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# Infrastructural Development and Economic Growth in Nigeria: Using Simultaneous Equation

**Fidelis O. Nedozi[1], Jude O. Obasanmi[2] and J. A. Ighata[3]**

*[1]Institute of Continuing Education, PMB 1051, Benin City, Nigeria*
*E-mail: knoph4u@yahoo.com*
*[2]Department of Economics, Ambrose Alli University, Ekpoma, Nigeria*
*E-mail: jocranetng@yahoo.com*
*[3]Department of Economics, College of Education, Igueben, Nigeria*

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**ABSTRACT** Infrastructure is basic essential services that should be put in place to enable development to occur. Economic development of Nigeria can be facilitated and accelerated by the presence of infrastructure. If these facilities and services are not in place, development will be very difficult and in fact can be likened to a very scarce commodity that can only be secured at a very high price and cost. The provision and development of infrastructures have been the subject of much theoretical analysis and empirical studies. This study in line with has tried to evaluate infrastructural development and economic growth of Nigeria, using simultaneous analysis. In this study, two models are specified, and after applying the substitution method (reduce form equation), the two models collapsed to one which enabled researchers to use OLS to run the regression. From the result, it is clear that infrastructure is an integral part of Nigeria economic growth. Underminding it (infrastructure) is underminding the growth and development of Nigerian economy. The study has shown that infrastructure is an intermediate goods and service for the real sector and a finished goods and service for consumers. So, if the real sector which is the engine of growth is to propel Nigerian growth and development, infrastructure should be given qualitative and adequate attention.

## INTRODUCTION

The relationship between infrastructural development and economic growth has, in recent years become one of the most important economic topics in both academic and policy cycle. Economic growth implies increase in per-capita Gross Domestic Product hereafter written as GDP. The source of economic growth has therefore ranked amongst the most significant issues the economist have examined (Roller and Waverman 2009). The role of infrastructures has renewed attention over the years. According to Calderon and Serven (2004) and Estache et al. (2005), from the policy point of view, the renewed concern with infrastructure can be traced to the world-wide developments that took place over the last two decades. The first one was the retirement of the public sector since the mid-1980s in most industrial and developing countries from its sole position in the provision of infrastructure to private participation in the provision of infrastructure. This was part of the worldwide drive towards increasing reliance on markets and private sector activity (privatization of public utilities) and multiplication of concessions and other forms public-private partnership (PPP). While this process first gained stronghold in industrial countries, particularly the United Kingdom, over the last decades, it has extended to a growing number of emerging economics, particularly Latin America and the sub-Sahara Africa region.

Infrastructure investment consists of capital-intensive projects, which in most countries are largely publicly owned and regulated, and which also provides the backbone of the production and distribution system. They are often regarded as the wheel of economic activity because of the crucial role they play in providing the foundation upon which production and distribution stands (Economic Reflection Vol B. No. 4 April 2008).

Infrastructure contribute to raising the quality of life by creating amenities, providing consumption goods (transport, energy and communication services and contributing to macro economic stability. In the sub-Saharan region, Nigeria in particular traffic congestion, power black outs in major cities, bad quality of roads, access to capital and market, inadequate telecommunication services, shortage of drinking, irrigation and industrial water, all bear witness to the inadequate existing infrastructure facilities. Even

schools are not equipped with basic infrastructure that enhances human capital development. Infrastructures in certain remote areas can serve as an incentive to attract certain levels of industrial activities in such places, in that wise, infrastructure provision facilitates investment in less developed areas. With electricity for example, farmers in rural areas can easily process their harvested cassava roots into gain flour. Infrastructure provision is therefore fundamental for successful rural transformation and agricultural development.

**Objectives of the Study**

The main objective of the study therefore is to examine the simultaneous relationship between infrastructural development and economic growth in Nigeria.

The objectives of the study specifically are to:

- Empirically ascertain the simultaneous relationship between infrastructural development and economic growth in Nigeria.
- Examine the development and contribution of some infrastructural facilities to GDP in Nigeria.

**Literature Review**

***Recent Studies of the Infrastructure-Growth Relationship***

Perkins et al.'s study (2005) was the first of a series of studies attempting to address these particular challenges. This study used the PSS ARDL technique to focus specifically on the question of causality, while taking into account the time trends in the data. They find that the direction of forcing varied across different infrastructure measures:

- Aggregate public sector investment and public sector fixed capita stock drive GDP;
- Roads (total road length, paved road length, number of passenger vehicles) drive GDP;
- GDP drives ports' freight handling levels and airports' passenger levels;
- The direction of forcing is ambiguous for measures of railway, power generation and telecommunication infrastructure.

