SUSTAINABLE ECONOMIC GROWTH OF NIGERIA: IS ROAD TRANSPORTATION AN X-FACTOR?

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Abstract

This paper attempts to provide empirical evidence on the contribution of road transport to sustainable economic growth in Nigeria. In this paper, Gross Domestic Product is used as the dependent variable while road transportation output is used as the independent variable; interactive variables are included in the models which are labour and capital as popularly shown in growth model. Relying on cointegration/error correction technique, it showed that there is a positive relationship between road transport and economic growth in Nigeria. The paper suggests that government of Nigeria should look into some existing major roads that require urgent intervention of palliative repairs and maintenance. It should also provide modern road infrastructure and facilities that can stand the test of time to take adequate care of commuters and freights

Keywords: Road Transportation, Sustainable Economic Growth, Nigeria, Co-integration, Error Correction Technique, Unit Root Test

1. Introduction

In recent years, all her efforts to grow the economy, Nigeria's rate of economic growth has remained very volatile and sluggish (Uwakaeme, 2015). However, sustainable economic growth is a function of a number of factors in which road transportation is of importance (Garg and Hyder, 2006). Efficient and effective road transportation serves as one of the channels for the collection

and exchange of goods and services, movement of people, dissemination of information and the promotion of rural and urban economy.

In Nigeria, the issue of road transportation development has continued to be of national importance. For instance, most of the rural roads are in poor condition, and this has imposed significant cost on the national economy especially to the agricultural activities due to increased vehicle operating costs and travel times (Akintola, 2007). This also affects the industrial sectors in the urban areas because the cost of transporting the raw materials from the rural area to the urban area is problematic. The Federal Government of Nigeria (FGN) has embarked on various programmes at one time or the other to ensure the provision of adequate road transport facilities to meet the needs of the population.

Against this background, this paper attempts to empirically analyze the impact of road transport on economic growth in Nigeria.

1.3. Research Hypothesis

H_0: Road transportation has not significantly impacted on economic growth in Nigeria.

H_1: Road transportation has significantly impacted on economic growth in Nigeria

2. Empirical Review

There are handful of literatures about transport-economic growth nexus both in the developed and the developing countries. Boopen (2006) analyzed the contribution of transport capital to growth for a sample of Sub Saharan African (SSA) and a sample of Small Island Developing States (SIDS), using both cross sectional and panel data analysis. In both cases, the analysis concluded that transport capital has been a contributor to the economic progress of these countries. Analysis further revealed that in SSA case, the productivity of transport capital stock is superior as compared to that of over all capital while such is not the case for the SIDS where transport capital is seen to have the average productivity level of over all capital stock.

For research of transport investment and growth in developing economies, Demurger (2001) examines data of 24 provinces of China in 1985-1998 and points out that the inequality of transport infrastructure is one of the main factors leading to growth inequality across provinces. Some researchers explored the impact of public capital on the growth rate of output. Canning and Pedroni (2004) used physical measures like kilometers of paved water to investigate "the long run consequences of infrastructure provision on per capital income in a panel of countries" covering the period between 1950 and 1992. His estimate results suggested that for paved water the sign of the impact of an increase in provision on GDP per capital varies across countries. Some studies also show that public capital can lead to economic growth by raising total factor productivity of all inputs. Aschauer (1989) find evidence that a one percent increase in public capital stock lead to a 0.39 percent increase of total factor productivity.

Yamaguchi (2008) conducted a regression analysis on panel data of five nations between 1992 and 2004 to identified water and road transport investment impact on macro-economic multi factor productivity growth (MFP) and reported that physical improvement of the road and water capital stock has positive effect.

Haines and Margo (2006) used panel data set of counties for 1850 and 1860 to examine the economic impact of gaining access to a railroad and waterways on local economic development in the US. Difference in Difference approach was adopted to compare outcomes from a treated group (counties that gain waterways and rail access in the 1850s) with a control group (those that gain waterways and rail access before and after 1850s). Results showed that rail access appears to have increased the percentage participation in the service sector, decreased agricultural yields, and reduced the share of improved acreage in total land area.

