Global Journal of Arts, Humanities and Social Sciences
Vol.6, No.11, pp.18-33, November 2018
Published by European Centre for Research Training and Development UK (www.eajournals.org)

SIZE AND GROWTH OF PUBLIC INVESTMENT IN NIGERIA: IMPLICATIONS FOR REAL SECTOR DEVELOPMENT

Ozigbu Johnbosco Chukwuma[1], Ezekwe Christopher Ifeanyi[2] and Morris Rachael Elo-Oghene[1]

[1]Ph.D Candidate, Rivers State University, Port Harcourt, Nigeria
[2]Ph.D Candidate, University of Port Harcourt, Nigeria

ABSTRACT: *This paper offers empirical evidence linking public investment to real sector development in Nigeria during 1981-2017. It specifically employed autoregressive distributed lag (ARDL) model to analyze the impacts of public investment in economic, social and community services and gross public investment as a ratio of GDP on agricultural and manufacturing value added. . The short run result showed that public investment in economic, social and community services impact positively on agricultural value added in the short run. The positive impact of investment in social and community services economic services was greater than that of economic services by a margin of 0.027 percent. This suggests that investment in human capital formation such as education and healthcare delivery seems to provide greater opportunity for agricultural development. Additionally, public investment in economic services also exerts significant positive impact on manufacturing value added. The result further showed that gross capital expenditure as a ratio of GDP impact positively on agricultural and manufacturing value added in the short run. It was evidence from the result that its impact on agricultural value added was stronger in the long run. Accordingly, it is recommended that policy makers should step up investment in social and community services in order to improve human capital required for real sector development in Nigeria.*

KEYWORDS: Public Investment, Real Sector, Agricultural Value Added, Manufacturing Value Added, GDP

INTRODUCTION

There has been a controversial debate on the size of public investment considered optimal for driving the process of economic growth and real sector development. The popularity of this debate is not limited to theoretical and empirical economics, but has continued to gain attention in the political landscape and general public discourse. From the Keynesian perspective, growth in public investment is an important policy tool for stimulating the level of economic prosperity and overcoming short-term cyclical fluctuations in total expenditure (Singh and Sahni, 1984 as cited in Ukwueze, 2015). In addition, public intervention is considered helpful for achieving Pareto optimal position following the reality of market failure. In spite of the growing supports for government intervention, contrary views have continued to evolve which question the rationale for increasing state activities. On one hand, it is argued that excessive government intervention generates negative spillover effects on the overall economy. On the other hand, growth in government expenditure often powered by increase in taxation is adjudged by Barro (1990); and King and Rebelo (1990) as a major of source of macroeconomic distortions and sub-optimal economic outcomes. Although theory and empirical evidence offer some justifications for increased state intervention, excessive size and growth of public

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

investments have been described as detrimental to economic prosperity in both developed and developing economies.

Like other development economies, the growth of public investments in Nigeria has largely been described as procyclical. This is consistent with "when-it-rains-it-pours hypothesis" of Kaminsky, Reinhart, and Vegh (2004) which aligns with earlier claim by Talvi and Vegh (2005) that, far from being a Latin-American phenomenon, procyclical policy tend to be a common practice in the developing economies. By and large, growth in public investment is associated with growing pace of economic activities. Since the return to democracy in 1999, central and sub-central governments in Nigeria have emphasized on public investment for real sector development. This is because the real sector is adjudged as precursor of economic prosperity due its positive spillovers on economic growth and development. Sanusi (2011) argued that a vibrant real sector, especially improved agricultural and manufacturing activities, create better linkages in the economy than any other sector and thus help in reducing the pressure on the external sector. In view of the central place of the real sector in the Nigerian economy, fiscal policy operations often make provisions for investments in infrastructure and other areas of economic concern capable of driving real sector development.

