



DYNAMIC INTERACTIONS AMONG ROAD TRANSPORT INFRASTRUCTURE DEVELOPMENT, ECONOMIC GROWTH AND POVERTY LEVEL IN NIGERIA

Oladipo S. O.

Department of Economics, University of Lagos, Akoka Lagos, Nigeria.

sooladipo2015@yahoo.com

ABSTRACT

This study examines the interactive effects among road transport infrastructure development, economic growth and poverty level in Nigeria. This was with the view to providing empirical evidence on the linkages among road transport infrastructure, economic growth and poverty level. The study used secondary data. Annual time series data from 1980 to 2013 on road network, Real Gross Domestic Product (RGDP) and Real Consumption Expenditure per Capita were collected from Central Bank of Nigeria (CBN) Statistical Bulletin (2013), National Bureau of Statistics (NBS) various publications and World Development Indicators (2013) published by the World Bank. The Structural Vector Autoregressive (SVAR) econometric technique was applied in the analysis of standard neoclassical macroeconomic framework. The result indicated that an unanticipated increase in road transport infrastructure development increased economic growth. Another indication is the positive response produced by real consumption expenditure per capita, as a proxy for poverty reduction due to an innovation in road transport infrastructure development. Furthermore, real consumption expenditure per capita increased immediately at the initial period following an innovation in economic growth but falls also thereafter. The study concluded that road transport infrastructure development had impacted positively on economic growth and poverty reduction in Nigeria.

Keywords: *economic growth, impulse response poverty level, real consumption expenditure, SVAR, transport infrastructure*



INTRODUCTION

Road transport infrastructure is defined in this study as a capacity expansion or addition to an existing road network. Road transport infrastructure has been recognized as a key ingredient for economic development, both in the developed and developing countries. Whether in rural or urban societies, road transport infrastructure constitutes the main avenue through which different parts of the society are linked together. In other words, as a society grows in terms of population and functions, the need for interaction among its various components also grows, thereby requiring quality and effective transportation systems. To this end, efforts have been made to improve and maintain the road transport infrastructure to make it functional in Nigeria over the years. with a significant improvement that does exist, but the overall demand for road transport infrastructure in Nigeria exceeds supply (CBN, 2003).

As seen in Table 1, government spending on road infrastructure led to an increase in federal road network from 14,673.72 kilometres in 1980 to 32,179.86 kilometres in 1992 and 36,455.61 kilometres in 2010 respectively. The expected implication is that increased access to good roads will stimulate rapid economic activities, both in the urban and rural areas. Evidently, Gross Domestic Product (GDP) rose from ₦49, 632.32m in 1980 to ₦532, 613.83m in 1992 and ₦ 29, 205,782.96m in 2010 respectively. Despite the increases in gross domestic product as well as road networks, poverty level (measured by one dollar per day) rose from 27.2% in 1980 to 42.7% in 1992 and 69% in 2010 respectively.

Although economic indicators in Table 1 show an upward trend in GDP and per capita income, it cannot be concluded that the upward movement is enhanced by road transport infrastructure development without proper empirical investigation. The primary objective of the Federal Government is to achieve a reasonable level of standard of living through economic growth, however, there is no clean-cut evidence to conclude if this has been attainable in Nigeria given Table 1, then one begins to imagine if this increase in GDP and road transport infrastructure development could not bring about poverty alleviation in the country. This is because instead of a reduction in poverty level, the reverse is the case. This then calls for an investigation to know if the growth in GDP is not sufficient to propel the country into the realm of per capita income increase that is needed to overcome poverty in Nigeria.



Table 1. Federal Road Network, Economic Growth and Poverty Level in Nigeria

Year	Poverty Level (%, 1\$per day)	Federal Road Network (KM)	GDP (₦m)	Per capita income (₦m)	Govt. Exp.(FRN) GDP
1980	27.2	14673.72	49,632.32	0.001	15.03
1992	42.7	32179.86	532,613.83	0.005	0.90
2004	54.4	34340.95	11,411,066.91	0.080	0.001
2010	69.0	34855.61	29,205,782.96	1.790	0.002

Sources; CBN, 2010, NBS, 1980-2010 and WDI, 2011

The need to address poverty in Nigeria has become an issue and various intervention programmes have been considered, as a result of the fact that poverty in Nigeria has been increasing over the years (see Table 1), with the highest proportion located in the rural regions, where most of the people are disconnected from profitable and efficient economic activities due to lack of adequate or decayed transport infrastructure Jacoby (2000). It is also imperative to determine if the problem of overshooting upward trend of poverty could be addressed given the increased rate in road transport infrastructure development over time in Nigeria. For instance, the average annual loss due to bad roads is valued at N80 billion, while additional vehicle operating cost resulting from bad roads is valued at N53.8 billion, bringing the total loss per annum to N133.8 billion. This figure does not take into account the man-hour losses in traffic due to bad roads and other emotional and physical trauma people go through plying the roads and the consequent loss in productivity besides the number of road accident across the country (CBNRDOPS, 2003). It is then important to know if this scenario has any empirical effect on economic growth and poverty level in Nigeria.