Furthermore, Herranz-Loncan (2011) examined the role of transport in export-led growth of Uruguayan economy between 1870 and 1913 using OLS estimation. The results showed that Uruguayan transport did produce some positive effects. They helped to integrate the national market while also promoting the political and administrative unification of the country. However, their economic impact was much lower than in other countries of the region that experienced export-led growth. This indeed has affected the growth prospects of the Uruguayan economy. The results, therefore, provide reason for relative poor performance of the economy during the period under study. The study concluded that Uruguayan case provides a clear-cut example in which geography limited the potential of railway technology to generate significant levels of economic growth.

Atack et al (2009) investigated whether railroad induced or followed economic growth in the American Midwest for the period 1850-1860. Using a newly developed GIS transportation database, the study examined the subject matter, focusing on two indicators of broader economic change, population density and the fraction of population living in urban areas. The difference in differences estimates (supported by IV robustness checks) strongly suggest that the coming of the railroad had little or no impact upon population densities just as Albert Fishlow concluded some 40 years ago. However, the results also imply that the railroad was the reason for Midwestern urbanization, accounting for more than half of the increase in the fraction of population living in urban areas during the 1850s.

In addition, Ramirez (2001) studied the impact of rail transport on the Colombian's economic development using panel data set for the period 1914-1980. The study adopted fixed effect model and found out that railroads did not play an overwhelming role in the Colombian economy, in contrast to other Latin American countries with similar rail transportation system such as Brazil

and Mexico. In addition, the study found out that railroads caused expansions in coffee exports, but the magnitude of these effects were lower than those suggested in the literature.

3. Overview of Road Transportation in Nigeria

Nigeria has the largest road network in West Africa and the second largest south of the Sahara, with roughly 108,000 km of surfaced roads in 1990 (Wikipedia, 2016). With respect to road travel, it is important to evaluate the extent and quality of the road network in the country.

In terms of the extent of the road network, the federal government has done much in the last two decades to improve the coverage of Nigeria‘s road system. One outstanding example is the work of the Directorate of Food, Roads, and Rural Infrastructure (DIFFRI), which in the late 1980‘s embarked on a campaign to construct approximately 60,000 kilometers of new rural roads. As with so many things in post-oil-boom Nigeria, many rural (and urban) roads have not received adequate maintenance. Poorly-maintained roads are particularly problematic in the rainy season (approximately March to October). In fact, some rural areas are only accessible by car in the dry season (Gumel, 2010).

Although urban roads are in better condition than most rural roads, maintenance of roads is also a problem in the cities. Since the collapse of oil prices in the early 1980‘s and implementation of a Structural Adjustment Program in 1986, state budgets have been extremely tight. Fiscal austerity has also been exacerbated by corrupt military regimes that have fuelled state revenues into non-productive projects (often contracted to firms owned by military leaders) or foreign bank accounts. Although almost all urban roads are paved (Nigerians often say "tarred"), many have large pot holes or large sections where pavement has been eroded.

Generally, the road networks in Nigeria are poorly maintained and are often cited as a cause for the country’s high rate of traffic fatalities. In 2004 Nigeria’s Federal Roads Maintenance Agency (FERMA) began to patch the 32,000-kilometre federal roads network, and in 2005 FERMA

initiated a more substantial rehabilitation (Wikipedia, 2016). These are the portions that are already modernized at motorway and expressway standard:

Table 1: Modernized Motorways and Expressway in Nigeria

Motorway Number	Route	Built	Planned	Remarks
A1	Agapa Rd - E1	15 km		
A1	Oyo – Ogbomosho	35 km		u/c, end of 2015
A2	Warri – Benin City	77 km		Benin City Bypass
A2	Madalla/Abuja (A234) – Kaduna (A235)	179		
A2	Kaduna North – Kano	221		Ring Road/Eastern Bypass
A3	Port Harcourt (E-W Rd) – Umuahia (Umu Opara Rd. /Mission Hill)	100		
A3	Okigwe – Enugu (A343)	87		
A3	Enugu – Ngwo (A232)	13		
A5	Papalanto – Abeokuta	37		
A121	Logbara/Sagamu(E1) - Benin City (A121, Benin City Bypass)	247		Shagamu- Benin Expy
A122	Ibadan – Ife	63		Ibadan – Ife Expy
A232	Benin City (Benin City Bypass) – Agbor (Aliagu Rd.)	46		
A232	Agbor (Lagos -Asaba Rd.) – Enugu (A3)	161		
A234	Abuja North Bypass (Gado Nasko Rd. – Murtalla Mohammed Expy)	25		
E1	Ring Rd Apongbon St – A1	21.5		Lagos East Bypass
-	Apapa – Oworonshoki- Tin Can Access - Creek Road	28.5		Apapa – Oworonshoki Expy/ West and South Lagos Bypass
-	Ring Rd Apongbon St – A1	80		Lagos - Badagry Expy
-	Ijora Cause Way	2		Lagos South Bypass

-	Eko Bridge - Apongbon St	4		Eko Bridge
-	Murtala Mohammed Expy	5		Abuja East Bypass
-	Nnamdi Azikiwe Expy	14		Abuja West Bypass
-	Airport Rd. /Umaru Musa Yar'Adua Rd.	38		Abuja South Bypass

Source: Wikipedia (2016).

4. Data and Methodology

Data Source

The data used in this study were time series spanning the period of 1980 to 2014. This secondary data were collected from the central bank of Nigeria, NIMASA, and the World Bank Data indicator. The research is designed to measure the impact of road transportation on economic growth in Nigeria using descriptive and econometric approach. This approach is selected to ensure that data-driven decision and evidence-based findings are made. Gross Domestic Product is used as the dependent variable while road transportation output is used as the independent variable; interactive variables are included in the models which are labour and capital as popularly shown in growth model.

Since the data were secondary, the study first tested the stationarity of the data using the Augmented Dickey Fuller test and the model was estimated using the Ordinary Least Square Regression technique then it was exposed to the error correction model for short run analysis and cointegration test to test for the long run equilibrium among the variables. Statistical and econometric tools are used as evaluation techniques, these include: Standard error, T-test, R-Squared, F-test and Durbin Watson statistics.

Specification of Model

The model for this study will be based on the Cobb-douglas function which specifies economic growth as a function of labour and capital with technology.

Basic production function $y = f(k,l)$----------1

in this case the cobb-douglas function is $y = A K^a L^{1-a}$ ----------2

This function exhibit constant returns to scale.

$y/l = A K^a l^{1-a} / L = A K^a L^{1-a} L^{-1} = A K^a L^{1-a-1} = A K^a L^{-a} = A K^a / L^a = A (K/L)^a$ ----------3

Income per capital is thus a function of capital intensity. Hence the growth rate of K is: $(1-dk) / k = 1/k - d = sy/k - d$----------4

Capital-output ratio is a constant $k = k/y$----------5

Hence upon rewriting, the growth rate of k is $gk = (1 - dk) / k = (sy - dk) / k = sy/k - d = s/k - d$----------6

Overall growth rate $y/l = A (k/l)^a$ and take log to get.

$LogY - logL = logA + a (logK-logL)$----------7

Now differentiate [$d(logx) = dx/x$]----------8

$dy/y - dl/l = dA/A + a (dk/k - dl/l)$ ----------9

Rewriting

$gy - gl = ga + a(gk - gl) = a(sy/k - d - gl) = a(s/k - d - gl)$----------10 by capital intensity, net of depreciation must be greater than the growth rate of labour if per capital is to grow.