The data directly address the issue of causality and explicitly consider both direct and indirect channels of effect. They find that aggregate infrastructure investment and infrastructure stock drive GDP, as do measures of road infrastructure. Telecommunication, port and airport infrastructure and some railway infrastructure, however, are driven by GDP. The direction of the relationship is ambiguous for electricity generation and some other railway infrastructure. These results are broadly consistent with those obtained by Perkins et al. (2005) and so are not presented in a separate table.

In calculating the magnitude of the relationship between output and infrastructure, they adopt a multivariate co-integration model that examines the long-term interaction between several variables, allowing for the possibility of ambiguous causal relationships. In this model they include GDP, fixed capital stock, public sector fixed capital stock (a financial measure of infrastructure), total road length and electricity generation capacity. They find that there is a relationship between infrastructure stock and GDP but that this relationship is indirect, with rising infrastructure stock encouraging investment in fixed capital and thereby boosting GDP. The elasticity of GDP with respect to fixed capital stock is 0.06 and that of fixed capital stock with respect to infrastructure is 1.37. This means that a one percent increase in infrastructure increases fixed capital stock by 1.37%, while a one per cent increase in fixed capital stock increase GDP by 0.06%. Furthermore, electricity generation directly effects GDP with an elasticity of 0.2 (that is, a one per cent increase in electricity generation capacity directly increases GDP by 0.2%). Some of these results, however, are not robust to the replacement of total road length by other infrastructure measures.

They also introduced a control for property rights to test for the role of institutions in the infrastructure-growth relationship. With this control included, the indirect relationship via fixed capital stock is maintained and a significant direct positive relationship is also found, with an elasticity between 0.4 and 0.5.

A paper by Kularatne (2006) looks at both economic and social infrastructure. He also uses both the PSS ARDL approach to test the direction of causality and a VECM model to examine the relationship between his two measures of infrastructure, private investment and Gross Value Added (GVA). By including the private investment variable, he allowed for the possibility that the infrastructure-growth relationship is direct or indirect, via private investment.

Using physical measures of economic and social infrastructure (constructed from road and class-room data, respectively), he finds that social infrastructure directly drives economic infrastructure, private investment and GVA. Ambiguous causal relationships exist between economic infrastructure on the one hand and both private investment and GVA on the other hand. Using the VECM model, he finds that GVA responds to social infrastructure spending with an elasticity of 0.06, while the private investment rate responds to economic infrastructure spending with an elasticity of 0.02. (GVA in turn responds to private investment with an elasticity of 2.5.)

While he finds a positive infrastructure-growth relationship, he also tested explicitly for the possibility that this relationship may be non-linear: that infrastructure spending initially enhances growth but then stunts growth beyond some sufficiently high level. He finds that the relationship is positive for both economic and social infrastructure for all values of infrastructure investment recorded in South Africa in the last thirty years. This finding is of substantial importance when interpreting the other South African empirical studies, as it suggests that their results are not compromised by the fact that they do not take into account the possibility of a non-linear relationship between infrastructure and growth.

### *Road Infrastructure and Economic Growth: Some Empirical Evidences*

To access the contribution of road infrastructure to economic growth, a number of studies specified an aggregate production function that included transportation infrastructures among the explanatory variables. Antle in Uwagboe (2011), for example estimated a Cobb-Douglas production function for 47 developing countries and 19 developed countries. Infrastructure was specified as gross national output from transportation and communication industries per-square kilometer of land area. Antle found that transportation infrastructure was an effective factor of production.

Canning and Bennathan (2000), using a co integration methods, estimated the rate of returns to paved roads for a period of 41 countries over the past four decades. Canning found out that the highest rate of return to roads infrastructure occurs in countries with infrastructures shortages. Canning and Bennathan (2000) also analyzed whether physical capital, labour and other infrastructure variables are complement or substitute to road is highly correlated with physical and human capital. He however found that the margined return to roads decline rapidly if the length of paved roads increased in Isolation from other inputs. A study carried out by Fan et al. (2005) on the impact of road investment a promoting production growth in China consistently showed the importance of road investments in promoting production growth in China.

