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A Multivariate Causal Relationship among Road Transport Infrastructure Development, Economic Growth and Poverty Level in Nigeria

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Abstract: The study investigated the nature and direction of causality among road transport infrastructure development, economic growth and poverty level in Nigeria. These were with the view to providing information on the extent to which road infrastructure development influence economic growth and poverty reduction in Nigeria. The study used secondary source of data collection of annual time series data from 1980 to 2012 and VECM techniques was adopted. The findings showed that, road transport infrastructure development and economic growth were the sources of poverty reduction in the long run ($F = 5.7$, $p>0.05$) and that poverty reduction and economic growth could influence one another in the short run ($F= 3.0$, $p>10$). Therefore, the study concluded that road transport infrastructure development and economic growth could be seen as useful policy as it has the potential to contribute to the pace of poverty alleviation and vice-versa in the Nigerian economy.

Keywords: Causality; Economic growth; Poverty level; Real consumption expenditure; Road transport infrastructure.

1. Introduction

The provision of transport infrastructure could help in stimulating economic growth and reducing poverty through various channels, however, the linkages can also be vice-versa. Roads are important for communications, social integration and economic development. In recognition of the role transport plays in the overall development of any society and the desire to promote rapid socioeconomic development, particularly in the rural areas, the federal, state and local governments in Nigeria have been working towards the improvement and development of road transport infrastructure in the country. This is because the road accounts for more than 90 per cent of the movement of people, goods and services, and also essential for national socioeconomic activities.

The Federal Government is responsible for about 17 percent, State Governments 16 per cent and Local Governments 67 per cent of road maintenance in Nigeria, Central Bank of Nigeria (CBN) (2012). According to Buhari (2000), only 50% of federal roads and 20% of state roads in the country were in reasonably good condition, and only an estimated 5% of total rural roads were freely motor able. More lately Uche (2011) is of the opinion that, out of Nigeria's 198,000 kms of roads, less than 20% are paved and over 65% are in bad condition.

The Federal Government of Nigeria recognized that the development of transport infrastructure is essential to the growth of the economy, and for this purpose, substantial allocation has been made, following different developmental policies. This is because the mobility of people and goods provides for a more enhanced division of labour, increased productivity, structural change, greater competitiveness, growth in incomes and higher employment. Economic activity, reflecting higher productivity and consequent economic growth, is made possible by transport. In this chain of cause and effect, polices on transport efficiency would be necessary for further progress in economic growth and poverty alleviation program through an empirical investigation in Nigeria.

The issue of causality among road transport infrastructure development, economic growth and poverty alleviation is crucial since such nexus suggests that economic growth, transport infrastructure development and poverty reduction may perhaps be jointly determined in formulating appropriate policies (Gramlich, 1994). With respect to Nigeria, the issue of causality has not been addressed between road transport infrastructure development and economic development (economic growth or poverty reduction). Even in developed and some developing countries where attention has been paid to this issue, it remains essentially unclear whether the direction of causation is from transport infrastructure to economic growth on the one hand and to poverty reduction on the other hand or vice-versa.

One of the main shortcomings in addressing causation among transportation infrastructure development, economic growth and poverty reduction, is that, most scholars fail to adequately account for simultaneity issue. For

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instance, scholars have argued that, road transport infrastructure reduces poverty mainly by increasing economic efficiency, that is, by lowering costs and prices and enhancing opportunities. Poverty reduction as a result of connectivity to economic activities could also lead to increase in industrial sector, expansion in market of both agricultural output and manufacturing output as a result of increase in aggregate demand. Given this scenario, tax revenue of the government could increase, thereby enhancing government to expand or construct more roads. However, provision of good road network is an indirect way for growth to occur and pace of reducing poverty level in the economy. Although, attentions have been devoted to the issue of causality between road transport infrastructure development and economic growth with little evidence on the causal relationship between road transport infrastructure development and poverty reduction in the literature, however, conflicting result have been given (see Sadananda (2006), Jiwattanakulpaisarn *et al.* (2010), Keho and Echui (2011), Faridi *et al.* (2011) and Rudra and Tapan (2012).