Although the pattern and dimensions of public investment vary over time, successive governments, on balance, seem to reignite interest in investment in economic, community and social services. While investments in economic services such as agriculture, construction; communication and transportation foster infrastructural development, investments in community and social services such as education and health are crucial for human capital formation. Ekesiobi *et al.* (2016) observed that investment in education is critical to increasing the marginal productivity of labor and by extension industrial output. They further explained that in addition to facilitating technological innovation, investment in education contributes to the development of innovative capacity which leads to improved manufacturing output and overall economic prosperity.

Furthermore, Pervez (2014) identified investment in education as a pathway to building human capacity and sustained growth through knowledge and skills. Focusing on Nigerian economy, Emmanuel and Olagbaju (2015) found that government capital expenditure is positively linked to manufacturing sector output growth. Besides investment in education, healthcare sector has also received some attention in the fiscal plan. The focus on healthcare delivery in the public investment arrangement is as a result of its link to human capital formation which is generally adjudged as a driving force in the development process. In spite of the benefits developing economies derive from investing in education, they seem to lag behind their counterparts in developed world in terms of manufacturing output (see Idrees and Siddiqi, 2013).

Notwithstanding the incremental fiscal arrangement practiced at all levels of government in Nigeria, its effectiveness in driving real sector development has remained controversial in policy debate. Some of the issues linked to the ineffectiveness of public investment in Nigeria include allocative ineffectiveness, systemic corruption; misappropriation and poor control mechanism (see Ekesiobi *et al.*, 2016; Ewubare and Eyitope, 2015; Eze and Ogiji; 2013). More so, the political economy debate on the relatively effectiveness of public investment seems to be intensified following the varying outcomes in the key indicators of real sector development. This paper is therefore, designed to explore the link between public capital expenditure and real sector development with emphasis on agricultural and manufacturing value added. The question to contend with in this paper is: does public investment trigger agricultural and manufacturing value added? Following the introduction above, the rest of this paper is

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

organized as follows: section two focused on the review of related literature which includes theoretical framework, facts and figures on the size and growth of public investment and empirical evidence from previous studies. In section three, the empirical model was developed, nature and sources of data were defined and the tools for data analysis were provided. Section four focused on the results and discussion of findings while section 3 set out the conclusion and recommendation.

REVIVIEW OF RELATED LITERATURE

Theoretical Literature

The theoretical debate on public expenditure-growth nexus has evolved overtime. Wagner (1890) law of increasing state activities is one of the pioneer theories in economic literature that explains the link between public investment and economic growth. He argued that the reasons that drive state intervention include growing demand for public goods by the population and provision of public goods for effective and efficient functioning of the private sector. Generally, Wagner's Law assumes that rising levels of real necessitates public spending to increase relative to national income. Magazzino, Giolli and Mele (2015) opined that Wagner's Law reveals that the share of government spending to the gross domestic product tends to increase as the economy expands. This is concerned with the tendency for public expenditure to grow relative to national income. Thus, the cause of increase in public investments is assumed to be the level of progress in the overall economy.

Keynes (1936) theory of public investment assumes that changes in public expenditure bolters short-term stability and higher long run growth. Thus, public investment is believed to contribute positively to sectoral growth such as agricultural, manufacturing and services output. In Nigeria for instance, several studies (Ighodaro and Oriakhi, 2010, Njoku *et al.*, 2014 and Adigun, 2017) offered evidence in support of the Keynesian hypothesis of public expenditure. Further contribution to the theoretical debate of government expenditure growth was offered by Peacock and Wiseman (1961) as they explained the pattern through which government expenditure evolve overtime. The Wiseman-Peacock hypothesis which builds on the political theory of public determination rather than the organic state as maintained by Wagner (1890) assumes that government expenditure evolves as an impulse to social unrest such as wars.

The Wiseman-Peacock theory further disaggregated the effects of growth in public expenditure into displacement, inspection and concentration effects. The displacement effect is concerned with fluctuations in public expenditure between times of peace and social displacement while inspection effects involves efforts geared towards achieving fiscal balance. The concentration effect encompasses the stabilization of public revenue and expenditure to new level to bolster economic prosperity. Additionally, Musgrave (1959) proposed the theory of public expenditure growth which assumes that increase in government expenditure tend to emerge from the expansion of the economy overtime. According to the theory, at low level of per capita income, the demand for public services becomes and as such public expenditure remains low. However, rising levels of per capita income causes public expenditure on public services to increase following the increasing demand for public goods.

