and development are still open to debate. However, according to the World Development Report, 1994 infrastructure capacity grows step by step with economic growth.

Good road infrastructure services helps the poor contribute to environments sustainability. Clean water and sanitation, non-polluting sources of power, safe disposal of solid waste, and better management of traffic in urban areas provide environmental benefits for all income groups. The urban poor often benefit most directly from good road infrastructure

services which mitigates standard of living conditions characteristic of concentrated settlements such as unsanitary conditions, hazardous emissions, and accident risks.

Integrated urban planning and transport policy can lead to more efficient use of both land and transport capacity with favourable environmental results. Expansion of transport infrastructure can reduce total pollution loads as congestion falls, average .Vehicle speeds rise, and routes are shortened. Road improvements can also encourage vehicle use and decrease emissions. Therefore, additions to infrastructure capacity are only part of the solution. Improved management of traffic and land use and promotion of non-motorized modes, cleaner fuels, and public transport are also important.

This paper is an attempt re-examine the impact of road transportation system on economic growth in Nigeria to achieve the objective above the study is structured into five sections, which are introduction, literature review/theoretical framework, the methodology, data presentation/analysis, and conclusions/recommendations.

II. LITERATURE REVIEW

The evidences of research on the subject matter of this study are mixed across countries, data and methodologies, with some of the findings having positive impact, while others find little or no significant growth effect of infrastructure. Empirical work by Aschauer (1989) on the United States has provided evidence of a strong and positive relationship between public investment in infrastructure and growth over the period 1949-1985. He asserts that the decrease in public investment may be crucial in explaining the US economy's relatively poor economic performance between 1970s and 1990s. This finding has been confirmed in some subsequent studies, but challenged in others. For example, the World Bank's World Development Report (1994) finds a large range of empirical results on the importance of infrastructure for economic growth, with estimates ranging from no effect, to rates of return in excess of 100% per annum.

Using cross-country data, Easterly and Rebelo (1993) find a positive effect of investment in transport and communication on economic growth. Sanchez-Robles (1998) also find a positive impact of road length and electricity generating capacity in explaining subsequent economic growth. Aschauer (2000) finds that the stock of public infrastructure capital is a significant determinant of aggregate total factor of productivity and that investments in public sector not only improve quality of life but also increase economic growth and returns for private investments. The findings of Demetriades and Mamuneas (2000) indicate that public infrastructure capital has significant positive long-run effects on both output supply and input demands in 12 OECD countries. Boopen (2006) analyses the contribution of transport capital to growth for a sample of 38 Sub- Saharan African countries using both cross- sectional and panel data analysis. In both sample cases, the analysis concludes that transport capital has been a contributor to the economic progress of these countries. Result of Seethepalli (2008) also proves that infrastructure is important for promoting growth in East Asia.

The results obtained by Montolio and Solé-Ollé (2009) support the idea that productive public investment in road infrastructure has positively affected relative provincial productivity performance in Spain. In contrast, Tatom (1991; 1993), Holtz-Eakin and Schwartz (1995) and Garcia-Mila (1996) suggest that there is little evidence of an effect from infrastructure to economic growth in a panel of U.S. state level data, particularly when fixed effects are included. It is interesting to note that even though the relationship between transport infrastructure and economic growth has attracted a lot of research effort and attention from economists, policy makers and politicians in the early 1990s (Gramlich, 1994), it remains essentially unclear whether the direction of causation is from transport infrastructure to economic growth or vice-versa or both. Kessides (1996) notes that one of the main shortcomings of research on the economic impact of transportation infrastructure is that it has so far not adequately accounted for simultaneity of effects-economic growth can lead to development of the transport system as well as result from it.

Previous studies based on Cobb-Douglas production function could not confirm the direction of causation between the development of the transport sector and economic growth. In addition, most of these studies have typically relied on cross-sectional or panel data regressions. A general problem associated with such studies is that they implicitly impose or assume cross-sectional homogeneity on coefficients that in reality may vary across countries because of differences in geographical, institutional, social and economic structures. Hence, the overall results obtained from these regressions represent only an average relationship, which may or may not apply to individual countries in the sample (Bloch and Tang, 2003). Results obtained by Ashipala and Haimbodi (2003), Canning and Pedroni (2008) and Egart et al. (2009) lend support to this view.

The World Development Report noticed that as the economy develops, an increasing proportion of the country would need to open up by the construction of roads (World Bank, 1994). Work by Fernald (1999) provides evidence that increasing the road stock induces faster productivity growth in those industries that use reading more intensively, implying that the causation is more likely to be from infrastructure investment to output growth, rather than the other way around. Based on a cross-regional study comparing infrastructure provision in Spain and the US. De la Fuente (2000) also concludes that causality flows from infrastructure investment to economic growth. Other studies have used the VAR approach to solve the problem associated with the endogeneity of public investment in the production function approach. Majority seems to agree with the theoretical postulation that public investment has a positive effect on output. Among these are Queiroz and Gautam (1992) who find road infrastructure to be significant factor of economic growth and development.