Therefore, the causal relationship among economic growth, poverty reduction and road transport infrastructure development remains controversial giving the conflicting results among scholars. Sadananda (2006) and Niloy and Emranul (2005) for instance, found a uni-directional causality between economic growth and transport infrastructure development. Jiwattanakulpaisarn *et al.* (2010) observes bi-directional causality, while, Faridi *et al.* (2011) reports no existence of causality.

Given the above conflicting result, hence, the question of which of these variables causes one and other remains an empirical issue in Nigeria. So therefor, the causal relationship among economic growth, poverty reduction and road transport infrastructure development will be investigated in this study for the period of 31 years (1980-2012). This is because the road network is most affordable in carrying out economic activities which could bring about attainment of economic growth and poverty alleviation and vice-visa in both develop and developing countries of the world. Hence, the question of which of these variables causes one and other remains an empirical issue in Nigeria

In actual fact, studies are sparse on the causality between economic growth and poverty. This is understandable because there may not be a direct relationship between economic growth and poverty. However, provision of good road network is an indirect way for growth to occur and pace of reducing poverty level. Hence, the nature and direction of causality between economic growth and transport infrastructure development matters for poverty reduction in Nigeria. When it comes to specific guidance for transport investment decision-making, particularly a strategic one, existing knowledge on the link between transport infrastructure development, economic growth and poverty alleviation does not appear adequate.

2. Literature Review

2.1. Transport Infrastructure Development, Economic Growth and Poverty Theory

Jahan and McCleery (2005) argue that the impact of infrastructure on economic growth and poverty reduction takes the form of first-round effects, followed by subsequent impacts. In the first round, infrastructure development produces two initial effects that could lead to poverty reduction through economic growth. These two initial impacts are the supply side and demand side impacts. The development of infrastructure improves the supply side of the economy by reducing cost, enhances business climate, makes room for better access to market opportunities and opens up new opportunities. These supply side effects attract domestic and foreign investment, increasing employment and national output. The demand side effect of infrastructure development occurs when projects are implemented. In this case, the new project, say road construction, creates new jobs through which incomes are generated.

The social dimension of better infrastructure is that it increases access to basic social services, thus improving the living conditions of the poor. The subsequent effect of infrastructure development arises from fiscal revenue generated from it. As fiscal revenue increases through growth, additional budget can be generated for programmes that improve the living conditions of the poor. The theoretical exposition presented above has indicated that the link between infrastructure and poverty is not simple, but is rather a complex one. Infrastructure development can directly or indirectly lead to poverty reduction. It has also been emphasized that the extent to which infrastructure leads to poverty reduction through economic growth depends on the quality of governance and the institutional setting.

In general, access roads in rural and urban areas make only a modest contribution to national income growth, but they are likely to have a direct and significant impact on the daily life of the poor. On the other hand, inter-city transport modes such as trunk roads, rail and shipping are of strategic significance to a national economy. They are provided with the objective to stimulate and facilitate national income growth; their impacts on poverty reduction are likely to be indirect. The process through which the benefits of transport infrastructure development and policies lead to improvements in the standard of living of the low income groups often involves many links, and the final general equilibrium outcomes and incidence pattern across various groups are very difficult to predict (Prud'homme, 2004) and World Bank (2004)).

