IOSR Journal of Economics and Finance (IOSR-JEF)
e-ISSN: 2321-5933, p-ISSN: 2321-5925.Volume 11, Issue 5 Ser. I (Sep. – Oct. 2020), PP 39-47
www.iosrjournals.org

Components of public infrastructure spending in Nigeria from 1981-2016

AkuboUgbedeojo Isaac[1], Ibrahim Mohammed Taofik (PhD)[2]
[1](Economics Department, Ahmadu Bello University, Zaria. Nigeria)
[2](Economics Department, Ahmadu Bello University, Zaria. Nigeria)

Abstract
Generally *This study investigated the impact of two components of public capital investment; Direct (Transport Infrastructure) and Indirect(Education Infrastructure) components from 1981- 2016 using Dynamic Ordinary Least Square (DOLS) approach that incorporate endogeneity in its estimation. The test for stationarity was conducted using the Ng &Perron (2001) unit root test and all variables were tested stationary at first difference I(1) signifying an existence of long-run relationship between variables in the series. The long-run Dynamic OLS estimation revealed that variables under study are positive and statistically significant at 5% level of significance. Though it was observed that increase in government transport infrastructure spending induces growth faster (elastic by 30%) than increase in government infrastructural spending on education (elastic by 20%). The study further opined that there is need for government authorities in Nigeria to recalibrate their public capital infrastructure spending in order to reflect macroeconomic objectives. Also, deliberate measures should be taken to encourage Public Private Partnership (PPP) as capital infrastructure expenses require substantial financial investment. The study concluded that for a meaningful development to take place in Nigeria, government should not focus on front loaded infrastructure spending alone but rather emphasize on the component of infrastructure spending which yields greater output elasticity in the economy.*

Keywords*: Dynamic OLS, public investment, infrastructure components, economic growth.*

Date of Submission: 01-09-2020 Date of Acceptance: 16-09-2020

I. Introduction

Since Aschauer's (1989) seminar work on the productivity of public expenditure, there has been close to 30 years of empirical research conducted to examine the impact of infrastructure on growth. Studies on infrastructures in developed nations have shown that investment in infrastructures has a positive and significant impact on the growth and development of any country (Munnell, 1990; and Garcia-Mila & McGuire 1992). In Africa, slow growth rate and retarding economic situations are prominent which could be as a result of inadequate infrastructural stock that is prevalent in most countries within the continent. Public sector spending in Nigeria has been on a yearly increase over the past decades as developing countries like Nigeria only adopt the incremental budgeting system. Niloy, *et al.* (2003) opined that public sector spending has been increasing in geometric term through government various activities and interactions with its Ministries, Departments and Agencies (MDA's) even though the source of financing the budget are not sustainable. However, it is generally argued that public expenditure either recurrent or capital expenditure can be growth-enhancing.

World Bank (2017) identified four key areas of policy priorities to address investment needs and ensure sustainable financing in developing countries. These are sustaining public investments, encouraging greater private sector participation in infrastructure, strengthening public investment management systems and promoting regional integration of infrastructure. The issue of sustained investment in Africa is of top priority to this study because it is considered to be the crucial problem of African countries.Akinyosoye (2010) opined while making a comparative studying of infrastructure in Africa and that of Asia that, infrastructure spending in Africa (as a percentage of GDP) must increase to 18% to bridge the gap (with Asia) in 15 years and 24% in 10 years. However, beyond the need for increased government investment on infrastructure is issue of the composition of public infrastructure and that is why the study seeks to examine the components of public infrastructure spending and how they affect output in Nigeria. To do this, the components of public capital infrastructure has been categorized into two; the social components (education) and economic components (transportation) of public capital investment. The study seeks to examine which capital investment component (Direct or Indirect component) has more impact on growth in Nigeria and how increase in government investment on either of these two components of capital expenditure will induce growth in Nigeria in the long-run.

