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Growth Implications of Infrastructure Finance in Nigeria

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Abstract

Development in whatever form cannot transform into good healthy living if infrastructure such as telecommunications, transport, energy, water, health, housing and education are not sufficient. As such, financing of infrastructure projects is expected to yield positive externalities to economic growth and the welfare of the people. This study analyzes the effect of public and private investment on infrastructure and its impact on economic growth in Nigeria during the period 1970 to 2014 using a Stephane et al. (2007) and Sahoo et al. (2010) framework. The Engel-Granger (1987) cointegration and Error correction mechanism (ECM) were employed to analyze the unit root procedures, ascertain the long run relationship and establish the values of long run parameters. Empirical results show that domestic private investment, public investment and per capita real expenditure on health and education influenced economic growth negatively, while labour force and the infrastructure index affected growth positively. Nigeria's experience in terms of infrastructure development shows that the government needs to articulate a good economic policy that will enhance infrastructure quality and at the same time makes provisions for human capital development for sustained growth.

Keywords: Nigeria, Infrastructural development, Cointegration, Error Correction Mechanism

JEL Classification: O11

1. Introduction

Infrastructure development has been well documented in the economic literature as a critical factor driving economic growth (Aschauer,1989; Munnell, 1990; World Bank, 1994; Estache, 2006). Development in whatever dimension cannot result into good healthy living if infrastructure such as telecommunications, transport, energy, water, health, housing and education are not sufficient. Infrastructure raises growth quality, and reduces economic disparity and the poverty level. Direct investment on infrastructure is capable of promoting positive externalities in terms of making available increased production facilities, lowering costs associated with trade transactions and generating employment opportunities for the people. Conversely, deficiency of infrastructure constitutes a serious hindrance to sustainable growth and development and possibly worsen poverty levels. A number of studies have documented a positive relationship between economic growth and infrastructure development (for example, Sahoo et al., 2010; Srinivasu and Rao, 2013). These studies have maintained that investment in infrastructures directly affects economic development. The only avenue a country can take to attain a reasonable growth potential is to commit resources to the provision of infrastructure such as good roads, functional railway networks, water, electricity, schools, houses, hospitals, etc.

Nigeria is experiencing stunted growth due to sluggish infrastructure development. Resources channelled to the provision of infrastructure services were largely inadequate and sub optimal. Funds directed to the provision of infrastructures were either embezzled or out rightly diverted to less productive needs which are susceptible to corruption. This, however, created a lacuna in the infrastructure development process. The average growth rate in Nigeria increased from 26% to 34% between 1970 and 1999. The increase was sustained by high revenue inflow from the oil sector. However, the rise in the growth rate did not match Nigeria's infrastructure development needs. The growth rate declined substantially from 24.2% to 8.48% during the period 2000 and 2014 respectively. The downward trend in the growth rate could be attributed to the poor state of infrastructure development. Recently, it was discovered that one of the major features of Nigeria's dwindling growth performance has been a massive decline in physical infrastructure development.

There is need to invest in infrastructure in order to maintain a stable growth momentum in productivity and at the same time improve the quality of the living standard of the people. In every economy, be it a developing or developed country, there are two major development questions to answer. One, how would the economy make available basic core needs to the people? The second question is how would the economy achieve higher growth rates and sustainable development? There are only a few studies found to have investigated infrastructure development using varieties of infrastructure outcomes to gauge growth and development. Given the literature gap, this study can help explain the relationship of different infrastructure outcomes against growth. Another contribution of this study to current knowledge lies on the fact that a composite index of infrastructure indicators was computed to link infrastructure outcomes to growth. The study further examines the theoretical rationale behind infrastructure development and also analyzes the socio-economic relationship between infrastructure development and economic growth.

The remaining part of the paper is structured as follows: Section 2 discusses infrastructure finance and growth in Nigeria. Section 3 presents a brief review of literatures on infrastructure and economic growth. Section 4 explains the theoretical framework, while section 5 presents the estimation technique for the study. Section 6 discusses the empirical results while section 7 provides the conclusion and policy implication.