Development in transport infrastructure improves access to economic opportunities by reducing transport costs. Provided transport-market structures are reasonably competitive, this will be reflected in a reduction in prices for both freight and passenger services. Again, under competitive conditions, significantly predictable consequences will result. These include lower market prices for final products (both rural products and consumer goods), spatial extension of the market (due to the transport-induced changes in production and consumption patterns), higher personal mobility, and stimulation of socio-economic activities. In general, this dynamic process can be expected to

benefit all income groups in society in the form of real income effects and increased opportunities. In addition to improving accessibility, transport infrastructure development affects employment. The provision of transport services, including the construction and maintenance of transport infrastructure, generates demand for labour (often unskilled labour) and provides income earning opportunities for the poor. If a transport project generates jobs for the poor who are otherwise unemployed or under-employed, then it contributes to the reduction of poverty. In many developing countries, the construction aspect of transport sector development is often viewed equally as important as the service aspect of the sector in promoting economic growth.

2.2. Review of Empirical Literature

The idea behind many VAR studies provides weak evidence that there has been a strong linkage between infrastructure investment and private production as suggested in the previous empirical literature. Mcmillin and Smyth (1994), for example, use U.S. national time series data to estimate VAR models and find no clear evidence of a significant effect of publicly provided capital on private output. The VAR estimation by Pereira and De Frutos (1999) reveals that public capital is productive but its contribution to private sector output in the U.S. is substantially smaller than that found in the prominent work of Aschauer (1989c). In the Australian context, Otto and Voss (1996) find that the estimated elasticity of output with respect to public infrastructure within the VAR framework is approximately one-half of their earlier estimates using a production function approach (Otto and Voss, 1994). However, exceptions are a VAR analysis by Sturm *et al.* (1999), which shows that public investments in aggregate infrastructure and transport infrastructure have a positive significant impact on GDP in the Netherlands, and the estimated VAR models of Pereira and Roca-Sagales (2003), which identify a strong contribution of public capital to private sector output in the economy of Spain.

Empirical evidences at international level using cross sectional and panel data sets are also reviewed. Aschauer (1989) studies the economic contribution of public investment, of which transport capital forms part for the G7 countries using panel data for the period of 1966-1985. He specifies a Cobb-Douglas function and comes out with an output elasticity of 0.34 to 0.73 which clearly shows the importance of public investment in productivity and growth. In a subsequent study, also uses a total productivity growth function with fixed country and time effects to study the similar effect for 12 OECD countries over the period of 1960-1988. He reports a contribution between 33 – 55% of the non-military public capital stock to output growth. Nourzad and Martin (1995) also study a panel data for 7 OECD countries over the period of 1963-88 on the effect of public investment on output. Using similar econometric specification as Aschauer (1989c) but controlling for energy input price and taking into account random effects, they found a relatively low but significant output elasticity of 0.05 with respect to public investment

An earlier study, Sylvie (2001), examines data from China to establish that infrastructure might explain the regional disparities of economic development. Xu *et al.* (2007) formulated a two-stage correlation between highway transport and economic development. In a more empirical work by Huang and Harata (2010), there is an employment of a production function method and a VAR (Vector Autoregression) approach to study the relation with national empirical data (1978-2004) of China. The result of production function method is discussable because the elasticity of infrastructure to the output is negligible and may contradict common knowledge. It is also shown that more developed areas benefit more from infrastructure than undeveloped areas. The VAR method shows that infrastructure counts for a significant part of economic growth and that a shock in infrastructure might lead to significant short-term effect on economic growth but has small long-term effect. The causality of the infrastructure and economic development is vague in statistic meaning but it seems more likely that infrastructure explains the economic growth but not reversely. This was supported by Pradhan (2010) who explores the nexus between transport infrastructure (road and rail), energy consumption and economic growth in India over the period of 1970-2007. He finds evidence of unidirectional causality from transport infrastructure to economic growth.