Interestingly, empirical investigations on the dynamic interactions among transport infrastructure development, economic growth and poverty reduction seem to be very scarce in Nigeria. Although there exists some studies on the effect of infrastructure development on economic growth in Nigeria (see Akinlabi and Jegede, 2011; Onakoya et al., 2012 and Akanbi et al., 2013), however, they fail to examine the issue of road transport infrastructure development on poverty reduction knowing vividly that the major policy target of government is to pursue the welfare of



the people. Although, Ogun (2010) examined the effect of infrastructure on poverty reduction in Nigeria, but failed to address the effect of transport infrastructure on economic growth which could be a medium through which transport infrastructure affects poverty reduction.

More importantly, is that most of these studies employed investment in transport and communication services rather than physical stock as a proxy for infrastructure development. Moreover, Calderon and Serven (2008a) and Sahoo et al., (2009) have argued that the stock of physical infrastructure is more reliable than investment in infrastructure when considering empirical implications of infrastructure development on economic development.

Based on the issues raised, the study intends to fill this gap by empirically investigating the interactions effects among road transport infrastructure development, economic growth and poverty alleviation within the period of 1980-2013 in Nigeria. This is because the road transport infrastructure is a necessity if not the sufficient means of moving both goods and services within and outside the country.

REVIEW INFRASTRUCTURAL DEVELOPMENT OUTCOMES

Empirical research on the impact of infrastructure emerged following the seminal work of Aschauer (1989), which has boomed over the last twenty years. Literally, hundreds of empirical works have been devoted to assess the effects of infrastructure on growth, productivity, poverty, and other development outcomes, using a variety of data and empirical methodologies. Calderon and Serven (2008) offer a partial account of the literature on the growth and inequality effects of infrastructure; more comprehensive surveys include Estache (2006), Romp and de Haan (2007), Straub (2007), Ayogu (2007) on one hand, David and Elizabeth (2000), Khandker, Bahkt and Koolwal (2006), among others have considered the important of infrastructure on economic growth on the other hand.

There also exist studies on transport infrastructure-growth nexus using panel data but producing conflict results. For instance while studies like (Easterly and Rebelo (1993); Holtz-Eakin (1994), Fernald (1999), provided a positive impacts of transport infrastructure on economic, studies like (Demetriades and Mamuneas 2000, Hulten and Schwab, 1991; and Garcia-Mila, McGuire and Porter, 1996). Tatom (1991 and 1993), Evans and Karras (1994) are of the opinion that transport



infrastructure has insignificant and sometime negative effects on economic growth. However, Lahiri and Yao (2006) question the composition of transport infrastructure data used in previous studies and develop a leading economic indicator for the US economy based on transportation sector data.

Fan and Chan-Kang (2006) evaluate the contribution of roads to economic growth and poverty reduction in China. They disaggregate road infrastructure into different classes of roads to account for quality, and then estimate the impact of road investments on overall economic growth, agricultural growth, urban growth, urban poverty reduction, and rural poverty reduction. The study finds that benefit–cost ratios for lower-quality roads (mostly rural) are about four times larger than those for high-quality roads when the benefits are measured in terms of national GDP. Even in terms of urban GDP, these ratios are much greater for low-quality roads than for high-quality roads. In terms of poverty reduction, the study finds that, for every Yuan invested, lower-quality roads raise far more rural and urban poor people above the poverty line than high-quality roads.

In Nigeria most of the studies found in the examinations of the effects of transport infrastructure on economic growth are on government spending and economic growth, (see Olufemi 2008; Nurudeen and Usman 2010; Ogun 2010; Onakoya, Salisu and Oseni 2012; Nworji and Oluwalaiye 2012; Tella, Amaghionyiwe, and Adesoye, 2007 among others). However, it will be difficult to draw conclusion on performance of transport sector in stimulating economic policies given the outcome of these studies.

More specific is the study of Nworji and Oluwalaiye (2012) in examining the impact of government spending on road infrastructure development on economic growth in Nigeria for the period of 1980-2009. The model for the study was estimated using the Ordinary Least Square (OLS) technique, while further evaluation is carried out using the coefficient of determination to explain the variations between the dependent and independent variables. The result shows that transport and communication have significant impact on the growth of the economy.