2. Assessment of Infrastructure Finance and Growth in Nigeria

Nigeria has the potential to house a large number of the world's investments, but due to poor state of infrastructure development, this potentials could not be showcased to a greater height. The deplorable state of infrastructures and poor state of repairs and maintenance are evident on electricity distribution, road construction, railway networks and water facilities. The reasons for the deplorable conditions of the infrastructures are: reduction in government spending on infrastructure, vandalization of existing ones, corruption and rent-seeking, bureaucratic bottlenecks and delay, maintenance and repairs of damaged facilities (Babatunde et al., 2012). As rightly pointed out in the study conducted by Ijaiya and Akanbi (2009), the deplorable condi-

tions in infrastructure could result into: low productivity growth, low income growth, low savings, low level of industrial development and ultimately end up as vicious cycle of poverty. Infrastructure deficit have decimated Nigeria's growth potentials and made doing business very difficult and restrictive. For Nigeria to realize its growth potentials, a fully structured and sustainable infrastructure development policy is desirable. Infrastructure development and management constitute the critical area which requires efficient developments that the society heavily relies upon and this would provide a good yardstick of measuring socio-economic development.

The growth process in Nigeria can be ascertained through the quality of infrastructures supporting it. Infrastructures could be financed through domestic savings or foreign direct investment (Sahoo et al., 2010). The bulk of infrastructure financing in Nigeria comes from direct budget investment from fiscal resources, borrowing and market based financing. Table 1 clearly show that the bulk of government on infrastructure in Nigeria directly comes from government investment. A large number of urban infrastructures in Nigeria were financed through direct budget expenditures from the three layers of government (Central, State and local governments).

Table 1: Government Expenditure on Selective Infrastructure in Nigeria (N'm)

Infrastructure	1970-79	1980-89	1990-99	2000-2009	2010-2014
Education	102.6	608.7	11351.2	97338.8	201688
Health	27.5	172.3	3885.1	53608.9	127460
Transport & Communication	10.8	97.2	2132.3	30457.7	356040
Construction	24.5	236.2	1736.3	32728.7	234580.4
Water	11.3	238	400.9	641.8	1234.8

Source: Computed from the various issues of the CBN Statistical Bulletin and Financial and Economic Reports, 2014.

However, the dimension of finance differs due to constitutional limitations. Infrastructure development remains grossly inadequate relative to the nation's requirements due to lack of funds. Revenue inflows from taxation

and other income generating activities have been quiet inadequate to address the question of bourgeoning infrastructural needs in Nigeria. There appears to be a financing gap from direct budgetary spending on infrastructure. This gap can be filled by borrowing and market based financing. To address this challenge, the Central Bank of Nigeria established the infrastructure finance office to come up with a sustainable financing framework to stimulate long-term financing for infrastructure development (CBN, 2011). Budget estimates to sustain the available infrastructures has been on the increase as at 1977-1986 and 1997-2006. The actual recurrent and capital expenditure for infrastructure in Nigeria is presented in appendix 1. Transport and Communication infrastructure grew from a negative 1.84% to 79.6% and declined sharply to 7.03% during 2007-2014. During the same period, education, health, construction and water infrastructure grew from 8.78%, 11.1%, 18.8% and 38% to 33.1%, 44.1%, 57.1% and 73.2% respectively. Between 2007-2014, the growth of education, health, construction and water infrastructure stood at 13.3% and 4.96% respectively (Table 2). The increase in growth rate of the budget estimates on infrastructures in Nigeria did not reflect much on the state of infrastructures on ground. This implies that the funds allocated to the provision of infrastructural projects were channelled to less productive projects (see Babatunde et al., 2012).

Table 2: Growth of Recurrent & Capital Expenditure on Infrastructures in Nigeria (%)

Year	1977-1986	1987-1996	1997-2006	2007-2014
Transport & Communication	-1.84	49.2	79.6	7.03
Education	8.78	48.4	33.1	13.3
Health	11.1	38.9	44.1	13.3
Construction	18.8	27.0	57.4	4.96
Water	38.0	33.3	73.2	4.96

Source: Computed from the various issues of the CBN Statistical Bulletin and Financial and Economic Reports, 2014.

Table 3 further give credence to the fact that despite government's spending on the provision of infrastructures in Nigeria, the contribution of the existing ones are far from raising the quality of growth. Evidence from table 4 show that education, transport, health, electricity and water contributed insignificantly to growth in Nigeria. Between 1970-1979, the contribution of education, transport, health, electricity and water stood at 1.49%, 3.01%, 0.52%, 0.43% and 0.07% respectively. This fell to 0.22%, 2.58%, 0.06%, 0.21% and 0.01% during the period 2000-2009. During period 2010-2014, the contributions of these infrastructures to growth was not sustained as it fell to 0.15%, 1.84%, 0.04%, 0.18% and 0.01% respectively. This indicates a gross deficits in infrastructure finance required to catalyzed growth. During the same period, telecommunication infrastructure recorded massive improvement due to positive globalization externality (see Adewuyi, 2004 and Adeleke & Adele, 2010).