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

Facts and Figures on the Size and Growth of Public Investment in Nigeria

Both as a share of GDP and sector-specific allocations as a share of gross public investment, government capital expenditure has varied overtime, thus, providing some insights into the Nigerian economic outlook. The ratio of gross public capital expenditure to GDP between 2000 and 2017 as reported in the Central Bank of Nigeria (2017) Statistical Bulletin is showed in Figure 1.

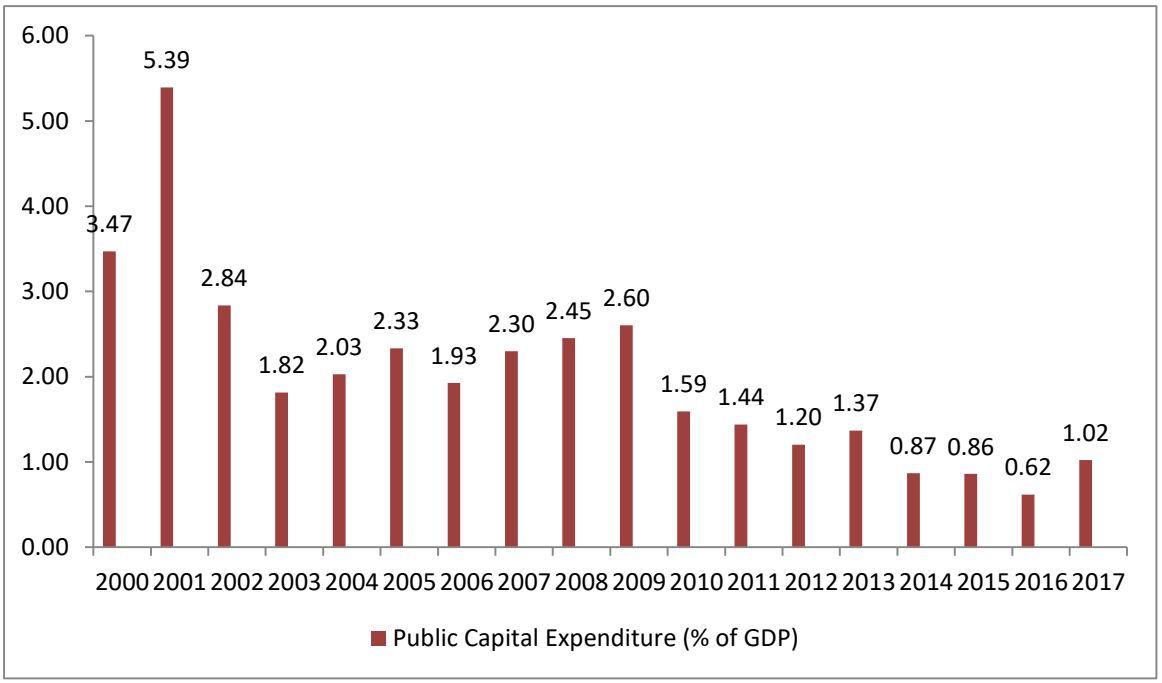

Figure 1: Share of public capital expenditure to GDP

Source: Central Bank of Nigeria (2017) Statistical Bulletin

Figure 1 shows gross public capital expenditure as a ratio of GDP during 2000-2017. It increased from 3.47 percent in 2000 to all-time high value of 5.39 percent in 2001. It fluctuated between 2002 and 2017. It was further observed that public capital expenditure trended upward from 1.93 percent in 2003 to 2.33 percent in 2005. This could be linked to the federal government's commitment to the goals of wealth creation, poverty reduction, employment generation and value re-orientation associated with the National Economic Empowerment and Development Strategy (NEEDS). Similarly, the period of 2007-2009 