**Table 1: The contribution of road transportation to gross domestic product 1981-2013**

| *Year* | *Total GDP (₦M)* | *Contribution of road transport* | *Growth rate of road transport* |
|---|---|---|---|
| 1981 | 47,619.7 | 2,328.7 | - |
| 1982 | 49,089.3 | 1,905.1 | 18.2 |
| 1983 | 53,107.4 | 1,860.9 | 2.3 |
| 1984 | 59,622.5 | 2,089.8 | 12.3 |
| 1985 | 67,908.6 | 3,030.5 | 45.0 |
| 1986 | 69,147.0 | 3,171.1 | 4.6 |
| 1987 | 105,222.8 | 3,430.0 | 8.2 |
| 1988 | 139,035.3 | 3,710.0 | 8.2 |
| 1989 | 216,797.5 | 4,019.6 | 8.3 |
| 1990 | 267,550.0 | 4,886.6 | 21.6 |
| 1991 | 312,139.7 | 5,293.8 | 8.3 |
| 1992 | 532,613.8 | 8,050.8 | 52.1 |
| 1993 | 683,869.8 | 13,548.2 | 68.3 |
| 1994 | 899,863.2 | 29,826.6 | 120.2 |
| 1995 | 1,933,211.6 | 46,687.5 | 156.5 |
| 1996 | 2,702,719.1 | 66,621.7 | 29.8 |
| 1997 | 2,801,972.6 | 69,876.1 | 15.3 |
| 1998 | 2,708,430.9 | 90,067.6 | 28.9 |
| 1999 | 3,194,015.0 | 106,212.1 | 17.9 |
| 2000 | 4,582,127.3 | 116,336.7 | 19.5 |
| 2001 | 4,725,086.0 | 129,967.8 | 11.7 |
| 2002 | 6,912,381.3 | 160,679.9 | 23.6 |
| 2003 | 8,487,031.6 | 205,936.7 | 28.2 |
| 2004 | 11,411,066.9 | 344,913.0 | 67.5 |
| 2005 | 14,572,239.1 | 362,605.3 | 5.1 |
| 2006 | 18,564,594.7 | 416,240.3 | 14.8 |
| 2007 | 20,657,317.7 | 444,990.0 | 6.9 |
| 2008 | 23,842,170.7 | 472,495.3 | 6.1 |
| 2009 | 718,977.33 | 17534.51 | 6.8 |
| 2010 | 776,332.21 | 18727.95 | 6.9 |
| 2011 | 834,000.83 | 20017.89 | 6.9 |
| 2012 | 888,893.00 | 21394.38 | 5.85 |
| 2013 | 9,29,1515.40 | 23073.84 | 7.85 |

*Source:* Various issues of CBN Statistical bulletin and other periodicals

From Table 1, it is clear that the contribution of road transport to GDP has not being encour-

aging in spite of government effort at revamping road development. The table shows that as at 1981, the total contribution of road transportations to GDP was 2,328.7 representing 4.89% of the total GDP. This fell to 1,860.9 in 1983 representing 3.50% of the total GDP leading to -2.3 growth rate of road transportation. This, however, increased to 46687.5 in 1995 representing 2.42% of the total GDP leading to 156.5 growth rate of road transportation. In the year 2000, the growth rate of the sector was 19.5%, this rate was not sustained, the rate fell to 5.1% in 2005, rose a little to 6.9% in 2010 and rose again in 2013 to 7.85%. This indicates an improvement in the sector.