Table 3: Contributions of Selected Infrastructures to Growth in Nigeria, 1970-2014 (%)

Year	1970-1979	1980-1989	1990-1999	2000-2009	2010-2014
Education	1.49	0.46	0.23	0.22	0.15
Transport	3.01	4.46	2.64	2.58	1.84
Health	0.52	0.14	0.06	0.06	0.04
Electricity	0.43	0.45	0.13	0.21	0.18
Water	0.07	0.27	0.07	0.01	0.01
Telecommunication	0.20	0.11	0.03	0.52	1.34
GDP Growth (%)	28.9	19.4	34.4	24.2	8.5

Source: Various issues of CBN Statistical Bulletin, 2014.

Going by the submissions of Babatunde and Shuaibu (2011) and WHO (2013), electricity and health was cited as the critical major setbacks to growth in Nigeria. Tables 4 and 5 corroborated the assertion. Electricity generation and consumption continues to be Nigeria's largest infrastructure challenge as it filtrates into other segments of the economy. The Nigerian

power sector is characterized by low generating capacity relative to installed capacity. A large number of consumers do not have access to the product. Presently, electricity consumption has been increasing while the percentage of electricity generated fluctuated. This reduces the quality of electricity infrastructure. Electricity tariff has gone up for products not supplied. Government policy towards addressing the question of electricity needs could not be articulated in clearer terms

Table 4: Electricity Generation and Consumption in Nigeria, 1970-2014

Year	1970-1979	1980-1989	1990-1999	2000-2009	2010-2014
Installed Capacity (mw)	1097.8	3495.3	4654.8	8244.5	12112.2
Total Generation(mw/hr)	384.4	1117.2	1736.5	3850.9	6096.6
Capacity Utilized(%)	35.6	32.6	37.4	45.6	50.3
Total Consumption	312.5	712.3	1006.5	1997.6	4032.9
% of Generation Used	83.0	63.2	58.1	54.7	66.0

Source: Computed from : (i) CBN Statistical Bulletin, Vol.15, 2004. (ii) CBN Annual Report & Statement of Accounts. (iii) National Electric Power Authority (NEPA). (iv) CBN Statistical Bulletin, 2014.

As shown in Table 4, there is a wide gap between the installed capacity and total electricity generated. The gap became widened during the periods: 1970-1979, 1980-1989; 1990-1999; 2000-2009 and 2010-2014. Consequently, power outages became so frequent and the sector operated below its estimated capacity. As observed in the table, the demand for electricity is than its supply. This gap could be attributed to transmission and distribution problem. Low water levels at various power stations are frequently claimed to be responsible for the frequent power shortages (Babatunde and Shuaibu, 2011). This constitute a serious administrative lag.

Table 5 explains the state of health situation in Nigeria. The health infrastructure in Nigeria is at worrisome stage during the period 1995-2014. As at 2005-2009, the value of public health expenditure as percentage of total health expenditure increased from 25.04% to 29.10% during the period

1995-1999 and 2000-2004. It reached its peak during 2005-2009 with 32.62% and fell to 29% during 2010-2014. During the same period, private health expenditure as percentage of GDP stood at 2.32% during 1995-1999. It increased sharply to 2.76% during 2005-2009 and declined to 2.61% during 2010-2014. Similarly, public health expenditure as percentage of government expenditure increased significantly from 8.51% to 17.69% during 1995-1999 and 2005-2009. It declined to 16.70% during 2010-2014. However, public health expenditure as percentage of GDP stood at 0.78% during 1995-1999. It increased marginally to 0.98% in 2000-2004, peaked at 1.33% during 2005-2009, and later declined to 1.06% during 2010-2014 respectively. Similarly, the total health expenditure as percentage of GDP increased from 3.10% to 4.09% during 1995-1999 and 2005-2009. It reduced marginally to 3.66% in 2010-2014.