In a more recent study, Akanbi, Bamidele and Afolabi (2013), examined the impact of transportation infrastructure improvement on economic growth in Nigeria for the period of 1981 to 2011, using the Ordinary Least Square Regression (OLS) technique, and generalized Cobb-



Douglas production, and extending the neoclassical growth model to include transport infrastructure stock (i.e. output of transport sector) alongside capital stock (i.e. investment on transport infrastructure) as the input and gross domestic product. They realised that transport output and investment made on transport infrastructure in Nigeria has significant positive contribution to growth. However this study is highly faulty for estimating a component of variables on the same variable i.e. by proxy transport infrastructure improvement as output of transport. This study may have suffered the problem of endogeneity that is not accounted for in their study.

In summary, despite various studies on transport infrastructure development and economic development, there exist some gaps in the understanding of this research stream that deserve further empirical investigation, most especially in the area of the dynamic relationship among road transport infrastructure development, economic growth and poverty reduction in Nigeria. Although there are few studies in Nigeria which have examined this relationship separately, however, they suffer from improper data since they all make of use investment in infrastructure rather than physical stock as a proxy for infrastructure development. This is because the result provided by these studies could not be a solid ground on which policies towards transport infrastructure development in attaining economic development could be formulated, due to the level of corruption in the country.

RESEARCH METHODOLOGY

Theoretical Framework

The endogenous growth theory is employed in this study by modifying the framework of Lakshmanan (2007) in expanding the framework mechanism of transport infrastructure, economic growth and poverty reduction. Lakshmanan illustrates how provision of transport infrastructure could potentially affect long-term growth within the framework of standard neoclassical macroeconomic framework, considering transport infrastructure as an argument in a production function, as that of Cobb-Douglas. This is shown in Figure 1, which offers the mechanisms and processes underlying the wider economic benefits of transport infrastructure development. It is a contemporary version of what Williamson (1974) and O'Brien (1983) call "forward linkages" of transport infrastructure. Lower cost and increased accessibility due to



transport improvements modify the marginal costs of transport producers, the households' mobility and demand for goods and services. Such changes ripple through the market mechanisms, endogenizing employment, output, and income in the short run.

Over time, dynamic development effects derived from the mechanisms set in motion when transport service improvements activate a variety of interconnected economy-wide processes and yield a range of sectoral, spatial, and regional effects that augment overall productivity. This in turn opens up several channels of economic effects.

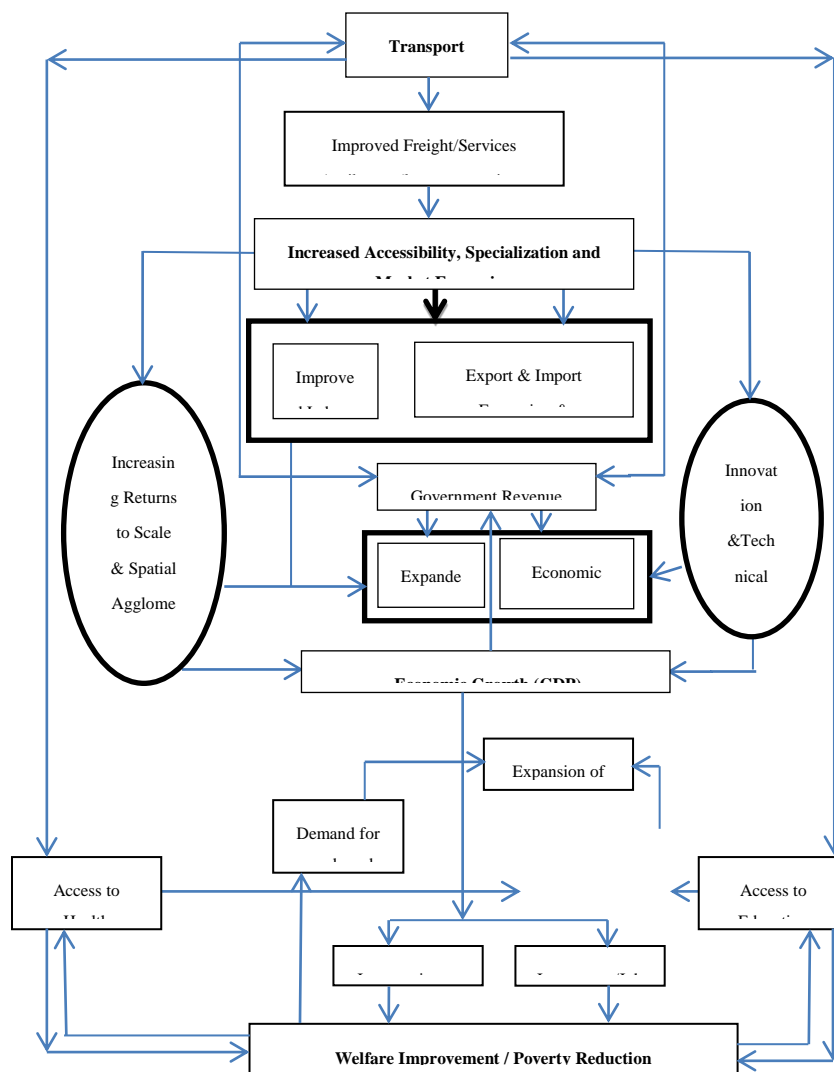


Fig.1: Linkage between Transport Infrastructure Development, Economic Growth and poverty Level
Source: Adapted from Lakshmanan (2007)