The significance of this study cannot be overemphasized as growth is cardinal to the economy of every country. A number of gaps have been identified in the literature on the link between growth and infrastructure stock in a development process. On the methodological side, most study seems to aggregate infrastructure capital in their study of economic growth rather than emphasizing on the composition of the nature and type of public infrastructure spending that is best for stimulating growth in country specific studies. In contrast, this study explored the component of infrastructure capital by classifying the components by their character, significanceand way in which they contribute in the growth process in Nigeria and by extension other developing nations. Furthermore, the study departed from the widely used Ordinary Least Square method (OLS) conducted by Usman, *et al.* (2011); Ezeabasisili, *et al.* (2012); Oni &Ozemkoha (2014), etc. and General Equilibrium Framework (GEF) by Manoj, *et al.* (2017) , Error Correction Model (ECM) by Hakhu (2015) and Ibrahim (2016), Vector Error Correction Model (VECM) by Samson (2013) by exploring the options available in the Dynamic Ordinary Least Square method (DOLS) as proposed by Stock-Watson (1993).The study covered public investment on the capital infrastructure component in Nigeria for the period 1981 to 2016.

Assessment of Infrastructure and Growth in Nigeria

Nigeria is one of the countries of the world where infrastructure investment is at a suboptimal level. According to Akinyosoye (2010), for Nigeria to bridge the gap and reach average levels of annual growths recorded amongst Asian countries, infrastructure spending (as a percentage of GDP) must increase to 18% to bridge the gap (with Asia) in 15 years and 24% in 10 years. Over the years, investment in transport sector can be seen to be front-loaded in most developing countries of the world, despite this fact, there seem to be little or no much result as regarding the massive investment in infrastructure and growth as there is still the existence of huge underdevelopment in most developing countries. Kayode, *et al.* (2013) rightly observed in their study on transport infrastructure investment and economic growth in Nigeria "In most developing countries, transport investment forms a major component of the capital formation as public expenditure on transportation is usually the largest single item (up to 40%) in national budget". In Sub-Saharan Africa in particular, only 16 percent of roads are paved, and less than one in five Africans has access to electricity (Agénor, 2006).Likewise, education infrastructure has its enormous deficit as its effects on growth is not well felt. According to Ibrahim (2016), public spending on education and health care, being major determinants of human capital are generally low in Nigeria accounting for about 6.36% and 7.01% of national budget share on education and health respectively in the year 2015. These low figures have implications for the level of development of human capital in the country and consequently growth. Therefore, the need for the government to engage in well informed and quality developmental projects is essential.

Table no 1: Shows Percentage Growth of Capital Budget Estimate on Infrastructures in Nigeria

Year	**1977-1986**	**1987-1996**	**1997-2006**	**2007-2016**
Transport/communication	-1.84	49.2	79.6	9.03
Education	8.78	48.4	33.1	14.7

Source: Computed from the various issues of the CBN Statistical Bulletin and Financial and Economic Reports, 2016.

This assertion is in line with Ibrahim (20016) argument that even though public capital expenditure in Nigeria has been on a yearly increase, the ratio of public investment to government expenditures has being decreasing.

Table no 2: Shows Percentage Contributions of Selected Infrastructures to Growth in Nigeria

Year	**1970-1979**	**1980-1989**	**1990-1999**	**2000-2009**	**2010-2016**
Transport/communication	3.01	4.46	2.64	2.58	1.80
Education	1.49	0.46	0.23	0.22	0.15

Source: Computed from the various issues of the CBN Statistical Bulletin and Financial and Economic Reports, 2016.

A Brief Empirical Literature Review

Musgrave (1959) is one of the pioneer contributors of the public choice theory. He introduced the notion of public good by providing a clear structure for achieving an optimal allocation of resources across public and private goods based on individual preferences and government role in that process. Musgrave suggested the need to incorporate "higher laws" or community values into the allocation process. While the study of Aschauer (1989) blazed a trail in the study of government infrastructure contribution to the growth process of any country. According to him, there existed a strong and positive relationship between public investment and productivity of the private sector in the United States of America. The effect of public investment on private sector productivity for the period 1949 to 1985 shows that decrease in public investment may be crucial in explaining the US economy's relatively poor economic performance between 1970s and 1990s.

Barro (1991) in doing a cross sectional study to assess economic growth in a cross section of Countries" used the neoclassical growth model. His aim was to bring out some empirical regularity about growth, fertility, and investment for 98 countries in the period 1960-1985. Their study discovered that Countries with higher human capital also have lower fertility rates and higher ratios of public investment to GDP. Therefore, Growth is inversely related to the share of government consumption in GDP, but insignificantly related to the share of public Investment.