Mittnik and Neumann (2001) also establish that public investment has positive influence on GDP. However, there is no significant causal link running from GDP to public investment. Their results provide evidence for a complementary relationship between public and private investment. Using time series data for the US economy and cointegration analysis, Lau and Sin (1997) reject the endogenous growth model for the US economy. Looney (1997) analyses the effects of several types of public infrastructure in Pakistan and finds that public infrastructures have not been instigating private sector expansion but have been rather a response to the needs of the sector. Mamatzakis (2002) finds a positive effect of public infrastructure (ports, railways, roads, electricity and communications) on output and private capital productivity of the Greek industrial sector. He also finds that the causal relationship is from public infrastructure to productivity. Canning and Pedroni (2008) investigate the consequence of various types of infrastructure provision in a panel of countries. They show that while infrastructure does tend to cause long-run economic growth, there is substantial variation across countries.

Ashipala and Haimbodi (2003) look at the relationship between public investment and economic growth in South Africa, Botswana and Namibia using the VECM methodology. They find that the effect of public investment on growth is not significant however, it has the correct sign. On the other hand, private investment is shown to have a long run growth impact in South Africa and Namibia. However, they find evidence indicating a reverse causality from GDP growth to public investment. The causality is negative in the case of Botswana suggesting that as the economy grows investment in public goods declines, which contradicts both the Keynesian theory and Wagner's law. Nurudeen and Usman (2010) use cointegration and error correction methods to analyze the relationship between government expenditure and economic growth in Nigeria. Their results reveal that government total capital expenditure, total recurrent expenditures, and government expenditure on education have negative effect on economic growth. On the contrary, rising government expenditure on transport and communication results to an increase in economic growth. Finally, Pradhan (2010) explores the nexus between transport infrastructure (road and rail), energy consumption and economic growth in India over the period 1970-2007. He finds evidence of unidirectional causality from transport infrastructure to economic growth.

III. METHODOLOGY

Econometrics methodology was employed in this study as the analytical tool for the examination of the relationship between road transport infrastructure and economic growth. Consequently, the Ordinary Least Squares method was adopted to investigate the long-run relationship between them. The model states that economic growth is a function of road transportation in GDP, capital utilization (CUR), government expenditure on road transportation (GENOT), and Exchange Rate (EXCHR).

To further examine the relationship, the study employed Johanson's Cointegration Test. The secondary data used were obtained from the World Bank Database, Central Bank of Nigeria Statistical Bulletin, National Bureau of Statistics, Global Development Finance Statistics and International Development Statistics.

Model Specification:

The model formulation of rooted in the theoretical framework as postulated by Bloch and Tang (2003), the model was specified as follows:

$$GDP = f(ROT, AIT, RAT) \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

Where the GDP is the gross domestic product in Nigeria, ROT is the amount of road transportation in the gross domestic product, AIT is the amount of air transportation in gross domestic product and RAT is the amount of rail transportation in gross domestic product in Nigeria. This model was used to establish the relationship between economic growth and transportation infrastructure in Nigeria.

Modification was done on the model in order to achieve the objective of the study as follows:

$$GDP = F(ROT, CUR, GENOT, EXCHR) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \ (2)$$

The model transformed by introducing the Logarithm form:

$$GDP = \alpha + \beta_1 ROT + \beta_2 CUR + \beta_3 GENOT + \beta_4 EXCHR + \mu \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots \ (3)$$

From the model above the Gross Domestic Product is a function of the amount of Road Transportation in GDP, Capital Utilization (CUR), Government Expenditure on Road Transportation (GENOT), Exchange Rate (EXCHR) and the Error Term.

Taking the natural log of the variables in equation 3 we derive the equation 4 as follows:

$$InGDP = \alpha + \beta_1 InROT + \beta_2 InCUR + \beta_3 GENOT + \beta_4 EXCHR + \mu \ \ldots\ldots\ldots\ldots \ (4)$$

The a priori expectation of the model specified in equation 4 such that $\beta_1, \beta_2, \beta_3' and \beta_4 \succ 0$

IV. EMPIRICAL RESULTS, INTERPRETATION AND ANALYSIS

A. Unit Root Tests:

The unit root test was conducted to ascertain the stationarity of the data before estimation using both the Augmented Dickey Fuller (ADF) and the Philips-Perron (PP). The results of the test presented in Table I show that all the variables included in the model are stationary at 1 percent level. Given the unit-root properties of the variables, we proceeded to conduct the co-integration test to ascertain the long-run relationship between transportation and economic growth.