witnessed a positive growth rate in public capital expenditure in line with the implementation of 7-point agenda initiated by Late President Yar'Adua administration which prioritized investment in critical infrastructure amongst other goals to ensure that Nigeria successfully keyed into the Millennium Development Goals (MDGs). However, public investment decreased to a record low of 0.62 percent in 2016. Similarly, its growth rate in 2015 was negative. The successive negative growth rate in public capital expenditure in 2015 and 2016 could be attributed to the economic recession that engulfed the Nigeria. It further suggests that Nigeria seem to follow procyclical fiscal policy operation as degrease in pace of economic growth due to recession is associated with negative growth in the public capital expenditure. Overall, gross public investment, on the average, accounted for only 2.01 percent of GDP. This indicates that capital

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

expenditure tend not to receive adequate attention in the design and implementation of fiscal policy in Nigeria.

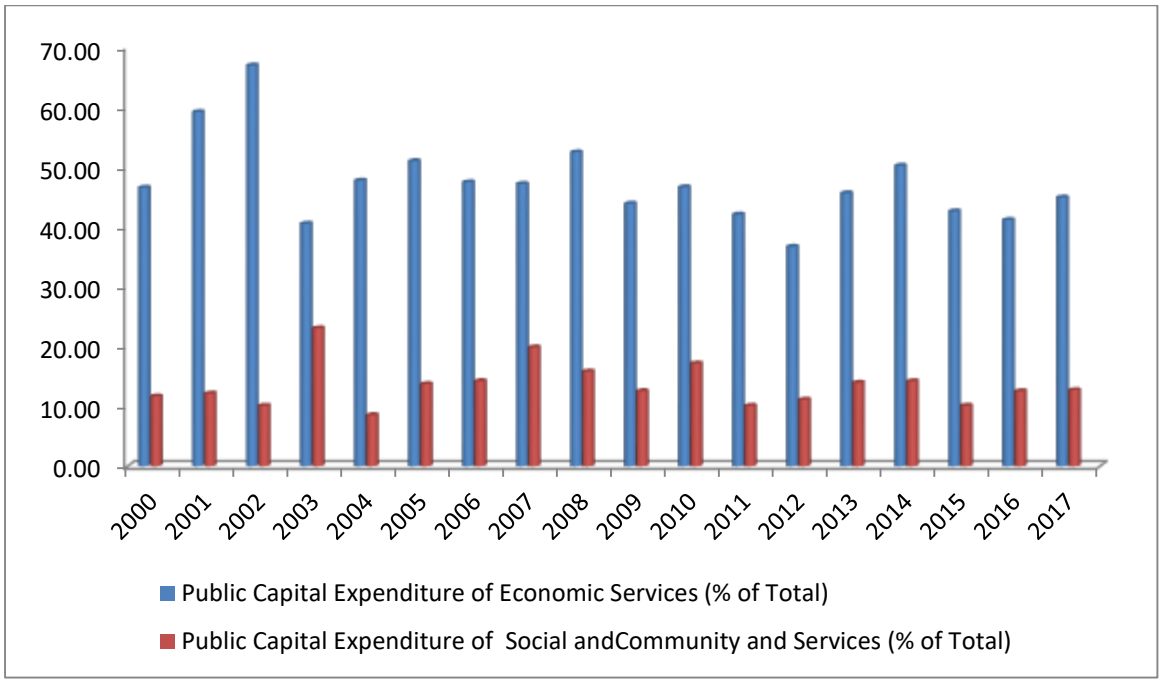

Figure 2: Share of public capital expenditure on economic services, social and community services to Overall capital expenditure.