In addition, Sadananda (2006) juxtaposes whether or not expansion of railroad transportation facility can act as a means to supplement domestic investment for achieving a higher level of economic growth in India by constructing a railroad transportation index (a proxy for railroad transportation facility) using Principal Component Analysis (PCA), a special case of factor analysis. In order to examine the long-run relationship among real economic growth, real domestic investment and railroad transportation facility during the period of 1971 – 2005, time series tools (i.e., unit root, causality and cointegration tests) is used. The findings of the paper are: (i) there exists a high degree of positive correlation between railway route length and road length; (ii) domestic real investment causes not only real economic growth but also railroad transportation facility; (iii) higher domestic real investment and more railroad transportation facility lead to higher real economic growth in India in the long- run. The above findings suggest that if India wants to achieve 8 per cent economic growth target as mentioned in the Tenth Five Year Plan (2002-2007), it should take some special measures by encouraging private investment in infrastructure, especially in the construction of railways and roads.

Olorunfemi (2008) examines the direction and the strength of the relationship between infrastructure services and manufacturing output in Nigeria using time series data from 1981 to 2005 and Vector Autoregressive (VAR) model. Also, Granger causality test was carried out. Results show that transport and electricity services in Nigeria did not cause growth to occur in the manufacturing sector during the period. It is also revealed in the study that telecommunication and education contributed to the growth in the manufacturing sector.

Lately, Jiwattanakulpaisarn *et al.* (2009) analyzed the relationship between U.S. highway supply and employment using time-series cross-sectional data on roadway lane miles and private sector employment for the 48

contiguous states over the period of 1984–1997. The analysis found that employment growth is temporally influenced by annual growth in major highways within the same state and all other states, but the existence and direction of these effects depend on highway type and time lags.

In a more empirical study by Ogun (2010), the impact of infrastructural development on poverty reduction in Nigeria is addressed. Specifically, the relative effects of physical and social infrastructure on living standards or poverty indicators are examined, with a view to providing empirical evidence for the implications of increased urban infrastructure for the urban poor. The paper employs secondary data for the period of 1970:1 to 2005:4 while the Structural Vector Autoregressive (SVAR) technique is adopted for its analysis. The study unequivocally finds that infrastructural development leads to poverty reduction

Moreover, Keho and Echui (2011) examine the temporal relationship between transport infrastructure investment and output in Cote d'Ivoire over the period of 1970-2002. Using cointegration and causality tests within a multivariate framework, it was found that the public investment in transport infrastructure, private investment and economic output are cointegrated. The results of the Granger causality tests reveal that public investment in transport does not have a causal impact on economic growth; conversely economic growth has a causal impact on transport investment

In contrast to this, is the study by Rudra and Tapan (2012) that examined the effect of transportation (road and rail) infrastructure on economic growth in India over the period 1970e-2010 Using Vector Error Correction Model (VECM), they finds bidirectional causality between road transportation and economic growth, bidirectional causality between road transportation and capital formation, bidirectional causality between gross domestic capital formation and economic growth, unidirectional causality from rail transportation to economic growth and unidirectional causality from rail transportation to gross capital formation. They concluded that expansion of transport infrastructure (both road and rail) along with gross capital formation will lead to substantial growth of the Indian economy. However, most of these studies fail to examine the causal relationship between economic growth and poverty reduction.

Considering this short coming, Almas (2004) examines the causal relationship between inequality and a number of macroeconomic variables frequently found in the inequality and growth literature. These include growth, openness, wages, and liberalisation. Almas reviews the existing cross-country empirical evidence on the effects of inequality on growth and the extent to which the poorest in the society benefit from economic growth. The linkage between growth, redistribution and poverty is also analysed. In the review of literature, mainly empirical examples from 1990s are taken. In addition, he tested the conditional and unconditional relationship between inequality and growth in the post-World War II period using WIDER inequality database. Regression results suggest that income inequality is declining over time. Inequality is also declining in growth of income. There is a significant regional heterogeneity in the levels and development over time. The Kuznets hypothesis represents a global U-shape relationship between inequality and growth.