Model Specification

Given that the dynamics of the economy could be typically approximated by a system of linear equations, the n-variate SVAR representation assuming p lags, could be explicitly summed up as:

$$A_0 y_t = \alpha + A_1 y_{t-1} + \dots + A_p y_{t-p} + u_t \quad (1)$$

$$A_0 y_t = A_1 * y_{t-1} + \dots + A_p * y_{t-p} + B_0 * X_t + \dots + B_p * X_{t-p} + M * W + \xi_t. \quad (2)$$

The A's and B's are n x n coefficient matrices. $y_t = (y_{i_1}, \dots, y_{i_n})$ is a vector of observable endogenous variables ; $X_t = (X_{i_1}, \dots, X_{i_m})$ is vector of observable exogenous variables;

W_t is the vector of deterministic variables consisting of a constant, a linear trend, seasonal dummy variables or some specified dummy variables, and ξ_t is the stochastic white noise process $(0, I_n)$.

The specified reduced form of the structural VAR representation in Equation (2) is:

$$y_t = \gamma_o + \gamma_1 y_{t-1} + \dots + \gamma_p * y_{t-p} + \kappa_0 * X_t + \dots + \kappa_p * X_{t-p} + v_t \quad (3)$$

In this study, the Cholesky restriction approach is to be explored. Therefore, in the moving average representation, the following sequences: **lpt** is the log of poverty, **lg** is the log of real gross domestic product and **lq** is the log of transport infrastructure. Therefore, the variables can be expressed as a linear combination of current and past structural shocks.

$$lq = \sum_{k=0}^{\alpha} s_{11}(k)v_{1t-k} + \sum_{k=0}^{\alpha} s_{12}(k)v_{2t-k} + \sum_{k=0}^{\alpha} s_{13}(k)v_{3t-k} \quad 4$$

$$lg = \sum_{k=0}^{\alpha} s_{21}(k)v_{1t-k} + \sum_{k=0}^{\alpha} s_{22}(k)v_{2t-k} + \sum_{k=0}^{\alpha} s_{23}(k)v_{3t-k} \quad 5$$

$$Pt = \sum_{k=0}^{\alpha} s_{31}(k)v_{1t-k} + \sum_{k=0}^{\alpha} s_{32}(k)v_{2t-k} + \sum_{k=0}^{\alpha} s_{33}(k)v_{3t-k} \quad 6$$

The above structural equations can be represented in a vector matrix form as follows:

$$\begin{pmatrix} lq \\ lg \\ lpt \end{pmatrix} = \begin{bmatrix} s_{11}L & s_{12}L & s_{13}L \\ s_{21}L & s_{22}L & s_{33}L \\ s_{31}L & s_{32}L & s_{33}L \end{bmatrix} \begin{bmatrix} v_{1t} \\ v_{2t} \\ v_{3t} \end{bmatrix} \quad 7$$

Where, v_{1t} , v_{2t} , v_{3t} are uncorrelated white noise disturbances and $S_{ij}(L)$ are polynomial in the lag operator. The coefficient of $s_{11}(L)$ for instance, is the impulse response of (transport infrastructure development) shock on poverty level and real gross domestic product are zero in



the long run. This suggests that the effects of v_{2t} , and v_{3t} on transport infrastructure are necessarily equal to Zero. That is,

$$\sum_{k=0}^{\alpha} s_{12}(k) = \sum_{k=0}^{\alpha} s_{13}(k) = 0 \tag{8}$$

Equation 8 can be compactly expressed as:

$$X_t = S(L)v_t \tag{9}$$

Where:

$$X_t = \{lq, lg, lpt\} \tag{10}$$

and

$$v_t = [v_{1t} v_{2t} v_{3t}] \tag{11}$$

The shocks v_t are normalised in order to avoid reaction or collision of any shock effect that may be produced by the white noise disturbance by variables of interest.