**Table 2: Contribution of rail transport and pipeline to real gross domestic product in Nigeria 1981-2013**

| *Year* | *Total GDP (₦M)* | *Contribution of road transport* | *Growth rate of road transport* |
|---|---|---|---|
| 1981 | 47,619.7 | 110.6 | — |
| 1982 | 49,089.3 | 128.3 | 16.0 |
| 1983 | 53,107.4 | 110.5 | -13.9 |
| 1984 | 59,622.5 | 109.3 | -1.1 |
| 1985 | 67,908.6 | 131.5 | 20.3 |
| 1986 | 69,147.0 | 138.3 | 5.2 |
| 1987 | 105,222.8 | 93.7 | -32.3 |
| 1988 | 139,035.3 | 79.8 | -14.8 |
| 1989 | 216,797.5 | 58.7 | -26.4 |
| 1990 | 267,550.0 | 50.9 | -13.3 |
| 1991 | 312,139.7 | 59.3 | 16.5 |
| 1992 | 532,613.8 | 42.7 | -28.0 |
| 1993 | 683,869.8 | 58.7 | 37.5 |
| 1994 | 899,863.2 | 2.9 | -95.1 |
| 1995 | 1,933,211.6 | 2.4 | -17.2 |
| 1996 | 2,702,719.1 | 2.9 | 20.8 |
| 1997 | 2,801,972.6 | 3.7 | 27.5 |
| 1998 | 2,708,430.9 | 3.9 | 5.4 |
| 1999 | 3,194,015.0 | 4.2 | 7.7 |
| 2000 | 4,582,127.3 | 4.5 | 7.1 |
| 2001 | 4,725,086.0 | 4.9 | 8.9 |
| 2002 | 6,912,381.3 | 5.4 | 10.2 |
| 2003 | 8,487,031.6 | 5.9 | 9.3 |
| 2004 | 11,411,066.9 | 6.4 | 8.5 |
| 2005 | 14,572,239.1 | 6.9 | 7.8 |
| 2006 | 18,564,594.7 | 7.5 | 8.7 |
| 2007 | 20,657,317.7 | 9.6 | 2.8 |
| 2008 | 23,842,170.7 | 11.8 | 22.9 |
| 2009 | 718,977.33 | 2.12 | 5.7 |
| 2010 | 776,332.21 | 2.24 | 5.8 |
| 2011 | 834,000.83 | 2.37 | 5.9 |
| 2012 | 888,893.00 | 2.51 | 5.9 |
| 2013 | 9,29,1515.40 | 2.67 | 6.47 |

*Source:* Various issues of CBN Statistical bulletin and other periodicals

Table 2 reveals that out of the total GDP of 47,619.7 in 1981, rail transport and pipeline transportation contributed 110.6 representing 0.23% of the total GDP. In 1994 and 1995, rail transport contributed 2.9 and 2.4 respectively leading to a negative growth rate of 95.1 and 17.2. However in 2008, rail and pipeline transportation contributed 11.8 to GDP leading to a growth rate of 22.9%. The year 2008 witnessed the highest growth in the sector. Since then, the sector witnessed a sharp fall to 5.7% in 2009. The sector maintained stead rates in 2011 and 2012 which are 5.9% respectively. In 2013, the sector managed a marginal growth rate to 6.47%.

## Telecommunications Infrastructure and Economic Growth: Some Empirical Evidences

Despite the obvious policy relevance of telecommunication infrastructure, there are far few studies that accentuated on the specific impact of telecommunications on economic growth. Using data for over 15 developed and 45 developing nations from 1960 to 1973, Hardy (2014) regressed Gross Domestic product per capital on lagged telephone per capita and the number of lagged radios. He concluded that telephone per capita do have a significant impact on GDP, whereas the spread of radio does not. However, when the regression was attempted for developed and developing economies separately, no significant effects occurred.

Cronin et al. in Calderon and Serven (2004) employed the causality and reverse causality analysis to confirm the existence of feedback process in which economic activities and growth stimulates demand for telecommunication services. As the economy grows, more telecommunication facilities are needed to conduct the increased business transactions Cronin et al. in Calderon and Serven (2004) investigated this relationship at the state and sub state levels of United States. This study confirm at both the state and country's level using data from the state of Pennsylvania, USA, that telecommunication investment affects economic activities and that economic activities can also affects telecommunication investment.

Roller and Waverman (2009) on their part estimated the impact of telecommunication infrastructures on economic growth from 21 OECD countries over the past 20 years using simultaneous approach. After accounting for simulta-

neity and country specific fixed effect, Roller and Waverman (2009) found that the impact between telecommunication infrastructure and aggregated output was much reduced and statistically insignificant