In the work done by Devarajan, *et al.* (1996) for the period 1970 to 1990 to examine the composition of public expenditure and economic growth looked at conditions under which a change in the composition of government expenditures leads to a higher steady growth rate state of the economy. They conducted a cross-sectional study for 43 LDCs and found out that developing countries have been misallocating public expenditure in favor of capital expenditures. In their model, government consumption and investment are negatively related to growth in LDCs thus increase in the share of current expenditure has positive and statistically significant growth effect in developing countries.

Kweka & Morrissey (2000) conducted a study on government spending and economic growth in Tanzania for the period 1965 to 1996. Using Barro (1990) & Ram (1986) model to investigate the impact of public expenditures on economic growth in Tanzania, their result showed that public consumption spending impacts positively on growth whereas public investment impacts negatively on growth. Their Conclusion was that

Ekpung, *et al.* (2014) carried out a study on public expenditure growth on infrastructure in Nigeria. Their objective was to examine the trend in public expenditure on infrastructure in Nigeria between (1970 and 2006) and compare the trend in public expenditure between military and democratic government in Nigeria. Using the Ordinary Least Squares (OLS) multiple regression analysis they found out that there is a unique long-run equilibrium relationship between public expenditure on infrastructure, government revenue, population density, openness, external measures, rate of urbanization and administration. Furthermore, the response of rate of urbanization, openness, government revenue, external reserves, population density and type of government to public expenditure is high, particularly in the short-run and with a higher adjustment toward long-run static equilibrium

Aregbeyen& Ibrahim (2016) empirically examined the nature of public investment and how they affect output performance in Nigeria. Their study explored the direct and indirect long-run relationships and dynamic interaction between public investment and output performance in Nigeria for the period 1970 to 2010. Using the Keynesian macro-economic modeling approach, they made their analysis in two directions, firstly to test the direct effect of public investment on output and secondly the indirect effect. They found out that the indirect effect of public investment through import multiplier was stronger while there was a relatively less strong direct effect of PI on aggregate output in Nigeria. The cause of a less direct effect of PI on output was as a result of decline in capital expenditure, poor implementation and low quality of PI projects due to widespread corruption. Their conclusion was that Pi generally exerts considerable influence on aggregate output.

Manoj, *et al.* (2017) conducted a general equilibrium analysis to comparatively investigate public infrastructure investment on Roads or Schools. They examined why government spending on social infrastructure (school) is not higher in developing economies. They argued that in developing countries, Public Investment in school infrastructure is of more advantage than investment on roads and there by suggested that multilateral co-operations should provide concessional financing and aids to help government cover the gap existing between investment in schools and roads.

They further argued that even though social infrastructure yields 15% return differentials over the economic infrastructure in the long-run, the combined dynamics of front-loaded fiscal costs of investments and slow benefits from investing in schools does not square well with LIDC where distortionary taxation and debt intolerance, with political myopia are issues prominent there. Even though the writers supported the "big push" idea, they recognized that front loading investment decreases the fraction of the investment scale up dedicated to schools to about one half. Hence they suggested that multilateral cooperation should provide concessional financing and aids to support the government to cover this gap existent in investment on schools.

We observed from the above review that there has been unanimity in the literature on the importance of infrastructure in growth processbut the nexus between infrastructure and economic growth is inconclusive and requires a holistic approach that would reveal a new insight into the link between infrastructure and growth.The nexus between infrastructure and economic growth is inconclusive and requires a holistic approach that would reveal a new insight into the phenomenon. For example, Akonji, *et al.* (2013) argue in support of Wagnerian theory that GDP growth determines public investment expenditure in Nigeria while other studies like Aregbeyen& Ibrahim (2016) Argue otherwise. Furthermore, the widely used Ordinary Least Square method (OLS) conducted by writers like Usman *et al.* (2011); Ezeabasisili, *et al.* (2012); Oni &Ozemkoha (2014), etc. and General Equilibrium Framework (GEF) by Manoj, *et al.* (2017), Error Correction Model (ECM) by Hakhu (2015) and Ibrahim (2016), Vector Error Correction Model (VECM) by Samson (2013) have attempted to

analyze the nexus between infrastructure growth and growth in the economy. All their works have contributed greately to the body of knowledge on this matter; however, this study gives a different approach by exploring the options available in the Dynamic Ordinary Least Square method (DOLS) as proposed by Stock-Watson (1993). This estimation method gives a higher order of integration as opposed to the OLS and GLS methods as it is robust to simultaneity and small sample bias.