Table 5: Health Expenditure in Nigeria, 1995-2014

Year	1995-1999	2000-2004	2005-2009	2010-2014
Public health exp (% of Total)	25.04	29.10	32.62	29.00
Private health exp (% of GDP)	2.32	2.40	2.76	2.61
Public health exp (% of Govt. Exp)	8.51	11.30	17.69	16.70
Public health exp (% of GDP)	0.78	0.98	1.33	1.06
Total health exp (% of GDP)	3.10	3.38	4.09	3.66

Source: World Health Organization Global Health Expenditure database

3. Brief Review of Literature on Infrastructure and Economic Growth

There has been a flurry of literatures on the link between infrastructure and economic growth. Pioneering work on the role of infrastructure in the process of moulding growth started after the seminar work by Aschauer (1989) when he established that slower growth recorded in the public capital accumulation in United States during 1970s and 1980s were largely from the spill over effect of stunted growth recorded in the private sector productivity. Aschauer (1989) further noted that private output elasticity with respect to

public capital stood at 42%. Some other studies have relatively investigated the cause of the decline in the United States output and productivity growth. There were empirical regularities in the findings of these studies that the services provided through public capital are more important in the process of raising production efficiency (Lynde and Richmond, 1993; Munnell, 1990 and Garcia-Mila & Guire, 1992). In another study, Aschauer (1993) observed further that infrastructure provision through public investment should be taken as a critical fundamental in the production process just like the pivotal role played by labour and capital in the private production process. In order to raise productivity growth, countries must boost the existing stock of capital accumulation and at the same time investment abundantly on research and development.

A large volume of studies have maintained that public and private institutions investment raises the quality of infrastructures and at the same time promote growth. The literatures harmonized relatively wide range of estimates of output elasticities relating to both public and private investments in infrastructure. Four permutations of scenarios were observed. The first permutation suggested that output elasticity of public capital exceeds private capital (Aschauer,1989; Khan and Reinhart, 1990). The second observed that output elasticity of public capital equals private capital (Munnell, 1990). However, the scenario show that output elasticity of public capital is less than private capital (Eberts, 1986) while the forth permutation noted that public investment yields negative contribution to infrastructure (Hulten and Schwab,1991; Deverajan, Swaroop and Zou, 1996 and Prichett, 1996).

Some other branch of studies on infrastructure and growth have focused on optimal and efficient use of infrastructure for growth. It should be noted that optimal investment in infrastructure is expected to catalyze growth and sub-optimal investment would result into loss of efficiency and constitute growth drag (Hulten, 1997; Canning and Pedroni, 2004). The study conducted by Romp and De Hann (2007) further concretized the earlier works which submitted that public capital enhances infrastructure growth and that public capital enhances the share of income apportioned to each persons in the economy (per capita income). ILO (2010) pointed out the significance of infrastructure development in the process of development. Apart from the fact

that it raises the quality of living standards and support growth process, it serves as a window for job creation, employment and poverty alleviation.

It should however be noted that growth-enhanced effect of public investment infrastructure differs across studies. Studies on Nigeria's infrastructure development are few and scanty. Nedozi et al. (2014) analyzed infrastructure development and economic growth in Nigeria using simultaneous equation analysis. Two models were specified and analyzed using the OLS method. Findings from the study show that infrastructure constitute a critical part of growth process in Nigeria. In line with the above submission, Babatunde et al. (2012) attempted to investigate the impact of infrastructure on economic growth in Nigeria using a multivariate model of simultaneous equation during 1970 to 2010. The study utilized three-stage least squares regression technique to capture the transmission channels through which infrastructure impacted on growth. The study submitted that infrastructure investment directly impacted on the overall output and indirectly stimulate growth of other sectors. Herranz-Loncán (2007) investigated the impact of infrastructure investment on Spanish economic growth during the period 1850 to 1935 using VAR technique. The study showed a strong positive relationship between infrastructure and growth but infrastructure returns were not significant in the estimation. We observed from the literatures that the arguments on the nexus between infrastructure and economic growth remained inconclusive and requires a robust approach that would reveal a new insight into the enquiry of infrastructure and growth.