Lately, Salvador and Diana (2012) examine the causal relationship between growth and poverty reduction in developing countries between 1970 and 1998, using traditional Granger causality to test the times series that are available, and panel data model evaluation techniques to test the out-of-sample forecasting performance of competing models. They find a unidirectional causality running from growth to poverty reduction. The result is confirmed by country groups when splitting the countries' samples into low- and middle-income countries and into mid-high- and very-high-inequality countries. However, in the period of 1980s-1990s, economic growth did not cause poverty reduction growth in a Granger-causal fashion, except in low-income countries for the $1/day poverty rate.

In conclusion, almost all the studies employ investment in infrastructure rather than physical stock as a proxy for infrastructure development that is not good enough for the measure of transport infrastructure development most especially in a country where corruption has deepened down in the budget and also the data on investment on road transport could not be accessible adequately for a proper analysis, therefore, making them questionable. Moreover, in time-series context, the issue of simultaneity is arguably more problematic for those studies using investment flows (or their cumulated value) to measure infrastructure than for those using physical asset stocks.

3. Methodology/ Model Specification

Econometric literature proposes different methodological alternatives to empirically analyse causal relationships among time-series variables. The most widely used methods include the two-step procedure of Engle and Granger (1987) and the full information maximum likelihood-based approach due to Johansen (1988) and Johansen and Juselius (1990). All these methods require that the variables under investigation require a step of stationarity pre-testing, thus introducing a certain degree of uncertainty into the analysis.

Moreover, if the variables are not integrated and I (0), the Granger causality test is conventionally conducted by estimating vector autoregressive (VAR) models. Based upon the Granger Representation Theorem, Granger (1986) shows that if a pair of I(1) series are cointegrated there must be a unidirectional causation in either way. If the series are not I(1), or are integrated of different orders, no test for a long run relationship is usually carried out. However, given that unit root and cointegration tests stationary and cointegrated, estimating VAR these tests is inappropriate and can suffer from pre-testing bias. However, if the data are integrated but not cointegrated, then causality tests can be conducted by using an unrestricted VAR model by simply conducting whether some parameters are jointly zero, usually by a standard Wald statistic (or F-statistic). Toda and Phillips (1993), show that the asymptotic distribution

of the test in the unrestricted case involves nuisance parameters and nonstandard distributions. An alternative procedure to the estimation of an unrestricted VAR consists of transforming an estimated error correction model (ECM) into levels VAR form and then applying the Wald type test for linear restrictions.

However, if our variables are I(1), multivariate framework within the environment of vector error-correction model (VECM) will be employed to unveil Granger causality among the variables. The error-correction terms derived from the cointegrating vectors are obtained through Johansen's multivariate cointegrating testing procedure (Johansen, 1988; Johansen and Juselius, 1990), which are used as additional channel in order to identify Granger-causation. Since this procedure identifies multiple cointegrating relationships and hence error-correction terms, this is an issue of crucial importance in Granger-causality testing in a dynamic multivariate context.

To investigate the nature and direction of causality among road transport infrastructure development the model is specified as Thus.

$$\lg_t = \beta_0 + \sum_{i=1}^{k} \beta_1 \Delta \lg_{t-i} + \sum_{i=1}^{k} \beta_2 \Delta \mathrm{l} q_{t-i} + \sum_{i=1}^{k} \beta_3 \Delta \mathrm{l}\, pt_{t-i} + \beta_4 ECM_{2t-1} \quad 1$$

$$\Delta \mathrm{l} q_t = \alpha_0 + \sum_{i=1}^{k} \alpha_1 \Delta \mathrm{l} q_{t-i} + \sum_{i=1}^{k} \alpha_2 \Delta \lg_{t-i} + \sum_{i=1}^{k} \alpha_3 \Delta \mathrm{l}\, pt_{t-i} + \alpha_4 ECM_{1t-1} \quad 2$$

$$\Delta \mathrm{l}\, pt_t = \delta_0 + \sum_{i=1}^{k} \delta_1 \Delta \mathrm{l}\, pt_{t-i} + \sum_{i=1}^{k} \delta_2 \Delta \lg_{t-i} + \sum_{i=1}^{k} \beta_3 \Delta \mathrm{l} q_{t-i} + \delta_4 ECM_{3t-1} \quad 3$$

