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Infrastructure Development and Economic Growth Nexus in Nigeria

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ABSTRACT

The impact and significance of infrastructure development towards the economic growth of a country cannot be overemphasised. This is because it is a major component that is required to ensure an increase in domestic productivity and attract foreign direct investment (FDI) inflow. This study through the use of Ordinary Least Squares and Granger Causality econometric techniques investiages the infrastructural development and economic growth nexus in Nigeria. The former is proxied by Gross Fixed Capital Formation (GFCF) while the latter is proxied by Gross Domestic Product (GDP). The period under review is from 1983 to 2013 and the data for this study is obtained from the World Bank's Africa Development Indicators. The empirical results from this study reveal that infrastructural development has a positive and statistically significant impact on Nigeria's economic growth. However, the Granger Causality test connotes that there is no mutual correlation between both variables in Nigeria in the period under review.

Keywords: Economic Growth, Nigeria, Gross Fixed Capital Formation, Infrastructural Development, OLS and Granger Causality.

1 Introduction

The attainment of sustainable economic growth remains a paramount objective of every country. A primary source required for achieving this objective is through increased domestic productivity. However, for this to occur, such country must be able to create sufficient domestic physical capital to stimulate such desired economic growth. In other words, fixed capital formation is a major contributor, catalyst and determinant of a country's economic growth.

Gross Fixed Capital Formation (GFCF) according to the World Bank (2014) refers to fixed assets accumulation such as land improvements, equipment, machinery construction of roads and railways, building of schools etcetera, required for augmenting a country's economic productivity. This definition reiterates and captures the predictions of Romer (1986) and Lucas (1988) Growth Models which stipulates that increased growth rates can be achieved by increasing capital accumulation. Also, the building of schools leads to improved educational enrolment rate which will enhance the quality of human capital. The improvement of human capital in this regards will ensure innovation, invention and enhancement of productivity in the economy. Likewise, the investment in machinery and equipment will also increase the efficiency of labour productivity. Furthermore, Bakare (2011, p. 12) explained capital formation

as the "proportion of present income saved and invested in order to augment future output and income". This definition buttresses the importance of savings as an integral element needed for creating GFCF and enhancing economic growth. Therefore, it can be concluded that a country with low domestic marginal propensity to save is likely to have poor capital formation which potentially impedes economic growth and vice versa. This is because, such country will have an insufficient pool of loanable funds for domestic investment into physical capital. More importantly, the availability of quality physical capital attracts Foreign Direct Investment (FDI) inflow, which is an integral macro-economic variable necessary for increasing a country's economic prosperity. In a broader perspective, capital formation in the financial economics lingual refers to savings drives, developing of capital and secondary markets and privatizing financial institutions (Ray, 2013). Ray, (2013) opined that GFCF results in increased production in the long run which eventually causes share prices to rise, thus increasing profitability which in the end has a positive spillover effect on a country's economic growth.

Based on the discussion so far, an intuitive conclusion that a key precondition for ensuring and enhancing sustainable economic growth is through increased fixed capital formation. This study is geared towards investigating the contribution of Infrastructure development (using GFCF) towards economic growth in Nigeria. It also aims to determine if there a relationship between GFCF and economic growth in Nigeria as well as exploring whether there is a causal relationship between both variables.

1.1 Research problem

In recent years, Nigeria has experienced increased infrastructural transformation in terms of building of more schools, road, telecommunication facilities and etcetera. However, there are only a few studies found to have investigated the impact that these infrastructural development has on Nigeria's economic growth. Thus, the aim of this study is geared towards contributing to the existing studies by investigating the contribution and impact that infrastructural development has on Nigeria's economic growth.

Research Objectives

- To explore the impact that infrastructural development has on Nigeria's economic growth.
- To investigate whether there is causal relationship existing between infrastructural development and economic growth in Nigeria.

1.2 Hypotheses

The hypotheses of this study include:

H_1: Infrastructural development has a positive impact on Nigeria's economic growth.

H_2: A mutual correlation exists between infrastructural development and economic growth in Nigeria.