**Table 3: The contribution of the communication industry to real GDP in Nigeria 1981-2013**

| *Year* | *Total GDP (₦M)* | *Contribution of road transport* | *Growth rate of road transport* |
|---|---|---|---|
| 1981 | 47,619.7 | 157.9 | — |
| 1982 | 49,089.3 | 179.7 | 11.9 |
| 1983 | 53,107.4 | 145.5 | -19.0 |
| 1984 | 59,622.5 | 151.1 | 3.8 |
| 1985 | 67,908.6 | 186.0 | 23.1 |
| 1986 | 69,147.0 | 191.8 | 3.1 |
| 1987 | 105,222.8 | 201.7 | 5.2 |
| 1988 | 139,035.3 | 215.7 | 6.9 |
| 1989 | 216,797.5 | 219.5 | 1.8 |
| 1990 | 267,550.0 | 247.9 | 12.9 |
| 1991 | 312,139.7 | 252.3 | 1.8 |
| 1992 | 532,613.8 | 323.3 | 28.1 |
| 1993 | 683,869.8 | 446.2 | 38.0 |
| 1994 | 899,863.2 | 452.2 | 1.3 |
| 1995 | 1,933,211.6 | 525.7 | 16.3 |
| 1996 | 2,702,719.1 | 605.7 | 15.2 |
| 1997 | 2,801,972.6 | 684.5 | 13.0 |
| 1998 | 2,708,430.9 | 743.3 | 8.6 |
| 1999 | 3,194,015.0 | 814.0 | 9.5 |
| 2000 | 4,582,127.3 | 1,009.1 | 24.0 |
| 2001 | 4,725,086.0 | 6,891.2 | 583.0 |
| 2002 | 6,912,381.3 | 9,816.5 | 42.5 |
| 2003 | 8,487,031.6 | 13,206.7 | 34.5 |
| 2004 | 11,411,066.9 | 21,609.5 | 63.6 |
| 2005 | 14,572,239.1 | 39,513.2 | 82.9 |
| 2006 | 18,564,594.7 | 65,524.1 | 318.9 |
| 2007 | 20,657,317.7 | 243,551.0 | 47.1 |
| 2008 | 23,842,170.7 | 261,868.8 | 7.5 |
| 2009 | 718,977.33 | 26,298.88 | 34.4 |
| 2010 | 776,332.21 | 35,339.34 | 34.6 |
| 2011 | 834,000.83 | 47,561.07 | 31.8 |
| 2012 | 888,893.00 | 62,697.40 | 31.8 |
| 2013 | 9,29,1515.40 | 78,215.01 | 24.75 |

*Source:* Various issues of CBN Statistical bulletin and other periodicals

Table 3 reveals that the contribution of the communication industry to GDP has actually not been encouraging until times. For example in 1981, communication contributed 159.9 to total GDP of 47,619.7 representing 0.33% of the total GDP. However in 2001, communication contributed 6,891.2 to total GDP of 4,725086.0 representing 0.12% of the total GDP and growth rate of 583.0% which indeed was amazing. This sector witnessed the highest growth rate in 2006 with a increase to 318.9% from 82.9% in 2005. In 2008, the sector witnesses to shape fall in growth rate, but this was reversed in 2011 from 7.5% in 2008 to 31.8% , and in 2013, it dropped marginally to 24.75%.

## RESEARCH METHOD

### Model Specification

In the empirical analysis of the relationship between infrastructural development and economic growth using a simultaneous analysis; the researchers specified two models, one which is the Cobb-Douglas production function, $Q = f(K^{á}\cdot L^{1-á})$ and the other which is on infrastructure. After applying the simultaneous equation, the two models composed to one (below for details) :

From the original Cobb- Douglas production function

$Q = f(K^{\alpha},L^{1-á})$…… .....1 and ,

$K^{\alpha} = g(infra, Infl, exr, Q)$ ……..... (2)

*From equation 1*

$Q= \beta_0 + \beta_1 K^{\alpha} + \beta_2 L^{1-\alpha} + u_t$ ……..... (3)

*From equation 2*

$K^{\alpha} = \delta_0 + \delta_1 infl + \delta_2 exr + \delta_3 Q + \delta_4 infra + e_t$ …….(4)

Using the reduced form equation under the simultaneous equation method, the researchers substitute equation (4) into equation (3), the researchers have

$Q= \beta_0 + \beta_1(\delta_0 + \delta_1 exr + \delta_2 infl + \delta_3 Q + \delta_4 infra + e_t) + \beta_2 L^{1-\alpha} + u_t$ (5)

$Q= \beta_0 + \beta_1\delta_0 + \beta_1\phi_1 exr + \beta_1\phi_2 infl + \beta_1\delta_3 Q + \beta_1\delta_4 infra + \beta_1 e_t + \beta_2 L^{1-\alpha} + u_t$… .....(6)