Table 2. Data Description and Sources

Variables	Description	Source
Road transport infrastructures Development	Proxied by the length of paved federal road in kilometres.	NBS
Economic Growth	Proxied Real Gross Domestic Product	CBN
Poverty	Proxied by real consumption expenditure per capita (RCX)	WDI
Population	Total number of inhabitants	WDI
Inflation	Proxied by consumer price index (CPI)	CBN

Estimation Techniques

A crucial issue in SVAR is identification without imposing a required number of restrictions. SVAR cannot be identified both in the short run and in the long run. The restrictions in this study are imposed based on theoretical framework earlier discussed in section two of this study. The recursive identification scheme is achieved on the assumption that matrix A which encompasses short run restrictions gives an indication that structural innovations can be obtained from the reduced innovations using Choleski factorization. The A matrix is a 3x3 lower triangular matrix, while B is a diagonal matrix. SVAR verifies the identification conditions for a given structural form to be imposed on an estimated VAR model. The required inputs are the set of constraints to be placed on the elements of the A and B matrices so that



$$A = \begin{bmatrix} 1 & 0 & 0 \\ a_{21} & 1 & 0 \\ a_{31} & a_{32} & 1 \end{bmatrix}, B = \begin{bmatrix} b_{11} & 0 & 0 \\ 0 & b_{22} & 0 \\ 0 & 0 & b_{33} \end{bmatrix}$$

Recall from Equation 3 that

$$A\xi_t = Bv_t \tag{12}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ a_{21} & 1 & 0 \\ a_{31} & a_{32} & 1 \end{bmatrix} \begin{bmatrix} \xi_t^q \\ \xi_t^s \\ \xi_t^{pt} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 \\ 0 & b_{22} & 0 \\ 0 & 0 & b_{33} \end{bmatrix} \begin{bmatrix} v_t \\ v_t \\ v_t \end{bmatrix} \tag{13}$$

This can be expressed as thus

$$\xi_t^q = b_{11}v_t^q. \tag{14}$$

$$\xi_t^s = -a_{21}\xi_t^q + b_{22}v_t^s \tag{15}$$

$$\xi_t^{pt} = -a_{31}\xi_t^q - a_{32}\xi_t^s + b_{33}v_t^{pt} \tag{16}$$

Equation 22 to 24 above represents the Choleski Decomposition of the residual matrix of covariance. The implication of Choleski Decomposition is that the first variable in the VAR is only affected contemporaneously by the shocks to itself. The second variable in the VAR is affected contemporaneously by the shocks to the first variable and the shocks to itself, and so on. The equation also depicts the restrictions imposed to the model; thus it expresses the links between the random errors of the reduced form and the structural errors. The structural innovations (v_i) which are orthogonal and uncorrelated need to be identified in order to trace out the dynamic responses of the model to these shocks which provide the impulse response functions.

The recursive identification scheme above is just-identified with three restrictions. To achieve the identification, we follow Peersman and Smets (2003), who use a three variable SVAR with some contemporaneous restrictions on impulse responses. The model satisfies Rothenberg (1971)'s order condition. In the short run, as presented in Eq 5, the identification is based on economic theory of transport infrastructure development, economic growth and poverty theory postulated by Jahan and Mcleely (2005).

FINDINGS AND DISCUSSION



Given the above short run restrictions, analysing the interactions among road transport infrastructure development, economic growth and poverty level is achieved by carrying out the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD). For the purpose of estimating the structural VAR model specified for this study, the determination of the appropriate and optimal lag length was carried out and haven determined the lag length, the following tests are carried out: normality and auto correlated tests and the stability test. These tests are carried out on the VAR model.

Results of SVAR Impulse Response Analysis Based on the Specified Model

Figure 2 shows the impulse responses generated from the recursive structural VAR models estimated in this study. The IRF measures the dynamic response of variables Lq , Lg and Lpt to an unanticipated shock measured as innovation in the model. In Figure 2, one standard deviation in the model is calculated in percentage. For each of the variables, the horizontal axis of the IRF shows the number of periods that have passed after the impulse has been given, while the vertical axis measures the responses of the variables.

Starting with the impact of road transport infrastructure, a shock to it produces a positive response throughout the time horizon of 35 periods. However, interest will not be given to response of a variable based on the shock to itself. Therefore, we are left with three panels based on the restriction placed on the variables estimated in this study as guided by the theories and institutions in Nigeria (i.e. Panel (B, D and E).

From the result of the SVAR impulse response function in Figure 3 (Panel B), it can be observed that a shock on road transport infrastructure development produces a positive effect on economic growth throughout the period of consideration. For instance, a positive effect of 0.06 per cent, which is observed at the 1st period, increased to 0.19 per cent and 0.24 per cent at the 5th and 10th periods respectively. However, this increase begins to fall gradually from the 15th, 20th, 25th, 30th and 35th periods, by (0.23, 0.20, 0.18, 0.16 and 0.14) per cent respectively. By implication, as road transport infrastructure development increases, it metamorphosis into economic growth, however, this effect increases over a period of time but reduces thereafter.