2 Literature Review:

There have been several studies that have investigated the relationship that exist between infrastructure development and Economic growth. However, the results emanating from these studies have been inconclusive. Some studies suggests that infrastructure development impacts

positively on economic growth while others have opined that a negative relationship exist between both variable. In an empirical study of 61 countries investigating the relationship between equipment investment and GDP per capita between 1960-1985, De Long and Summers (1991) finds that increasing investment on equipment facilitates quicker economic growth. Likewise, Bose and Haque (2005), findings suggest a unidirectional causation running from economic growth to capital formation in the form of public investment in transport and communication. However, the outcome of the study of Easterly and Levine (2001) concludes that capital accumulation does not contribute to faster economic growth. Bakare (2011) using data spanning from 1979 – 2009 found the presence of a significant relationship between capital formation and economic growth in Nigeria. The study also concludes that savings is paramount to the attainment of economic growth in Nigeria. Also, Dash, Sahoo and Nataraj (2010), using data spanning between 1975 to 2007 opines that infrastructural development in China has contributed significantly to economic growth. Again, in China, a research by Dash and Sahoo (2010), using Two-Stage Least Squares (TSLS) and Dynamic Ordinary Least Squares (DOLS) techniques on data spanning between 1970-2006 finds that both physical and social infrastructure have a significant positive effect on economic growth in the country. From the discussion so far, it can be noted that most studies are of the view that infrastructure development in the form of GFCF is an important determinant of economic growth. However, for a country to be able to effectively achieve and sustain its economic growth, such country must have a ratio of GFCF to GDP of at least 27 percent (Bakare 2011, Hernandez-Cata 2000). However, Nigeria since the mid-1980s till 2013 has experienced a GFCF-GDP ratio of less than 20 percent; this could be a reason for the country's meager economic performance.

Increasing the level of economic productivity has been a major concern for Nigeria's policymakers and economists. Over the years, the country experienced increased GDP growth rate. However, there was a significant decline in ratio of GFCF to GDP from 32.2 percent in 1980 to 11.9 percent in 1985 (World Bank, 2014). As a result of this decline, the Nigerian government in 1986 instigated several economic reforms geared towards the improvement of capital formation through private sector empowerment and participation. During this period, the Central Bank of Nigeria ensured a positive interest rate to encourage savings; which is the primary source for stimulating investment through the creation of loanable funds. Likewise, in order to further encourage savings, there was a need for a strong financial system. Thus, in 1987, Nigeria commenced the financial deregulation to improve innovation and competitiveness particularly in the banking industry (Omankhanlen, 2012). After these policies, GFCF experienced an increase from 14.3 percent in 1990 to 16.9 percent in 2010 (World Bank, 2014). However, it began to decline again to 15.98, 14.6, and 14.4 percent in 2011, 2012 and 2013 owing to the severe civil unrest hitherto. In addition to this, the high level of corruption, embezzlement of government funds, and the deteriorating exchange rates are some salient factors that have negatively affected the growth of fixed capital formation in Nigeria.

3 Methodology

This study uses annual secondary data from the World Bank's Africa Development Indicators. The period of observation covered in this study is between 1983-2013. The Ordinary Least Square technique is used to estimate the impact that infrastructural development has on

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Nigeria's economic growth. Likewise, the causal relationship between both variables will be explored through the use of the Granger Causality test. Economic growth, which is the explained variable, and infrastructural development which is the explanatory variable, are proxied by GDP and GFCF respectively. E-Views 8.0 Statistical Package is used for computing the results for this study.

Table 1: Data for Gross Domestic Product (GDP) and Gross Fixed Capital Formation (GFCF)

Year	GDP (Current US$)	Gross Fixed Capital Formation(Current US$)
1983	35,451,565,749	8,156,165,138
1984	28,500,815,241	4,053,947,718
1985	28,873,977,228	3,454,840,989
1986	20,721,499,308	3,140,099,585
1987	24,093,203,445	3,278,488,698
1988	23,272,161,397	2,762,656,914
1989	24,231,168,859	2,845,302,291
1990	30,757,075,595	4,382,926,589
1991	27,392,886,873	3,761,777,241
1992	29,300,921,687	3,735,332,476
1993	15,789,003,753	2,139,415,232
1994	18,086,400,536	2,019,424,063
1995	28,546,958,641	2,017,058,556
1996	34,987,951,375	2,550,595,125
1997	35,822,342,618	2,993,588,736
1998	32,004,613,750	2,752,912,045
1999	35,870,792,988	2,508,841,854
2000	46,385,996,027	3,255,313,774
2001	44,138,014,092	3,345,603,416
2002	59,116,868,250	4,144,046,790
2003	67,655,840,108	6,700,671,053
2004	87,845,403,978	6,494,735,850
2005	112,248,324,603	6,127,632,109
2006	145,429,802,542	12,021,030,820
2007	166,451,202,370	15,396,131,741
2008	208,064,724,514	17,318,219,521
2009	169,481,270,115	20,487,174,199
2010	369,062,403,182	62,706,686,931
2011	411,743,801,712	65,793,194,145
2012	462,979,245,902	67,716,991,829
2013	521,803,314,654	75,511,095,008

Source: World Bank's Africa Development Indicators (2014).