II. Materials and Research Methods

The critical issue of emphasisin this study is not just infrastructural development or increased capital investment but rather accentuating on the component or type of infrastructural investment that would accelerate the slackening rate of economic growth in the country. In order to carry out the linear combination of the variables in the model an alternative approach proposed by Stock-Watson, which has more improvement over both the single equation and Johansen maximum likelihood procedures is adopted for this study.

Model Specification

For simplicity, we assume that capital fully depreciates at each period and savings rate (S) is constant. Thus testing the possibility of constant return to scale[2], equation (3.3) in Cobb-Douglas production form and including (A) as a measure of total productivity yields gives:

$$Y_t = AK_t^{\psi} L_t^{\theta} G_t^{\partial} \pi_t^{\lambda} \qquad (3.3)$$

Taking the natural logarithm of equation (3.3) we get

$$\ln Y_t = InA + \theta InK_t + \partial InH_t + \psi InG_t + \lambda \ln \pi_t \qquad (3.4)$$

Where G is a vector of infrastructural capital (transport and education).

The output elasticity with respect to public capital infrastructure ψ is the main variable of interest in this study. The other production elasticities: ∂ , θ and λ are of interest mainly to assess the shape of the production function.

Based on the discussion on the measurement of infrastructure earlier discussed, two different measures of infrastructure are adopted in this study to account for both economic and social requirement of infrastructure. These two measures are adopted because of their relevance in the production process. For instance, Public Investment on transportation affects output by increasing the level of economic activities in the society and Public Investment in school affect output by increasing the productivity of human capital.

In order to avoid multi-collinearity and to compare the impact of these measures of infrastructure on output, each infrastructure (transportation and education) is expressed as a function of total output in the economy and measured through the method proposed by Stock-Watson.

$$\Delta \ln RGDP_t = \alpha + \theta \Delta InK_t + \partial \Delta InLF_t + \psi \Delta InTRANS_t + \psi \Delta InEDU_t + \lambda \Delta \ln \pi_t + \varepsilon_t \qquad (3.6)$$

Where; the explanatory variables *K, LF, TRANS, EDU*represent capital, labour, Public capital expenditure/investment on transportation and education respectively.

Estimation Technique

The approach proposed by Stock-Watson has more improvement over both the single equation and Johansen maximum likelihood procedures and hence is adopted for this study. The Stock-Watson method has asymptotic optimality properties like the Johansen procedure. This estimation method gives a higher order of integration as opposed to the OLS and GLS methods as it is robust to simultaneity and small sample bias. The DOLs model is based on Monte Carlo simulation which opined that the DOLS estimation is superior in smaller samples compared to other alternative estimators, as well as not only being able to accommodate higher orders of integration but also to account for possible simultaneity within repressors of potential demand system (Masih, 1996). The DOLs growth equation is expressed below as:

Eqn (3.8)

$$\ln GDP_t = P_t x' + \sum_{i-m}^{i-m} a_i \Delta \ln GFCF_{t-i} + \sum_{i-n}^{i-n} b_i \Delta \ln LF_{t-i} + \sum_{i-0}^{i-0} c_i \Delta \ln TRN_{t-i} + \sum_{i-q}^{i-q} d_i \Delta \ln \pi_{t-i} + e_1$$

Eqn (3.9)

$$\ln GDP_t = R_t M' + \sum_{i-m}^{i-m} \alpha_i \Delta \ln GFCF_{t-i} + \sum_{i-n}^{i-n} ß_i \Delta \ln LF_{t-i} + \sum_{i-0}^{i-0} {}^{\delta}_{i} \Delta \ln EDU_{t-i} + \sum_{i-q}^{i-q} \mu_i \Delta \ln \pi_{t-i} + e_2$$