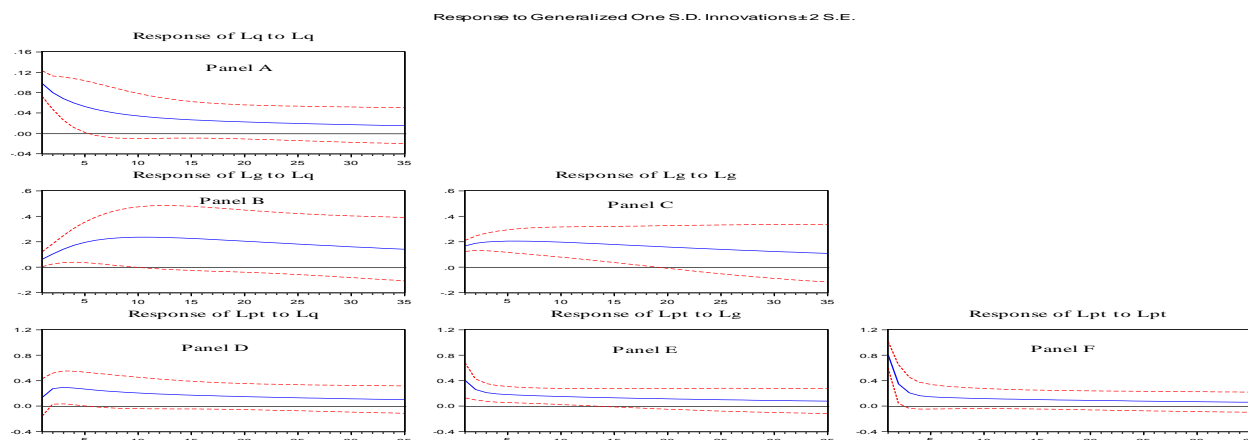


Figure 2. Structural VAR: Impulse Response Functions (SVAR Ordering = Lq Lq Lpt)

Note: Solid line indicate SVAR impulse response while broken lines indicate 95% Hall's Percentile confidence intervals calculated with 1000 Bootstrap procedure.

Source: Author's Computation (2015).

An observation from Figure 3 (Panel D) shows that, a positive response of about 0.14 per cent is produced by real consumption expenditure per capita, as a proxy for poverty reduction due to an innovation on road transport infrastructure development in the 1st period. This increases greatly to 0.27 per cent in the 5th period before it begins to fall gradually to (0.21, 0.17, 0.15, 0.13, 0.11 and 0.10) in 10th, 15th, 20th, 25th, 30th and 35th respectively. This implies that when road transport infrastructure development occurs, it increases real consumption expenditure per capita in the economy, but this increase in real consumption expenditure per capita reduces over time.

In addition, in Figure 3 (Panel E), a positive response of about 0.40 is produced by real consumption expenditure per capita as a result of an innovation on economic growth. The response reduces heavily from 0.40 per cent in 1st period to 0.18 per cent in the 5th period and thereafter reduces gradually up to 35th period. This implies that when economic growth occurs, it increases real consumption expenditure per capita in the economy, but this increase in real consumption expenditure per capita reduces over time.

Results of SVAR Forecast Error Variance Decomposition (FEVD) Based on the Specified Model

In order to further shed light on the link among road transport infrastructure development, economic growth and poverty level, the variance decomposition derived from the SVAR is



generated and analysed. This is to examine the magnitude of the effect of the shock to the innovation Akinlo (2003). The results presented in Table 4 (Panel A) show that its own shocks explained a large proportion of the variations in the variance of road transport infrastructure. The magnitude, which however decreases from a high value of 100 per cent to 96.8 per cent in the fifth period, later decreases marginally over the periods. Other variables that are of importance are economic growth and real consumption expenditure per capita. Although they explain a neutral proportion of variations in the variance of road transport infrastructure at the first period, this increases from 0.00 per cent to 1.3 (economic growth) and 1.8 per cent (real consumption expenditure per capita) and later to 2.7 per cent (economic growth) and 2.6 per cent (real consumption expenditure per capita) in the fifth and tenth periods respectively and this continues for rest of the periods.

Panel B in Figure 4 depicts the proportions of forecast error variance in economic growth, LY, explained by innovations of the considered endogenous variables. The two variables appear crucial in determining the variation in the variance of economic growth. The magnitude of road transport infrastructure development (Lq), which is about 14 per cent in the first period, increases greatly to 44 per cent in the fifth period and at thirty fifth period it increased to 72.8 per cent.