3.1 Model Specification

The Multiple linear regressions model that is used to ascertain whether an increase in GFCF in Nigeria will result to an increase in economic growth is summarized by equation (1):

$$\text{LnGDP} = \beta_0 + \beta_1 \text{LnGFCF} + \varepsilon_t \quad (1)$$

where,

LnGDP = Gross Domestic Product (Current U.S dollars),

LnGFCF = Gross Fixed Capital Formation (Current U.S dollars),

β_0 = Intercept,

β_1 = the coefficient of the explanatory variables,

ε_t = Stochastic error term.

Note: All the variables are in their natural logarithm form.

Table 1: Summary of OLS Results

Variable	Coefficient	Std.Error	T-Value	P-Value
GFCF	0.504454	0.070960	7.109013	0.0000
Constant	0.544147	0.085357	6.374984	0.0000
R^2:	0.635395			
Adj. R^2:	0.622822			
Durbin-Watson stat:	2.303443			

Source: Computed by the author using Eviews 8.0

The results emanating from Table 1 above shows that over 63 percent of the variation in the explained variable (GDP) is explained by the independent variable (GFCF). Also, the Durbin-Watson stat of 2.3 shows that there is no presence of autocorrelation in the model. Furthermore, the coefficient of GFCF which is 0.50 means that increasing GFCF by a percentage point will lead to an increase of GDP by 0.50 percent. Also, due to the fact that the p-value is zero, it can be concluded that the contribution of GFCF to Nigeria's economy is statistically significant. This result agrees with the findings of Bakare (2011) and Dash, Sahoo & Nataraj (2010) that a significant positive relationship exists between both variables.

3.2 The unit root test:

The Augmented Dickey-Fuller (ADF) test is used in this study to determine if both GFCF and GDP are stationary or not. The variable is considered stationary if the absolute value that is obtained from the ADF test is greater than the absolute MacKinnon values. However, the variables are considered non-stationary if the absolute value of the ADF test is less than the MacKinnon values in absolute terms. The null hypothesis for this test is that both variables GDP and GFCF possess unit root. On the other hand, the alternative hypothesis connotes the absence of unit root for both variables.

Table 2: Summary of the Unit Root Test

Variable	ADF test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	p-value	Decision
GDP	-5.345704	-3.670170	-2.963972	-2.621007	0.0001	Reject null
GFCF	-4.652229	-3.670170	-2.963972	-2.621007	0.0008	Reject null

Source: Computed by the author using Eviews 8.0

The results from Table 2 above reveal that both variables Gross domestic Product and Gross Fixed Capital Formation are stationary. This means that the null hypothesis can be rejected and the alternative hypothesis is accepted.

3.3 Granger Causality Test

Since both variables have been determined as stationary, the Granger Causality test is conducted in order to explore the possibility of a mutual correlation between both variables.

Table 3: Granger Causality Test Results

Null Hypothesis:	F-Statistic	Probability	Decision
LGFCF does not Granger Cause LGDP	0.31686	0.7314	Fail to Reject Null
LGDP does not Granger Cause LGFCF	1.44270	0.2561	Fail to Reject Null

Source: Computed by the author using Eviews 8.0

The F-statistic and the P-value indicates and determines the acceptance or rejection decision of the null hypothesis. According to the results that are obtained from Table 2 above, LGFCF does not granger-cause LGDP. In other words, there is an absence of causality and hence the null hypothesis cannot be rejected at the 5% level of significance. Likewise, the result also finds that LGDP does not Granger-cause LGFCF in Nigeria in the period under review.

4 Conclusions and Recommendation:

This study was undertaken to evaluate infrastructural development and economic growth nexus in Nigeria through the use of Ordinary Least Squares (OLS) technique. Likewise, this study also investigated whether there is a causal relationship between both variables. The data used for this study was obtained from the Africa Development Indicators derived from the World Bank database. Finally, the period under review was between 1983 to 2013.

The OLS results show that a positive and significant relationship exists between infrastructural development (proxied by GFCF) and economic growth in Nigeria (proxied by GDP). Thus it will be worthwhile for the Nigerian government and policymakers to implement policies geared towards the development of infrastructure. This would result in increasing economic efficiency, productivity and also attract potential FDI inflow in to the country. However, the Granger Causality test reveals that there is no mutual correlation or causality between both variables in Nigeria in the period under review.

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