B. Johansen Co-integration Test Results:

The Johansen co-integration test result in Table II shows the existence of two co-integrating equations at 5% significance level in the model. The hypothesis which states there is no long-run relationship between transportation infrastructure and economic growth is rejected at 5% significance level. This implies that there exists a long-run relationship between transportation infrastructure and economic growth in Nigeria.

	Likelihood	**5 Percent**	**1 Percent**	**Hypothesized**
Eigenvalue	**Ratio**	**Critical Value**	**Critical Value**	**No. of CE(s)**
0.753709	111.0280	82.49	90.45	None **
0.710742	70.39203	59.46	66.52	At most 1 **
0.362152	34.41942	39.89	45.58	At most 2
0.305066	21.37941	24.31	29.75	At most 3
0.225435	10.82518	12.53	16.31	At most 4
0.111151	3.417023	3.84	6.51	At most 5

**(**) denotes rejection of the hypothesis a 5 %(1%) significance level* L.R. test indicates 2 cointegrating equation(s) at 5% significance level

C. The Long Run Regression Results:

The table III below shows the estimation results of the equation used in the study, from the results the R-squared of 0.78 indicates that 78 percent variation in the dependent variable is accounted for by the estimated equation. This implies that 78 percent variation in the Gross Domestic Product in Nigeria is caused by the independent variables.

The Adjusted R-squared of 74 percent suggests that the model in used is fit in explanation the variation in GDP put in consideration the losses of degree of freedom cause by the number of independent variables, that is the independent variables are statistically significant in determining the total variation in Gross Domestic Product in Nigeria. The F-statistic suggest that the model employed in the study is statistically significant given the value as 18.45499 , meaning at 5 percent level of significant, the equation in use is statistically significant that means, useful in explaining a unit change in Gross Domestic Product in Nigeria.

From the result Road transportation contribution to Gross Domestic Product has a positive impact on Economic Growth in Nigeria, given its coefficient (0.209677) of the equation it is statistically significant at less than 5 percent level of significance and it is capable of determining the variation in economic growth in Nigeria. This implies a unit change in Road transportation contribution will cause 0.21 percent change in Gross Domestic Product in Nigeria.

The capital utilization from the model was seen to have a negative relationship on Gross Domestic Product in Nigeria but statistical insignificant in determining the variation in economic growth given its coefficient which is higher than 5 percent level of significance. This implies that in determining the impact of road transportation system on the Nigerian economic growth. Capital utilization is statistically insignificant in determining the changes in economic growth in Nigeria, but it has a negative effect on Gross Domestic Product in Nigeria.

The results shows that the Government Expenditure on Road Transportation (GENOT) is positively related to Gross Domestic Product in Nigeria and its coefficient suggests that Government Expenditure on Road Transportation (GENOT) is statistically significant at less than 5 percent level of significance in determining the variation in Gross Domestic Product in Nigeria. This implies that Government Expenditure on Road Transportation (GENOT) has a positive impact on economic growth in Nigeria and that Government Expenditure on Road Transportation (GENOT) can either increase the rate of economic growth in Nigeria or reduce the level of growth in Nigeria. From the result Government Expenditure on Road Transportation (GENOT) will is responsible for 0.160711 changes in Gross Domestic Product in Nigeria that is a unit change in Government Expenditure on Road Transportation (GENOT) will cause 0.161 percent change in Gross Domestic Product in Nigeria.

Exchange Rate (EXCHR) is found to be positively related to Gross Domestic Product in Nigeria that is having a positive impact on Gross Domestic Product in Nigeria, but statistically insignificant in explaining the variation in Gross Domestic Product in Nigeria given the value of its coefficient and the level of significance higher than 5 percent level of significant. This implies that Exchange Rate (EXCHR) account for less or no variation in Gross Domestic Product in Nigeria that is its impact is less on the economic growth in Nigeria.

From the result the External Reserves (EXTR) was found to be positively related to Gross Domestic Product in Nigeria, and given the coefficient of 0.1447 and the level of significant it is statistically significant in accounting for the variation in Gross Domestic Product in Nigeria. This implies that External Reserves in Nigeria can improve road transportation which can translate to increase in economic growth in Nigeria. Also a unit change in external reserve we cause 0.1447 increases in Gross Domestic Product in Nigeria.

V. SUMMARY OF MAJOR FINDINGS AND POLICY OPTIONS

The analysis and the results from model estimation has clearly defined that there is a strong and positive relationship between road transportation and economic growth in Nigeria and also the results from the probity model shown that transportation infrastructure can improve the well-being of the citizens in Nigeria. From the results of the secondary data, it is clear that road transportation contribution to Gross Domestic Product in Nigeria has a great impact on the economic growth. This implies that transportation system can increase productivity and effective distribution at the long run increase the economic growth in country.