Table 5: SVAR Forecast Error Variance Decomposition

Variance Decomposition of Lq (Panel A)					
Period	S.E.	Lq	Lg	Lpt	
1	0.097822	100	0	0	
5	0.166584	96.83434	1.320607	1.845051	
10	0.192192	94.71360	2.726234	2.560165	
15	0.205036	93.33249	3.768438	2.899074	
20	0.213442	92.38580	4.506968	3.107231	
25	0.219501	91.72488	5.027928	3.247193	
30	0.224028	91.25440	5.400041	3.345557	
35	0.227462	90.91331	5.670125	3.416561	

Variance Decomposition of Lg (Panel B)					
Period	S.E.	Lq	Lg	Lpt	
1	0.166868	13.96677	86.03323	0	
5	0.482569	44.06563	50.05894	5.875431	
10	0.769863	60.62098	33.16688	6.212141	
15	0.969129	66.83003	27.05761	6.112363	
20	1.107715	69.70555	24.25759	6.036859	
25	1.206329	71.25560	22.75372	5.990679	
30	1.278072	72.18254	21.85557	5.961885	
35	1.331168	72.77830	21.27859	5.943110	



Variance Decomposition of *lpt* (Panel C)

Period	S.E.	<i>Lq</i>	<i>Lg</i>	<i>Lpt</i>
1	0.807977	2.848920	22.23078	74.92030
5	1.055472	29.73214	18.19407	52.07379
10	1.192764	41.43799	16.62180	41.94021
15	1.277440	46.54148	16.17934	37.27919
20	1.336745	49.47120	15.99195	34.53685
25	1.380339	51.36823	15.88739	32.74438
30	1.413062	52.67342	15.81958	31.50700
35	1.437885	53.60348	15.77228	30.62424

Source: Author's Analysis (2015)

The innovations in economic growth and the variation in itself which are very high at the first period, reduces greatly over time. For instance, it reduces from 86 per cent in the first period to 50%, 24% and 21% in the fifth, twentieth and thirty fifth periods respectively. The variation in economic growth as a result of an innovation in real consumption expenditure per capita is neutral in the first period but becomes 5.9 per cent in the fifth period and increase to 6.1 per cent in the fifteenth period but reduces slightly from twenty fifth period up to the thirty fifth period by 5.9 per cent on average.

From Table 5 in Panel C, the innovation in road transport infrastructure makes the real consumption expenditure per capita variance to be decomposed by 2.8 per cent in the first period but increased sharply to 29.7, 46.5, 51.4 and 53.6 per cent in the fifth, fifteenth, twenty fifth and thirty fifth periods respectively. Moreover, the magnitude of economic growth reduces from 22.3 per cent in the first period to 18.2 and further reduces over time.

The result of the IRF indicates that the effects of road transport infrastructure development on economic growth and poverty reduction is positive, though the positive effect reduces over time. This is indicated by the positive response of economic growth and real consumption expenditure per capita to road transport infrastructure shock throughout the time horizon, and a greater fall in the value of their responses over time. The implication from this is that: the initial high positive impact on real consumption expenditure per capita could be interpreted to be that poverty level reduces at the initial stage of road transport infrastructure development, but that the fall in the value shows that the road transport infrastructure developed could no long reduce poverty level of the country over time in Nigeria.



CONCLUSION AND RECOMMENDATION.

Overall, the interactions among road transport infrastructure development, economic growth and poverty reduction appear very weak and do not follow a predictable pattern in Nigeria. This is a true picture of the Nigerian economy since most of the time in Nigeria roads transport infrastructure are not properly constructed and maintained to stand the test of time, and the consumer of these roads increase at a very high increasing rate, thereby leading to diminishing return and decay of the road transport infrastructure over time.

Additionally, this implies that most of the federal roads constructed in Nigeria were majorly constructed in urban areas leaving most of the rural areas with no or inadequate roads to carry out their economic activities which in turn could lead to increase in the welfare of the entire populace and bring about reduction in the poverty level of the country. Although the available federal roads encourage economic activities which could reduce poverty rate in Nigeria, the reduction rate is very minimal to the extent that the poverty rate remains very high. This could also be factual since the demand for road transport infrastructure surpasses the supply at every point in time in Nigeria. Therefore, if policy makers could tailor transport policies towards developing rural roads in Nigeria, there could be a great improvement on poverty reduction (which is, of course the ultimate goal of any government).

ACKNOWLEDGEMENT: Council for the Development of Social Science Research in Africa (CODESRIA)

REFERENCE

Akanbi B, Bamidele, A. and Afolabi, D. (2013). Improvement in Transport Infrastructure and Economic Growth in Nigeria. Available at www.ijhss.org vol. 2 issue 8, pp 26-31.

Akinlabi, B. H, Kehinde, J.S and Jegede, C.A. (2011). *Public infrastructures: An approach to poverty alleviation and economic development in Nigeria. The European., Journal of Humanities and Social Sciences*, ISSN 2220-9425 4(1): (Special Issue)