4. Theoretical Framework

This study borrowed Stephane et al. (2007) and Sahoo et al. (2010) approach to explain the effect of public and private sector investment in infrastructure and its impact on economic growth. The study utilized a generalized Cobb-Douglas production function and extended it within the framework of neoclassical growth model to capture infrastructure variables. The choice of this technique was premised on the fact that positive effect of infrastructure on economic growth could be detected easily. The production function for the economy can be expressed as:

$$Grout_t = f(Privc_t, Pubc_t, Labf_t, Infst_t) \quad (1)$$

Where :
$Grout_t$ = GDP growth
$Privc_t$ = Private capital
$Pubc_t$ = Public capital
$Labf_t$ = Total labour force
$Infst_t$ = Infrastructure investment

Equation (1) implies that GDP growth is expressed as a function of private and public investments, total labour force and infrastructure investment. It should be noted that equation (1) is characterized by constant returns to scale (Solow, 1956). Some endogenous growth proponents admitted the possibility of constant or increasing returns to capital when the production function is disaggregated into private and public capital (Romer, 1987). However, the neoclassical and endogenous growth models have the potentials of generating a long run impact of infrastructure on income. In the exogenous growth model, technical progress has proven more relevant in driving long run growth in infrastructure on growth and shocks on investment may have transitory effects. Shocks on infrastructure finance could affect the steady state income per capita in the endogenous growth framework. More importantly, social and human capitals are growth driven variables (Lucas, 1988; Barro, 1990; Mankiw, Romer and Weil, 1992).

Increase in public expenditure on infrastructure investment raises the condition of living in terms of better education facility, good health, improved human capacity, improved manpower skills e.t.c. which enhances productivity and in the long run promotes economic growth. In order to understand how human capital affect growth, we use public expenditure on health and education. These two variables proxied social indicators. The following equations would be estimated empirically to explain the impact of infrastructure finance on output growth in Nigeria.

$$lnRGDP_t = \varphi_0 + \varphi_1 lnDPV_t + \varphi_2 lnDPUB_t + \varphi_3 lnTLB_t + \varphi_4 lnINFIN_t + \varphi_5 lnPBHE_t + e_t \quad (2)$$

Where :
$lnRGDP_t$ = Real Gross Domestic Product
$lnDPV_t$ = Domestic Private Investment
$lnDPUB_t$ = Domestic Public Investment
$lnTLB_t$ = Total Labour Force
$lnINFIN_t$ = Infrastructure Index
$lnPBHE_t$ = Per Capita Real Expenditure on Health and Education

All the variables in equation (1) are expressed in logarithmic to reduce them to the same form and also to maintain the growth status.

Empirical literature have provided evidence on the impact of infrastructure on economic growth using varieties of indicators of infrastructure. We establish a composite index of infrastructure indicators to explain the relationship between infrastructure investment and growth. In order to create the index, we use the Principal Component Analysis (PCA) by taken some variables as indicators of infrastructure. These variables include: Road (total network in km), Air transportation (million ton-km), Railway density per thousands, Telephone lines per thousands, Energy use and Electric power consumption (kwh per capita). There are many infrastructures driving growth. We use six infrastructures considered as critical to growth process in Nigeria, to build infrastructure index. The data utilized in this study were obtained from the Central Bank of Nigeria Statistical Bulletin, World Health Organization Global Health Expenditure database and World Development Indicators (WDI). The data point for the study is from 1970 to 2014.

5. Estimation Technique

The study applies econometric technique to analyze the effect of infrastructure finance on growth in Nigeria. The data employed in the study were subjected to unit root test using the Augmented Dickey-Fuller Statistics (ADF) to determine the order of integration of the variables and also to prevent spurious regression results. Moreover, Engel-Granger (1987) two-step method cointegration test and Error correction technique were employed to establish the long run relationship and short run dynamics of the model. Engle-Granger (1987) further established that when variables were found to be I (1), the

stationarity of residual (obtained from static regression) implies cointegration. Based on this position, a long run equilibrium condition exist between the dependant and independent variables. We therefore include the residual series from regression estimate as an error correcting mechanism. Long run regression results are obtained by traditional ordinary least square (OLS) technique.

6. Discussion of Empirical Results

The descriptive statistic of the relevant variables is presented in Appendix 3 showing their mean, median, standard deviation, skewness and kurtosis.

6.1 ADF Test for Unit Root

As reported in Table 6, all the variables were non-stationary at levels but stationary at first difference. Since the variables were stationary at first difference, we proceed on Engel- Granger (1987) cointegration method to establish whether there is long run relationship among the variables.