Government expenditure on transportation has a positive and a significant relationship on economic. The implication is that increase in government expenditure on transportation in Nigeria will increase the level of economic growth on the other hand reduction in government expenditure on transportation will cause decrease in the economic growth in Nigeria.

But over the years, government expenditure on transportation has been very poor and less attention has been shown by government.

Similarly, External Reserve was positively related to Gross Domestic Product in Nigeria and has a positive impact on economic growth. This is because external reserves can be used for expansion of capital project and can be used in road transport maintenance and for the construction of road facilities. If external reserves from the result can improve the economic growth in the country if the funds in the external reserves are well managed.

The following policies recommendations was made after the research findings

i. Government and its agencies like FERMA should come out with sustainable and implementable road development and maintenance policies that will ensure good access and good traffic flow on our roads across the nation.

ii. There is need to increase and encourage private participation in the provision of public transport services as mentioned earlier.

iii. The use of motorcycle as public mode of transportation in cities should be institutionalized since the users are constrained to use it in the absence of alternate. However, policies guiding the regulations and use of this mode should be formulated and monitored so that its use would not affect negatively the commuters' mobility problems. Similarly, government should provide enabling environment that would guaranty efficient and adequate movement of vehicles in cities.

iv. The management of road transportation companies should make sure that the transport vehicles go through routine maintenance to reduce the rate of breakdown of transportation vehicle on the highway.

v. Secondly, the management as well computerizes the company as to monitor the speed limits on the driver. This will help to reduce the rate of road accidents and make the company to have goodwill and the management should also provide modern infrastructure and facilities to take adequate care of the commuters.

VI. CONCLUSION

This research work was an attempt to examine the economic impact of road transportation system in Nigeria, seeing that all Nigerian government developmental agenda of the past and present leaders includes transportation development, especially road transportation as a tool for ensuring social well-being of its citizens. Some specific objectives were to examine the nature and state of road transportation system before, during and after independence in Nigeria.

Also to examine the various National policies and programme toward the revitalization of the road transportation system in Nigeria for economic growth and development, to investigate factors militating against the improvement and the development of road transportation in Nigeria and to examine the economic prospect of road transportation system if the policy of the present government transformation agenda is well managed and implemented.

The research findings suggests that road transportation has an impact in the economic development in Nigeria. From the result economic growth in Nigeria depended on the level of good and accessible road transportation and the level of road transport infrastructures that will complete the business activities and facilitate trade of Small and Medium scale Enterprises in Nigeria.

One of the challenges of road transportation system in Nigeria is poor funding and management of the facilities across the nation. From the research, it is noted that government attention to road transportation system and even the entire transportation sector is poor. Money meant for the maintenance of old projects and development of new projects are diverted for personal use. This has been the situation in Nigeria and most West Africa countries. For the road transport system to be revitalized, government should give more attention to the sector.

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APPENDIX – A

TABLE I *UNIT ROOT TEST RESULTS*

ADF Test Statistic			Philips-Perron Test Statistic		
Variables Level		**1st Difference**	**level**	**1st Difference**	**Conclusion**
GDP	4.629	2.6253	1.599	-5.176	I(0)
ROT	2.775	1.9662	6.829	4.8642	I(0)
CUR	3.999	2.5641	11.158	1.3470	I(0)
EXCHR	6.787	5.0909	-1.198	-4.464	I(0)
GENOT	0.1266	-3.701	-1.510	-3.736	I(I)
EXTR	2.258	-4.559	-0.919	-6.385	I(0)
1% Critical	-3.6661	-3.649	-3.6661	-3.6752	
5% Critical	-2.9627	-2.953	-2.9627	-2.9665	
10% Critical	-2.6200	-2.616	2.6200	-2.6220	

**indicates significant at 1% or a rejection of the null hypothesis of no unit root at the 1% level*

TABLE II THE LONG RUN REGRESSION RESULTS

VARIABLES	COFFICIENT	STANDARD ERROR	T-STATISTICAL	PROB.
InC	4.7577	0.5763	8.2550	0.0000
InROT	0.2096	0.1252	1.6744	0.0060
InCUR	-0.0307	0.3470	-0.0886	0.9301
(D)InGENOT	0.1607	0.0613	2.6216	0.0144
(D)InEXCHR	0.0425	0.1237	0.3434	0.7340
(D)InEXTR	0.1447	0.0948	1.5259	0.0391
R-SQUARE	0.780			
ADJ R-SQUARE	0.737			
F-STATISTIC	18.45499			
D-W STATISTIC	1.9115			
PROB	0.00000000			

Source: *Author's Computation from E-views software 7.0*