Where *lq* is log of transport infrastructure,
lg is the log of real GDP
lpt is the log of poverty level
ECM is the Error Correction Model
And *i= (1……n),* α, β *and* δ *are the coefficient of the parameters,* Δ *is the first difference of the endogenous variables.*

3.1. Measurement and Definitions of Variables

g_t is the Real Gross Domestic Product (RGDP) which is defined as the nominal GDP deflated by the composite consumer price index. This will be used to proxy economic growth.

q_t represents road transport infrastructure development in Nigeria, proxy by the length of paved federal road in kilometres as data constraint restricts to segregate the transport capital figures from the country's total investment (k). This has been used in many studies (see Canning (1999); Canning and Bennathan (2000); Faridi *et al.* (2011); Huang and Harata (2010); Boopen (2006); Calderon and Serven (2008); and Sahoo and Ranjan (2009); among others).

pt represents poverty rate in Nigeria, proxy by real consumption expenditure per capita (RCX). Real Consumption Expenditure per Capital is used as measure of poverty. Though an alternative to this measure is per capita income, this study employs real consumption expenditure per capita on the basis of the consensus of opinion that an expenditure measure of poverty is superior to income measures (Okojie, 2002).

3.2. Sources of Data

This study uses essentially secondary data for analysis. The data on road transport network, RGDP and poverty indicator from (1980-2012) were taken from the following source: (i) National Bureau of Statistics (NBS) various publications.

4. Empirical Analysis and Result

4.1. Unit root Test for Annual Data Series

Table 1 (a and b) below present the results of unit root tests using Augmented Dickey Fuller test and Philips and Perron test applied on annual data series.

Table-1(a). The Result of Unit root Test Using Augmented Dickey Fuller Test

Series	Level	First Diff	Remark
Lpt	-0.09	-5.38	I(1)
Lq	-1.47	-5.76	I(1)
Lg	-0.02	-4.42	I(1)

Table-1(b). The Result of Unit root Test Using Philips and Perron Test

Series	Level	First Diff	Remark
Lpt	-1.16	-10.14	I(1)
Lq	-1.58	-5.87	I(1)
Lg	-0.04	-4.42	I(1)

Source: Author's Computation
Note: at 5 per cent critical value = -2.96. *Lg, Lq and Lpt are log (of real gross domestic product, road transport infrastructure development, poverty level.)*

Table-2. Cointegration Test (Trace Value)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.540061	35.0272	29.79707	0.0114
At most 1	0.318846	12.504	15.49471	0.1343
At most 2	0.046109	1.368967	3.841466	0.242

Evidence from the results shown in Table 1 confirms that all the variables (real gross domestic product (g), road transport infrastructure development (q) and poverty rate (pt), are not stationary at level. However, they became stationary after first difference under the augmented dickey fuller and Philips and Perron test. Since the series are integrated of order one i.e. I (1). Moreover, Table 2 also indicated that road transport infrastructure, economic growth and poverty level are co-integrated; this does not implied causality among the variables. Therefore, Given that all variables for the study, are stationary at I(1) and co-integrated, the Multivariate Granger Causality relationship among variables is investigated in the context of Vector Error Correction Model (VECM). In the estimation of the VECM model, a period lag of the first difference of variables as well as the error correcting term is used. The p-value of the Wald statistics which follows F-distribution was observed. Moreover, the significance of the error correction term determines the long-run direction of causality, while the significance of the first differenced explanatory variables determines the short-term direction of causality. This is reported in Table 3 (a, and b) observing the p-value of the Wald statistics which follows the Chi- Square, both in the short –run and long-run respectively.