Base on this, road transport will be included in the model as stated below:

$GDP = \beta_0 + \beta_1 K_t + \beta_2 L_t + \beta_3 RT + \mu$ ---------- i

Where GDP = Gross Domestic Product

K = Capital

L = Labour force

RT = Road transportation (proxy by government spending on road infrastructure)

β_0 = Constant

β_1 to β_3 = Parameter estimates

μ = Stochastic error term

The a priori expectations are: $\beta_1, \beta_2 \beta_3 > 0$

4. Empirical Findings and Analysis

4.1. Unit Root Test

Table 2 in appendix shows the summary of Augmented Dickey Fuller Test which was used to test whether the variables in question are stationary or not. Non-stationary data produces spurious regression; hence the result may be misleading. Therefore, it is cognizant to establish the stationary property of the data. The decision rule is that the ADF test statistic value must be greater than the Mackinnon critical value at 5% and at absolute value.

From the summary of the Augmented Dickey Fuller Test in Table 1, it is evident that all the variables are not stationary at level at 1%, 5% and 10% level of significance however, when examined at first difference were stationary. This showed that if the variables are estimated in first difference the regression result will be free of spurious result.

4.2. Co-Integration Test

Table 2 in appendix shows the long run relationship existing among the variables of study. The table shows the variables converge in the long run thereby depicting the existence of long run relationship among them. The long run relationship exists at 5% level of significance according to the Trace test statistics and the Eigenvalue. This implies the existence of two (2) co-integrating relationship among the variables. Therefore there is long run relationship among the variables indicating that road transportation has long-run relationship with economic growth in Nigeria.

4.3. Ordinary Least Square Result

Table 3: Regression Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.292939	11.32274	0.555779	0.5829
RT	34.88267	5.500482	6.341747	0.0000
K	5.427539	0.695580	7.802901	0.0000
L	0.029020	0.029870	0.971536	0.3399
ECM(-1)	-0.808849	0.196320	4.120053	0.0003

R-squared	0.984921	Adjusted R-squared	0.982687
F-statistic	440.8842	Durbin-Watson stat	2.310748
Prob(F-statistic)	0.000000		

The findings from Table 3 above shows that a one percent increase in road transportation will to about 34.9% increase in economic growth. The test of statistical significance showed that there is statistical significance between road transportation and economic growth in Nigeria as shown by the t-test and standard error estimate. The findings showed that the t-test is 6.34 while the t-tabulated is 2.05 at 5% level of significance; the standard error is 5.500 while half of the parameter estimates (½ * 34.883 = 17.441). Since the calculated t-test is greater than the tabulated t-test and the standard error is lesser than half of the parameter estimate, there is sufficient evidence to conclude that there is statistical significance between road transportation contribution to GDP and economic growth.

Also, the empirical findings showed that there is positive relationship between labour force and economic growth in the country. This implies that increase in available work force would bring about increase in economic activities. This is further buttressed by the fact that labour force is an essential factor that facilitates production because it involves manpower which comprises both skilled and semi-skilled personnel. These personnel are expected to oversee various production activities for optimum output. Effective labour force is needed for optimum output in various sectors of the economy facilitating economic growth. Thus, the empirical analysis showed that a percent increase in labour force would result to about 0.029% increase in economic growth. However, this is statistically insignificant at 5% level of significance as revealed by the t-test and standard error. The insignificance between labour force and gross domestic product could be traced to the level of unemployment in the country.

The study showed that capital has positive relationship with gross domestic product. This implies that increase in gross fixed capital formation will result to an increase in the economic growth of

the country. The magnitude of the parameter estimate is explained by the value of the parameter estimate which states that a percent increase in capital would result on average to about 5.4% increase in the gross domestic product meaning that there is a complementary increase in economic growth as a result of increase in capital. This could be further justified on the ground that the establishment of any producing firm or industry is quite difficult without the availability of capital. Capital is essential funds needed for resources to be put in place for all factors of production to function effectively. Capital is not only needed to establish firms, they are also need to fund continuous production which on the long run enhances economic growth. This is statistically significance at 5% level of significance using t-test and standard error for decision making. The t-test is 7.81 while the t-tabulated is 2.05 at 5% level of significance; the standard error is 0.695 while half of the parameter estimates (½ * 5.427 = 2.7135). Since the calculated t-test is greater than the tabulated t-test and the standard error is less than half of the parameter estimate, there is sufficient evidence to conclude that there is statistical significance between capital and economic growth in the country.