Eqn 3.10

$$\ln Y_t = R_t M' + \sum_{i-m}^{i-m} \alpha_i \Delta \ln GFCF_{t-i} + \sum_{i-n}^{i-n} ß_i \Delta \ln LF_{t-i} + \sum_{i-0}^{i-0} {}^{\delta}{}_i \Delta \ln EDU_{t-i} + \sum_{i-p}^{i-p} c_i \Delta \ln TRAN_{t-i} + + \sum_{i-s}^{i-s} \text{?}_i \Delta \ln \pi_{t-i} + e_2$$

Eqn 3.8 and 3.9 are the specific equation and equation 3.10 is the generic form specification. While equations 3.8 and 3.9 address our first and second objectives respectively, equation 3.10 addresses the third objective.

Where X = [a, b, c, d], P = [1, GFCF, LF, *TRAN*, π]; M = [α ,ß, δ ,µ]; R = [1, K, L, *SCH*, π]; *TRAN* = PI on Transport infrastructure; *EDU* = PI in education infrastructure, GFCF = Gross fixed capital formation, LF= Labour Force, π= inflation and m, n, o, p, q, r and s are the lengths of leads and lags of the regressors.

Sources of Data

Table no 3: Showsthe annual time series data used in this study is from the period 1985 to 2016.

SN	VARIABLE	SOURCE
1	RGDP	CBN STATISTICAL BULLETIN
2	PUBLIC INFRASTRUCTURE INVESTMENT	CBN STATISTICAL BULLETIN
3	CONTRIBUTION OF SERVICE SECTOR TO GDP	CBN STATISTICAL BULLETIN
4	EDUCATION	CBN STATISTICAL BULLETIN
5	TRANSPORTATION	CBN STATISTICAL BULLETIN
6	TOTAL LABOUR FORCE	Source: Compiled from National Rolling Plan (1980 - 2003), NBS (Staistical Fact Sheets), NMB (data file, 1970-2005), Other Publications
7	%CONTRIBUTION OF INDUSTRY TO GDP	Source: Compiled from National Rolling Plan (1980 - 2003), NBS (Staistical Fact Sheets), NMB (data file, 1970-2005), Other Publications
8	INFLATION RATE	National Bureau of Statistics 2017 Report
9	GROSS FIXED CAPITAL FORMATION GROSS FIXED CAPITAL FORMATION	National Bureau of Statistics 2017 Report

Source: Authors' computation

III. Result

i. Descriptive Summary

Table no 4: Shows A Summary of Descriptive Statistics of Variables

SN	STAT	RGDP	L_F	GFCF	EDU	TRAN	INF
1	Mean	31757.15	44.41741	2.68E+12	537.7054	322.0395	19.60000
2	Median	22391.14	45.02500	1.49E+11	341.6752	208.1652	12.55000
3	Maximum	69023.93	73.11320	1.51E+13	1518.933	679.3052	72.80000
4	Minimum	13779.26	20.85000	3.09E+09	242.5559	127.5361	5.400000
5	Std. Dev.	18151.71	18.10630	4.74E+12	386.0119	198.5810	17.69177
6	Skewness	0.874864	0.161014	1.619543	1.481449	0.695330	1.663377
7	Kurtosis	2.318378	1.499611	3.963325	3.833312	1.756149	4.521209
8	Jarque-Bera	5.289229	3.532306	17.12951	14.20976	5.221651	20.07206
9	Probability	0.071033	0.170990	0.000191	0.000821	0.073474	0.000044
10	Sum	1143257.	1599.027	9.64E+13	19357.40	11593.42	705.6000
11	Sum Sq. Dev.	1.15E+10	11474.33	7.85E+26	5215180.	1380204.	10954.96
12	Observations	36	36	36	36	36	36

Source: Authors' computation.

Unit Root Test

The unit root test adopted for this study is the Ng &Perron (2001). This test is a modification of the Philip PerronZ_α and Z_t statistics and Bhargava 1986 R_1.This procedure has more advantage because it possesses a substantially higher power than the Philip Perron test when the autoregressive term is closed to unity (Ng &Perron, 2001).

[3] the coefficients ß$_1$> 0, ß$_2$> 0, ß$_3$> 0 and ß$_4$>0 and $\Psi > 0$, $\theta > 0$, $\partial > 0$, and $\lambda > 0$ (in the case of this study). Are taken as elasticities and all signs are expected to be positive.