Table-3a. Short Run Multivariate Granger Causality Test Result

$\alpha_1 = \alpha_2 = \alpha_3 = 0$	χ^2	$p-value$	Remark
DLq	0.025	0.874	No Causality
DLg	*0.021*	*0.888*	No Causality
DLpt	*5.7714*	*0.0163**	Causality

Source: Author's Analysis (2014)

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able-3b. Long Run Multivariate Granger Causality Test Result

$\alpha_1 = \alpha_2 = 0$	χ^2	$p-value$	Remark
$Lg \rightarrow Lq$	0.360	0.548	No Causality
$Lpt \rightarrow Lq$	0.243	0.622	No Causality
$Lq \rightarrow Lg$	0.541	0.462	No Causality
$Lpt \rightarrow Lg$	2.935	*0.086***	Causality
$Lq \rightarrow Lpt$	0.668	0.431	No Causality
$Lg \rightarrow Lpt$	*3.096*	*0.078***	Causality

*Notes: *and ** indicates statistical significance at 5% and 10% level of significance, while χ^2 is the Chi-Square of the Wald statistics and the hypothesis is that each of the coefficients of lagged explanatory variables is zero.*

Table 3(a and b) above shows the Granger Causality Test carried out among road transport infrastructure, economic growth and poverty reduction in Nigeria based on 5 and 10 per cent significance level. The result in Table 3a shows that, there is no causal relationship among the variables in the short run except that of bi-directional causality that exists between economic growth and real consumption expenditure per capita at 10 per cent level of significance. This implies that increase in economic growth granger-cause poverty reduction and vice-versa. Moreover, in Table 3b, a strong unidirectional causality was found between poverty reduction and road transport infrastructure development with the causality running from road transport infrastructure development to poverty

reduction at 10% level of significance in the long run. More also, a unidirectional causal relationship exists between economic growth and poverty reduction running from economic growth to poverty reduction at 10 per cent level of significance in the long run.

The implication of the granger causality is that, if road network increases, it could cause poverty level to reduce in the long -run. It is also interesting to know that variation in economic growth could lead to poverty reduction in Nigeria both in the short run and long run, while in the short run as poverty reduces, economic growth begins to emerge. This finding is in accordance with the works of Ogun (2010), and Lustig *et al.* (2002) who posit that actions to reduce poverty can create vicious cycles that raise economic growth which in turn reinforces poverty reduction. Surprisingly, there was no causal relationship between road transport infrastructure development and economic growth both in the short-run and long-run, which was also supported by the work of Olorunfemi (2008).

5. Conclusion

The general observation from these findings is that road transport infrastructure development and economic growth could be seen as useful policy as it has the potential to contribute to pace of poverty alleviation and vice-versa in the Nigerian economy. However, the way it is being handled through the various Federal Government agencies without proper monitor and implementation needs to be critically examined and corrected.

Unexpectedly, road transport infrastructure was found not have granger cause economic growth both in the short-run and in the long-run. This seems to contradict the theory, therefore, Federal Road Maintenance Agency (FERMA) should wake up to their responsibilities by properly and critical put in place every decayed road network in order to stimulate economic growth in Nigeria.

Although the study confirms the crucial role of economic growth to enhance the reduction of poverty level and as a means to ensure the success of road transport infrastructure development in the Nigerian economy, however, government should encourage both domestic and foreign investors by creating a more conducive environment which could increase government revenue in building more road network and implementation of poverty alleviation programmes.

More importantly, it could then be recommended that good governance, budget control, integrity, reforms, effective leadership, transparency and accountability should be pursued in the transport sector, most especially in the area of poverty alleviation programmes since they can all lead to economic growth and road transport infrastructure development in Nigeria. Additionally, there should be an improvement in government budgets towards transport sector, most especially the road network which is the most effective and more affordable mode of transportation in carrying out economic activities, when considering the rural poor, in Nigeria.

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