Collection of like terms

$Q - \beta_1\delta_3 Q = \beta_0 + \beta_1\delta_0 + \beta_1\delta_1 exr + \beta_1\delta_2 infl + \beta_1\delta_4 infra + \beta_1 e_t + \beta_2 L^{1-\alpha} + u_t$ …….....(7)

$Q(1 - \beta_1\delta_3) = \beta_0 + \beta_1\delta_0 + \beta_1\delta_1 exr + \beta_1\delta_2 infl + \beta_1\beta_4 infra + \beta_2 L^{1-\alpha} + \beta_1 e_t + u_t$ ……..…….....(8)

Dividing by $(1 - \beta_1\delta_3)$ the researchers have

$Q = \Omega_0 + \Omega_1 exr + \Omega_2 infl + \Omega_3 infra + \Omega_4 L^{1-\alpha} + v_t$ ….(9)

Where;

$(\beta_0 + \beta_1\delta_0)/ (1 - \beta_1\delta_3) = \Omega_0$

$\beta_1/(1 - \beta_1\delta_3) =$ &!$_1$

$\beta_2/(1 - \beta_1\delta_3) =$ &!$_2$

$\beta_3\delta_1/(1 - \beta_1\delta_3) =$ &!$_3$

$\beta_3\delta_2/(1 - \beta_1\delta_3) =$ &!$_4$

$(\beta_3 e_t + u_t)/(1 - \beta_3\delta_3) = v_t$

In order to remove the exponential in equation (9), the researchers log the equation,

$log Q = \Omega_0 + \Omega_1 log exr + \Omega_2 log infl + \Omega_3 log infra + \Omega_4(1-á) log L + v_t$.....(10)

therefore the model of infrastructure and growth is

$log Q = \pi_0 + \pi_1 log exr + \pi_2 log infl + \pi_3 log infra + \pi_4 log L + v_t$ ..... (11)

where :

Q = gdp (gross domestic product)
exr = exchange rate
L= labour force
infl= inflation rate
infra = contribution of infrastructure to gdp
$v_t$ = error term
apriori expectation
$\pi_i > 0$ , where i = 3 and 4
$\pi_j < 0$ where j = 1 and 2

## RESULTS AND DISCUSSION

The researchers used time series data obtained from various sources like CBN statistical bulletin, journals, internet etc. Because of spurious nature of data series data, the researchers used unit root test to check for the stationarity of each variable under consideration in this study.

### Analysis for ADF Unit Root Test

The results of Table 4 on the ADF unit root tests indicate that the variables (both explained and explanatory) are not stationary at 1(0) levels but are stationary at 1(1) first difference except infra (infrastructure) which is stationary at 1(2), that is, second order difference. The stationarity of the variables are at 1%, 5% and 10% levels. By summary, the results of the ADF tests suggest that all the variables of interest have a unit root (that is, the null hypotheses of all the relevant variables having unit root could not be rejected).This means that in order to eliminate possibility of spurious regression results and enormous inferences, the first differences of the relevant variables in the estimation process was used.

From the result on Table 5 the $R^2$ estimation shows that there is goodness of fits of the model. With the percent of 99 ,it indicates that the explanatory variables( L, exr, infra and infl) explain very well of the explained variable (GDP). This is endorsed by the R-bar-square of 98%.This means that the explanatory variables (L, exr, infra and infl) have good account of the dependent variable (GDP).The f-test statistic value of 86.23 indicates that at least one the explanatory variables is statistically significant or that the explanatory variables are jointly statistical significant in the determination of the relationship between infrastructure development and economic growth of Nigeria.

**Table 5: Result of the regression analysis regression result showing beta co-efficient and t-statistic**

| *Variable* | *co-efficient* | *t-stat* |
|---|---|---|
| C | 0.602152 | 0.238085 |
| logL | 0.956655 | 0.494467 |
| logINFRA | 0.787663 | 6.856789 |
| logINFL | 0.111694 | 3.462135 |
| logEXR | 0.165190 | 1.735265 |
| AR(15) | 0.492507 | 2.838969 |

R-squared = 0.99
R- bar – square = 98
F-stat = 86.23
DW stat = 1.99

For the t-statistic which is use to measure the individual statistic of the independent and using the rule of thumb which specifies that any t-value which is not up to two (2) is considered not statistically significant. From the result of table E, it is clear that only infra and infl (infrastructure and inflation) are individually significant in this study as in table B while other (exr, and), are not individually significant. The result of the t-statistic is not single as it is in line with the study of Udegbunam (2000), Fan and Cha-