Unit Root Test Table

Table no 5: ShowsResults for Ng and Perron Unit Roots Test

SN	Variables	MZa	MZt	MSB	MPT
1	RGDP Level Difference	-0.12927	-0.06279	0.48573	17.9514
	RGDP @ 1st Diff	-9.5503*	-2.1584**	0.2260*	2.6683*
2	LF @ Level Difference	-9.55034	-2.15847	0.22601	2.66837
	LF @ 1st Diff	-16.6739*	-2.8852*	0.1730*	1.4773
3	GFCF @ Level Difference	1.19786	1.21249	1.01221	73.7147
	GFCF @ 1st Diff	-15.6988*	-2.8015*	0.1784*	1.56107
4	EDU @ Level Difference	-6.18872	-1.43948	0.23260	4.89926
	EDU @ 1st Diff	-4.1328	-1.4185*	0.3432*	5.9510*
5	TRAN @Level Difference	0.25765	0.17619	0.68385	31.3606
	TRANS @ 1st Diff	-4.70528	-1.5072**	0.32033*	5.26169*
6	INF @ Level Difference	-10.9456	-2.33660	0.21347	2.24928
	INF @ 1st Diff	-16.6412*	-2.86559*	0.17220*	1.54206

Note: Note: *, ** and *** depicts significance at 1%, 5% and 10% levels respectively.
Source: Authors' computation.

The unit root tests show that all the variables under study are unit root non-stationary at level – See table 1.3. As a result, all specifications of Ng &Perron tests cannot reject the null hypothesis of a unit root process at a 1% or 5% significance level for the variables.

Co-integration Test

The study preferred the Johansen co-integration test over the Engle and Granger two steps procedure because the later conceals information about the coefficients of explanatory variables in the co-integrating equation which makes it unsuitable for this study.

Table no 6: VAR Lag Order Selection Criteria

Endogenous variables: LNRGDP, LNLF, LNGFCF, LNEDU, LNTRN, INFL_RATE

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-36.06769	NA	1.71e-09	2.518154	2.873662	2.640875
1	230.2916	395.7338*	1.79e-14*	-9.045236*	-5.845663*	-7.940744*

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The trace test and the Max-eigen value test above indicates 5 and 4 co-integrating equations at the 0.05 level. Therefore, the result of the unrestricted co-integration rank test for both tests reveals a co-integration relationship between variables in the long-run. The test for impact using the dynamic ordinary least square (DOLS) method is aimed at addressing our objective of the study. All data are logged and difference in this manner d(R*GDP*), d(LF), d(*GFCF*), d(*EDU*), d(*TRAN*), and d(*INF*).The purpose of including Leads and lags in DOLS regression model is to make the stochastic error term independent of all past innovations in stochastic repressors.

Table no 7: Shows Elasticity-Multiplier Coefficient of Key Variables In DOLS Estimation Equation

Sn	Variable	Labour Force	Gross FCF	Education	Transportation	Inflation
1	RGDP1	-0.822849	0.194064		0.348354*	0.00222
2	RGDP2	-0.568508	0.093390	0.19639*		-0.00145
3	RGDP3	-0.48068	0.187393	0.15491*	0.284302*	0.0009
Source: Author's Computation						

Note: The symbol * denote key variable of interest in the estimated equation

IV. Discussion

The generic and specific equations reveal that all variables of the models are in line with the a-priori expectation except for labour during the period understudy. A number of reasons may be attributed to this one that is worthy of note is the fact that labour productivity in Nigeria is relatively low. Holding all other explanatory variables constant, PI on education and transportation indicates a positive and statically significant effect on growth rate of real GDP and their elasticity co-efficient of (0.3%) for transportation and (0.2) for education revealed that they are both fairly elastic to Real GDP growth in the economy. However, compared to the education sector, the result suggests that a change in growth rate of real GDP is affected more by increase in PI on transportation because it affects growth faster in the short-run. Hence a percentage increase in government expenditure on education will lead to increase in growth by 0.2% and a percentage increase in government expenditure on transportation will lead to 0.3% increase in growth. The computed value of $R^2 = 0.998714$ shows that 99% of variation in RGDP is accounted for by the explanatory variables LNEDU and LNTRANS while 0.0013% of variation is attributed to other variables that are not captured in the model.