- Akinlo A.E. (2003) "Foreign direct investment and economics growth in sub-Saharan Africa". *International Review of Economics and Business*.RISEC, Vol 50 (4), 569 – 580.
- Aschauer, D. (1989). Is Public Expenditure Productive? *Journal of Monetary Economics* 23, 177-200. Aschauer, D. (1989), 'Does public capital crowds out private capital?' *Journal of Monetary Economics*, Vol. 24, pp 171-188.
- Ayogu, M. (2007): "Infrastructure and Economic Development in Africa: A Review", *Journal of African Economies Supplement 1*, 75-126
- Calderon, C. and L. Serven, (2008). "Infrastructure and Economic Development in Sub- Saharan Africa," Policy Research Working Paper Series 4712, The World Bank.
- Central Bank of Nigeria (2003): Highway Maintenance in Nigeria: Lessons from other Countries. *Research Department Occasional Paper No. 27*
- Demetriades, P. and Mamuneas, T., (2000). "Intertemporal Output and Employment Effects of Public Infrastructure Capital: Evidence from 12 OECD Economies." *The Economic Journal* 110, 687–712.
- Easterly, W. and Rebelo, S. (1993). Fiscal Policy and Economic Growth: An Empirical Investigation. *Journal of Monetary Economics*. 32 (3), 417-458.
[http://dx.doi.org/10.1016/0304-3932\(93\)90025-B](http://dx.doi.org/10.1016/0304-3932(93)90025-B)
- Fan, S. and Chan-kang. C (2006) Road development, Economic Growth and Poverty reduction in China: *Transpot Policy* 15(5): 305-314 www.ifpri.org/sites/default/shenggenfan_cv.pdf.
- Holtz-Eakin, D. (1994). "Public Sector Capital and the Productivity Puzzle", *Review of Economics and Statistics* 76, p. 12–21.
- Jacoby, H. G. (2000). Access to Markets and the Benefits of Rural Roads. *The Economic Journal* 110: 713–737.
- Jahan, S. and R. McCleery (2005). *Making infrastructure work for the poor*. UNDP. Available at: www.undp.org/poverty/docs/fpage/Synthesisreport.pdf.
- Khandker, S. R., Bahkt, Z., Koolwal, G. B.(2006). The Poverty Impact of Rural Roads: Evidence from Bangladesh. 2006. *World Bank Policy Research Working Paper* 3875, April.
- Lahiri, K., Yao, V.W. (2006) Economic indicators for the US transportation sector, *Transportation Re- search Part A*, 40 (10), 872-887.
- Lakshmanan, T. R. (2007). The Wider Economic Benefits of Transportation: An Overview Discussion b, Paper No. 2007-8 December 2007 OECD.
- National Bureau of Statistics (various years). Annual Abstract of Statistics. Abuja:
National Bureau of Statistics
- Nurudeen. A. and Usman, A. (2010). Government Expenditure and Economic Growth In Nigeria, 1970-2008: A Disaggregated Analysis. *Business and Economics Journal*. 2010 (4), 1-11.



- Nwoji, I. D and Oluwalaiye (2012): Government Spending On Road Infrastructure and its Impact on Growth of Nigeria Economy. IJNBS: Vol. 2: 2231-2463. U8y.
- O'Brien, P.(1983) Transport and Economic Development in Europe, 1789-1914 in Railways and the Economic Growth of Western Europe (ed) Patrick O'Brien, 1-27, London Macmillan.
- Ogun, T. P. (2010). Infrastructure and Poverty Reduction. Implications for Urban Development in Nigeria, UNU WIDER Working Paper No. 2010/43.
- Olorunfemi, S. (2008). Infrastructural Services and Manufacturing Growth in Nigeria: A *Dynamic Analysis African Economic and Business Review Vol. 6 No. 2, Fall 2008*
- Onakoya, B., Salisu, A. and Oseni, I. (2012): Infrastructure and economic growth in Nigeria: A multivariate approach; *Research Journal of Business Management and Accounting Vol. 1(3), pp. 030 - 039, October 2012.*
- Peersman, G., and F. Smets (2003): *The Monetary Transmission Mechanism in the Euro Area: More Evidence from VAR Analysis.* Cambridge University Press, Cambridge.
- Straub, S. (2007): "Infrastructure: Recent Advances and Research Challenges," Unpublished Manuscript. Retrieved from Susanne. T. 2011
- Tatom, J. A. (1991). Public Capital and Private Sector Performance. Federal Reserve Bank of Saint Louis Review. 73, 3-15.
- Tatom, J. A. (1993). The Spurious Effect of Public Capital Formation on Private Sector Productivity. Policy Studies Journal. 21 (2), 391-395.
- Tella, S. A., Amaghionyeiwe, L. A. and Adesoye, A. (2007). Telecommunication infrastructure and economic growth: Evidence from Nigeria. *UN-IDEP and AFEA Joint Conference in Dakar Senegal, 1 – 28.*
- Wei, Z, Zhang, F., Zhuang, Z. and Song, H. (2008). Transport Infrastructure, Growth and Poverty Alleviation "Empirical Analysis of China" *Annals of Economics and Finance* 9-2, 345-371
- Williamson, J. G. (1974), *Late Nineteenth-Century American Development: A General Equilibrium History.* London. Cambridge University Press. *Available in Lakshmanan 2007.*