Furthermore, it was discovered from the error correction model analysis which showed a co-efficient value = 0.808849, t-test value = 4.12 and a very low probability value of 0.0003. With this finding, an inference can be drawn that the economy needs 80.9% mechanical adjustment for it to be at equilibrium in the short-run.

The adjusted R-squared (98.3%) shows that after adjusting with the degree of freedom, the regression still has a moderate fit of measure and that capital, labour force and road transportation are good variables to explain variation in economic growth while the remaining 1.7% are other factors which affect economic growth other than those captured in the model.

F-statistics confirms the joint statistical significance of the explanatory variables with the dependent variables since the calculated F-statistics is greater than the table value i.e. 440.8842 > 4.23. It can therefore be concluded that capital, labour force and road transportation are effective for policy formulation regarding economic growth in Nigeria.

Durbin Watson statistics indicates that there is no evidence to show that there is presence of autocorrelation in the model as shown by Durbin Watson Statistics which is 2.3

5. Summary, Conclusion and Recommendation

This paper specified and estimated a model on the impact of road transportation system on economic growth of Nigerian. Gross Domestic Product was used as the dependent variable while road transportation (proxy by) was used as the independent variable. Other interactive variables are included in the model were labour and capital as popularly shown in growth model. Relying on OLS/Error Correction Technique, the result revealed that there is a positive relationship between road transport and economic growth in Nigeria. However, the poor state of roads in the country has remained, for many years, an unremitting source of risk for travellers and transporters. Road accidents which are a direct fall-out of bad roads and careless driving habits have also been a major and worrisome source of untimely deaths and destruction of valuable goods in the country (Theunion, 2015). Therefore, this paper suggests that:

Government should look into some existing major roads that require urgent intervention of palliative repairs and maintenance. It should also provide modern road infrastructure and facilities that can stand the test of time to take adequate care of commuters and freights.

There must be enforcement of relevant laws by the federal, states and local governments to improve competition and protect consumer welfare in the industries providing transport infrastructural services.

There should be targeted intervention in the provision of infrastructure especially to rural areas and vulnerable groups to ensure improvement in transport sector

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Appendix

Table 2: Unit Root Test Results

Variable	**Levels**	**Critical Values**		**First differences**	**Critical Values**		**Order of Integration**	
GDP	3.409968	**1%**	-4.296729	-6.488747	**1%**	-4.273277	**I(1)**	Stationary at 1st difference
		5%	-3.568379		**5%**	-3.557759		
		10%	-3.218382		**10 %**	-3.212361		
RT	-0.215223	**1%**	-4.262735	-4.538418	**1%**	-4.273277	**I(1)**	Stationary at 1st difference

		5%	-3.552973		**5%**	-3.557759		
		10%	-3.209642		**10 %**	-3.212361		
L	-2.244368	**1%**	-4.262735	-5.526292	**1%**	-4.273277	**I(1)**	Stationary at 1st difference
		5%	-3.552973		**5%**	-3.557759		
		10%	-3.209642		**10 %**	-3.212361		
K	-2.073257	**1%**	-4.374307	-4.847165	**1%**	-4.416345	**I(1)**	Stationary at 1st difference
		5%	-3.603202		**5%**	-3.622033		
		10%	-3.238054		**10 %**	-3.248592		

Table 2: Co-Integration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.667071	71.17501	47.85613	0.0001
At most 1 *	0.614655	37.08044	29.79707	0.0061
At most 2	0.215175	7.518354	15.49471	0.518 2
At most 3	0.000233	0.00722 0	3.841466	0.9319

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values