V. Conclusions and Policy Recommendations

The study conducted an investigation on the impact of two measures of infrastructure variables (education and transportation) on real GDP in Nigeria. Using the dynamic OLS (DOLS) estimation technique to examine the co-integrating relationship between social and economic infrastructural capital, and also account for plausibility of endogeneity, the estimation result shows that all variables under consideration has a positive effect on real GDP except for Labour Force. Holding all other explanatory variables constant, PI on education

and transportation indicates a positive and statically significant effect on growth rate of real GDP and their elasticity co-efficient of (0.3%) for transportation and (0.2) for education revealed that they are both fairly elastic to Real GDP growth in the economy. However, compared to the education sector, the result suggests that a change in growth rate of real GDP is affected more by increase in PI on transportation because it affects growth faster in the long-run. Based on the findings of the study, the following conclusion can be drawn.

1. It can be observed that government infrastructure expenditure whether social or economic in nature has significant influence on economic growth of Nigeria in the long-run. From the findings, the elasticity coefficient of (0.2%) for social (education) and (0.3%) for economic (transportation) infrastructure component tested positive and statistically significant.
2. Investment on economic infrastructure fast-track growth faster than investment on social infrastructure especially in developing countries. Economic infrastructure has an elasticity of 0.3% which is higher than that of social infrastructure investment of (0.2%). Public investment on economic infrastructure accumulation is connected to economic growth because it channeled resources towards individuals who have a higher propensity to save while investment in social infrastructure accumulation stimulates growth process through equality and hence alleviate effects of credit constraints on human capital. This thought is in line with Manoj. *et al.* 2017 empirical findings.
3. The share of gross fixed capital formation (GFCF) which is a representation of marginal addition to the stock of private capital is positive and statistically significant at a 0.18% elastic level. This implies that private sector investment has a positive and statistically significant relationship with growth in Nigeria.
4. Investment in infrastructure is highly capital intensive and hence government alone cannot adequately provide all the infrastructure needs in the county, concerted effort should be made by both private and public sector to boost infrastructural spending as it will consequently boost GDP growth. This could be achieved through public private partnership (PPP).

Recommendation

The study thereby made the following recommendations-

1. There should be effective channeling of public fund to productive activities that have significant impact on economic growth. This can be done by critically assessing the component of infrastructure that is of high priority given the level of the country's development and infrastructural need. Some studies suggest that the physical component of government infrastructure spending should be of top priority while others opined the government investment in social infrastructure should be the emphasis. Galer&Moav (2004) opined that physical capital (economicinfrastructure) accumulation is germane to economic growth at the early stages of development because it channeled resources towards individuals who had a higher propensity to save while human capital (social infrastructure) accumulation stimulates growth process through equality and hence alleviate effects of credit constraints on human capital.
2. Private sector participation which is measured by gross fixed capital formation indicated that private sector has positively impacted the economy of the country by as much as 0.18%. If this is so, fluctuations in the GFCF indicator are often considered to reveal possible future business activities, private sector business confidence and economic growth