**Table 4: ADF unit root test result**

| *Variable* | *Values* | *1% Critical value* | *5%Critical value* | *10%Critical value* | *Order of integration* |
|---|---|---|---|---|---|
| Exr | -1.671363 | -3.7076 | -2.9798 | -2.6290 | 1(1) |
| Gdp | -0.356657 | -3.7076 | -2.9798 | -2.6290 | 1(1) |
| Infl | -2.499352 | -3.7204 | -2.9850 | -2.6318 | 1(1) |
| Infra | -0.261163 | -3.7076 | -2.9798 | -2.6290 | 1(2) |
| L | -2.463575 | -3.7076 | -2.9798 | -2.6290 | 1(1) |

*Source:* Researchers' Computation using E-views 3.1

Kong (2005), Roller and Waverman (2009) and Fedderke and Luiz (2011). In the three estimations in these studies mentioned, infrastructure was divided in components. In these studies, all the coefficients have negative coefficients which are contrary to economic theory. As for the co-efficient of the explanatory variables (exr, L.infl and infra), it is observed that outside these variables, the economic growth (GDP) will operate at approximately 0.602 rate. This means that an increase of one unit in the autonomous will generate a positive increase in the GDP by 0.602 units.

All the explanatory variables conform to apriori expectation except inflation which is in line with economic theory. For labour force (L), holding other explanatory variables constant, a unit increase in LF will decrease GDP by 0.96 units. Also , for exr, infl and infra, a unit increase in them will increase GDP by 0.79,0.11 and 0.17 unit respectively. Finally, the result of the DW-statistic of 1.99 shows the absence of serial autocorrelation in the estimation. This makes the model/estimation to be acceptable.

## CONCLUSION

The linkage between infrastructural development and economic growth outcomes is one of the most popular topics for debates in recent scientific literature and economic research. The role of infrastructure is widely analysed as very vital to household and firms as availability and quality of infrastructure result in different decisions to invest and may influence migration, business establishment location. Although, the result of the two estimations speak that infrastructural development has a positive linkage with our economy growth but, the researchers believe this is in term of availability and quality of infrastructure in our economy .And also, the magnitude of the contribution leaves a lot to question. This questionable contribution or lack of quality infrastructural development has been seen in the relocation of some firms out of Nigeria to other neighbouring countries like Ghana etc. The relocation of some firms out of Nigeria which is as a result of weak quality of our infrastructure base has not only affected the economy negatively in the short run but also in the long run which are manifesting in a lot of social/ youth restiveness like Niger Delta militancy, boko haram in the North to mention but a few. Know fully that infrastructure services are used as final consumption item for households and intermediate consumption item for firms , any wrong action taken by government that negates the growth and development of infrastructure has both micro and macro economic effect to the economy at large.

The quality of infrastructure have direct effect on business productivity and growth, and different investments to infrastructure capital from inequality between regions and countries. The role of infrastructural development on economic is a vital issue for strategic and development country policy management for a country with weak quality of infrastructure base.

Efficient infrastructure attracts centers of production and consumption, gives greater access to markets and education centers and that timely access to health care, facilitated by transport can prevent maternal deaths and lower infant mortality rates.

## RECOMMENDATIONS

Infrastructure development is one of major elements of structural reforms in developing economy like Nigeria because of its expected large economic and social impact. As can be inferred from the studies by other researchers, infrastructure investments alone do not have a significant influence on economic growth. The institutional environment is a very important complement, allowing infrastructure investments to be translated into economic growth.

Based on this, the following are the recommendations of this study:

In the area of transportation, more roads should be constructed and the existing one adequately maintained particularly the ones already taken over by gully erosion as it will lead to the reduction of production of firms as well as inability of the firms to evacuate consumables both final and intermediate from rural to urban centers.

The government should enhance the competition between and the efficiency in infrastructure industries, (especially electricity) and with it, the government can make an indirect contribution to economic development.

The railways sector should receive government blessing as exemplified by the Chinese and Indians governments. This is because since passengers and goods are carried by railways cheap

and significant compared to other means of land transportation.

Demand for infrastructure is said to expand significantly in the decades ahead, driven by major factors such as global economic growth, technology progress, urbanization and growing congestion. The researchers propose that government should as a matter of priority create more favorite institutional policy and regulatory framework to meet up these challenges.

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