Table 6: Unit Root Test Result Using ADF

Variables	Level		First Difference	Result
	Without Trend	With Trend	Without Trend	
Ldpub	-0.2761	-2.0938	-8.3004*	I(1)
Ldpv	-1.5353	-2.4473	-3.8574**	I(1)
Linfin	-1.5593*	-2.8079	-5.3738**	I(1)
Lpbhe	-1.0750*	-3.6287*	-5.6311**	I(1)
Lrgdp	-0.3362**	-1.6699*	-7.8096**	I(1)
Ltlb	-1.4399	-2.2765*	-3.7529*	I(1)

*** and *** represent statistical significance at 10%, 5% and 1%.

Source: Computed by the Author using E-View software 8.0

6.2 Engle-Granger Cointegration Test

As indicated by the ADF test, the variables are integrated at first difference; therefore, the Engle-Granger two-step method is applied to check for cointegrating relationship between the dependent and independent variables. The residual obtained from static regression is tested and the results reported in Table 7.

Table 7: Engel-Granger Cointegration Test

Variable	ADF Statistic	Critical Value	Order of Integration
ECM	-4.42711	-3.97844	I(0)

Source: Computed by the Author using E-View software 8.0

This result indicated that the null hypothesis of no cointegration is rejected at 5%. Decision rule states that null hypothesis is rejected if ADF test statistic is greater than critical values in absolute terms. The ECM is cointegrated at 1% level of significance. The Engle- Granger (1987) two-step methodology maintained that if residuals are stationary at levels, that is, I (0) then the variables that were generated as residuals are said to be cointegrated. Therefore, we conclude that there exist stable long run equilibrium relationships among the variables in the specified equations. The next step in the Engle-Granger criteria is the estimation of dynamic model by incorporating the error correction mechanism into the list of regressors. However, the static model (see appendix 2) indicated that domestic private investment (*ln*DPV), public investment (*ln*DPUB) and per capita real expenditure on health and education (*ln*PBHE) influenced growth negatively, while total labour force (*ln*TLB) and infrastructure index (*ln*INFIN) influenced growth positively.

6.3 Results of Dynamic Error Correction Model

The long run specification of equation 2 produces the parsimonious error correction model obtained through an iterative process. The dynamic error correction model is presented in Table 8. The dynamic error correction model enables the researcher to investigate both the long run relationship between variables and the deviations from their respective long run trends

and gather a better understanding of the economy's major features. Statistical evidence from the result show that the model is very robust and exhibits a strong predictive power with a goodness measure as indicated by the coefficient of adjusted R^2 of 0.98 meaning that 98% of variation in the dependent variable is accounted for by the regressors inclusive of the error correcting variable. Secondly, Durbin-Watson statistic of 2.86 indicates the absence of autocorrelation at 1% level of significance.

As expected, the coefficients of domestic public investment on infrastructure, infrastructure index, and public expenditure on health and education are positive and significant, indicating statistically significant positive impact on economic growth. However, domestic private investment on infrastructure and total labour force exerted negative relationship on economic growth in Nigeria. Moreover, infrastructure components such as electricity power consumption, energy use, railway, telephone lines and air transportation constitute essential infrastructure driving sustainable growth. Human capital component such as public expenditure on health and education contribute immensely to economic growth in Nigeria. Domestic private investment on infrastructure in Nigeria are constrained by inconsistent macroeconomic policy, corruption and high intensive nature of infrastructure cost. The negative sign attached to the coefficient of domestic private investment on infrastructure could be attributed to these reasons. An increase in total labour force without functional infrastructure such as good road network, railways, telecommunication, electricity, water etc. would retard growth process (Srinivasu and Rao, 2013). Non provision of infrastructure to support the teeming population would create growth lacuna.

7. Conclusion and Policy Implications

This study investigated infrastructure finance and its impact on economic growth in Nigeria using Engle-Granger cointegration and Error correction mechanism (ECM). In this analysis, we develop a composite index for infrastructure to ascertain the level of satisfaction and economic benefits which the society derived from the provision of infrastructure. The index was included among the factors influencing economic growth in Nigeria. Other factors included in the growth equation are: domestic private and public

investment in infrastructure, labour force and public expenditure on health and education. Overall, the results reveal that domestic private investment (*ln*DPV), public investment (*ln*DPUB) and per capita real expenditure on health and education (*ln*PBHE) influenced growth negatively, while total labour force (*ln*TLB) and infrastructure index (*ln*INFIN) influenced growth positively.