References

[1]. Agenor, P. R. (2010). A Theory of Infrastructure-led Development. Journal of Economic Dynamics & Control, 34 (5), 932-950.
[2]. Akinyosoye, M. (2010). Infrastructure development in Nigeria, road map to sustainable development. Working paper.
[3]. Akonji, D.R.; Olubukola, O.A &Wakili, M. A (2013). Nexus between public expenditure and economic growth by testing Wagner's law time series: Evidence from Nigeria. International Journal of development and sustainability. 2(4), 2383-2395.
[4]. Auschauer, D. A. (1989). Is Public Expenditure Productive? Journal of Monetary Economics.23 (2), 177-200.
[5]. Ayogu, M. D (2000). The Political Economy of Infrastructure Investments in Nigeria.Washington DC, World Bank.
[6]. Babatunde O.A.; Saliu. A.A; &Osani O.I (2012). Infrastructure and economic growth in Nigeria: A multivariate approach. Research Journal of Business Management and Accounting. 1(3), 30-39.
[7]. Barro R. (1990). Government spending in a simple model of endogenous growthJournal of Political Economy. 98 (5), 103 – 125.
[8]. Canning, D. &Bennathan, E. (2000). The social rate of return on infrastructure investments. World Bank research project, Washington, D.C.
[9]. Canning, D. (1999). Infrastructure Contribution to Aggregate output. Policy research working paper series. A. 2246, the World Bank.
[10]. Central Bank of Nigeria Statistical bulletin, 2016 edition
[11]. Devarajan S.; Swaroop A.M.; & Zou H (1996). The Composition of Public Expenditure and Economic Growth. Journal of Monetary Economics. 37(2-3), 313-344.
[12]. Easterly, W. &Rebelo, S. (1993). Fiscal policy and economic growth: An empirical investigation. Journal of Monetary economics, 32(3), 417-458.
[13]. Edeme, R. K.; Emecheta C.; &Omeje O. M. (2017) Public Health Expenditure and Health Outcomes in Nigeria. Department of Economics, Faculty of the Social Sciences, University of Nigeria, Nsukka, Nigeria.
[14]. Ekpung, E. G. (2014). Trends analysis of public expenditure on infrastructure andeconomic growth in Nigeria. International Journal of Asian Social Science4(4), 480-491.

[15]. Galor, O., &Moav, O. (2004). From Physical to Human Capital Accumulation: Inequality and the Process of Development. Oxford University Press 71(4), 1001-1026.
[16]. Gujarati, D. N &Sangheeta, N. (2008). Basic Econometrics. Tata McGraw-Hill Publishing Company Ltd, 4th Ed. New Delhi, India.
[17]. Ibrahim, T. M. (2016). Human Capital-Growth nexus: the role of Government Spending on Education and Health in Nigeria. MPRA Paper 73712. University of Munich, Garmany.
[18]. Ibrahim, T. M. (2019). Infrastructure Development and Industrial Output in Nigeria: A Dynamic Model Approach. The Nigerian Journal of Economics and Social Studies (NJESS). The Nigerian Economic Society. 61(1), 89-122.
[19]. Iheanacho, E. (2016). The contribution of government expenditure on economic Growth of Nigeria:Disaggregated approach. International Journal of Economics and Management Science. 5(5), 1-9.
[20]. Kweka, J.P, & Morrissey (2000). Government Spending and Economic Growth: Empirical Evidence from Tanzania (1965-1996). DSA Annual Conference Inc New Haven, 1999.
[21]. Manoj, A.; Bin, G. L,; Ricardo, M.; & Giovanni, M. (2017). Investing in public infrastructure: Roads or Schools. IMF Working Paper 17(1)
[22]. Masih, R. (1996). Stock-Watson dynamic OLS (DOLs) and Error Correction Modeling approaches to estimating long-run and short-run in a demand function. New evidence and methodological implications from an application to the demand for coal in mainland China, Energy. Economics. 18 (4). 315-334.
[23]. Niloy, B.; Emranul M. H.; & Denis R.O (2003). Public expenditure and Economic growth: a disaggregated analysis for Developing Countries. School of Economic Studies, University of Manchester, Manchester, UK.
[24]. Nworji, I. D, &Oluwalaiye O. B (2012). Government Spending on Road Infrastructure and Its Impact on the Growth of Nigerian Economy. International Journal of management and business studies. 2(2), 24-30.
[25]. Ogundipe, A. A, &Oluwatobi S.(2013). Government Spending and Economic Growth in Nigeria: Evidence from Disaggregated Analysis. Department of Economics Covenant University, Ota, Nigeria.
[26]. Stock, J. H. & Watson M. (1993). A Simple Estimator of CointegratingVectors in Higher Order Integrated Systems. Journal of Econometric Society, 61(4),783-820.
[27]. Straub, S., (2008). Infrastructure and Growth in Developing Countries. Policy Research Working Paper R 4460.
[28]. World Bank (1994), World Development Report, Oxford University Press.
[29]. World Bank (2017), World Development Report, Oxford University Press.

AkuboUgbedeojo Isaac. "Components of public infrastructure spending in Nigeria from 1981-2016." *IOSR Journal of Economics and Finance (IOSR-JEF)*, 11(5), 2020, pp. 39-47.