From the policy perspective, the study suggests that infrastructure finance could raise the quantum of economic growth necessary to promote development in Nigeria if necessary and appropriate policy are implemented. There is need to invest in education and health so as raise production efficiency emanating from infrastructure spill-over. This result, from Nigeria's perspective suggest that it is necessary to design a practical economic framework that would raise the quality of infrastructure stock and addresses human capital formation for sustained growth and development. Above all, there is need for transparency and accountability in the dealings of transactions involving public investment.

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Appendix 1:

Actual Recurrent and Capital Expenditure on Selected Infrastructure in Nigeria, 1977-2014

Year	Transport & Communication	Education	Health	Construction	Water
1977	2341.7	738.6	223.6	98.0	355.4
1978	1360.5	569.6	122.5	82.9	1035.0
1979	1909.4	902.1	183.7	95.1	2561.4
1980	2407.8	1549.8	302.5	201.0	2549.5
1981	1684.8	984.6	248.2	278.2	1459.4
1982	1337.7	1135.1	286.0	217.8	2505.1
1983	1144.1	967.4	279.6	183.4	1721.6
1984	304.2	861.2	190.2	200.4	614.9
1985	366.7	850.2	223.9	193.2	471.8
1986	641.9	1094.8	360.4	329.8	1094.0
1987	489.3	653.5	236.4	259.1	452.0
1988	846.5	1084.1	443.2	433.0	994.4
1989	854.2	1941.8	452.6	449.6	529.8
1990	1109.8	2294.3	658.1	342.1	729.5
1991	598.8	1554.2	757.0	412.6	561.9
1992	881.6	2060.4	1025.4	1066.3	751.4
1993	1786.8	7999.1	2684.5	1272.5	1659.3
1994	1674.9	10283.8	3027.8	1438.8	4313.6
1995	4690.3	12728.7	5087.9	494.7	7103.3
1996	11003.3	15351.8	4851.5	984.4	1741.2
1997	8437.9	15944.0	5803.0	1477.2	13220.3
1998	8196.9	26721.3	11984.3	5775.1	11390.8
1999	9191.3	31563.8	16180.0	8793.2	6923.9
2000	5336.6	67568.1	18181.8	3808.6	13529.9

Year	Transport & Communication	Education	Health	Construction	Water
2001	53176.1	59744.6	44651.5	7202.4	12754.0
2002	53662.6	109455.2	63171.2	9276.0	13823.5
2003	29309.4	79436.1	39685.5	16944.5	14893.1
2004	14343.0	93767.9	59787.4	20671.5	15962.6
2005	27763.3	120035.5	71685.4	26435.5	17032.2
2006	16000.0	165213.7	105590.0	22986.4	18101.7
2007	21025.8	197784.8	124823.5	25679.4	19171.3
2008	21854.3	233507.7	147724.8	26836.8	20240.8
2009	22682.8	269230.6	170626.1	27994.3	21310.4
2010	23511.3	304953.5	193527.4	29151.7	22379.9
2011	24339.8	340676.4	216428.7	30309.2	23449.5
2012	25168.3	376399.3	239330.0	31466.6	24519.0
2013	25996.8	412122.2	262231.3	32624.1	25588.6
2014	26825.3	447845.1	285132.6	33781.5	26658.1

Source: Central Bank of Nigeria Statistical Bulletin, 2014.

Appendix 2 :

OLS Estimate (Static Model)
Dependent Variable: LRGDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.915503	0.600644	-6.518843	0.0000
LDPUB	-0.027314	0.071403	-0.382534	0.7078
LDPV	-0.106523	0.058843	-1.810279	0.0918
LINFIN	0.778311	0.116744	6.666815	0.0000
LPBHE	-0.195069	0.081186	-2.402739	0.0307
LTLB	2.509975	0.408803	6.139822	0.0000

R-squared	0.984151	Mean dependent var	1.947771
Adjusted R-squared	0.978491	S.D. dependent var	0.187813
S.E. of regression	0.027545	Akaike info criterion	-4.102689
Sum squared resid	0.010622	Schwarz criterion	-3.803969
Log likelihood	47.02689	Hannan-Quinn criter.	-4.044375
F-statistic	173.8693	Durbin-Watson stat	2.855042
Prob(F-statistic)	0.000000		