Source: Central Bank of Nigeria (2017) Statistical Bulletin

As reported in Figure 2, investment in economic services increased from 46.57 percent in 2000 to a maximum value of 67 percent in 2003. It varied between 2004 and 2017 reaching an all-time low value of 36.69 percent in 2012. On the other hand, investment in social and community services fluctuated between 2000 and 2017 reaching a maximum value of 23.06 percent in 2003 and minimum value of 8.56 percent in 2004. It was obvious from Figure 2 that investment in economic services surpassed investment in social and community services in each of the sample period. On the average, investment in economic services more than doubled investment in social and community services s the former accounted for 47.39 percent of the total capital expenditure while the latter accounted for only 13.54 percent of the gross capital expenditure. This indicates that fiscal policy operation in Nigeria in more than one and half decade has prioritized infrastructural development in agriculture, construction, transport and communication at the expense of human capital formation as investments in the indicators social and community services such as education and health are relatively low. This could be linked to the policy advice of the World Bank and International Monetary Fund (IMF) which emphasized on infrastructural development as a roadmap for rapid and sustained growth of the economy.

Empirical Literature

The empirical literature which centered on the review of previous studies is organized into two sub-sections. The first sub-section focused on studies in Nigeria while the second sub-section provided empirical evidence from the rest of the world.

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

Empirical Evidence from Nigeria

Njoku *et al.* (2014) analyzed how Nigeria's capital expenditure influenced growth of the manufacturing sector over the period 1971-2012. The ordinal least square method was applied as a method of data analysis with manufacturing GDP taken as dependent variable while exchange rate, interest rate, political stability, recurrent expenditure, money supply, interest rate, index of energy consumption, credit to private sector, degree of openness and rate of growth of GDP as explanatory variables. The results showed that capital expenditure, money supply, openness of the economy, recurrent expenditure positively influenced manufacturing output in Nigeria. This implication of this finding is that increasing the level of public investment offers opportunity for improved productivity of the manufacturing sector. On the basis of the findings, the study recommended for increase in the capital expenditure and proper management of the allocate funds in order to drive economic growth.

Ekesiobi *et al.* (2016) utilized Augmented Dickey Fuller (ADF) unit root test method and Ordinary Least Square (OLS) technique to empirically determine the stationary of the data on public educational spending, primary school enrolment rate, per capita income, exchange rate, foreign direct investment and manufacturing output growth and the relationship between the underlying explanatory variables and manufacturing productivity. The empirical evidence from the study showed that public education spending exerts an insignificant positive impact on manufacturing output growth. The study therefore, recommended among other things, that fiscal policy plan should target education spending in order to significantly drive the growth of manufacturing output.

Adigun (2017) employed the ARDL to evaluate the link between government expenditure and economic growth in Nigeria during 1981-2016. It is found that government expenditure on human capital development (education and health) positively influenced economic growth in the long run. The result further showed that government consumption expenditure and private sector investment are less significant in driving growth whereas government capital expenditure boost growth not in the short but in the long run. Based on the findings, the study recommended that government should place emphasis on capital expenditure with a view to fostering growth in the economy wide aggregate.

Empirical Evidence from the Rest of the World

Straub and Terada-Hagiwara (2010) applied growth regressions and growth accounting to determine the link between infrastructure, growth, and productivity developing Asian countries. They organized the study area into East Asia and Pacific region involving seventeen countries and South Asia area comprising five countries. The empirical result showed that that a number of countries in developing Asia have significantly improved their basic infrastructure endowments which appear to correlate significantly with the pace of growth. The study concluded that the finding is a demonstration that factor accumulation is helpful in boosting productivity.

Hofman *et al.* (2017) investigated growth experiences of 23 Latin American and English-speaking Caribbean countries during 1990-2013. The study was structured into three exercises. The first exercise focused on the 23 countries in the region using the traditional approaches in measuring capital, labor, and total factor productivity (TFP). The second exercise which based only on Latin American countries improved upon the labor measure by including a quality adjustment to hours worked, while the capital measure includes capital services. The third

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

exercise utilizes the LA-KLEMS database to disaggregate the data into nine industries. For each industry, the study showed evidence of three properties of the labor factor and eight types of capital assets.

Gupta *et al.* (2016) examined how investment in key infrastructure sectors impact on India's economic growth and the extent of significant of the impact. The study mainly focused on the qualitative e analysis of all the infrastructure sectors to know their relative importance in the growth process. In the final part of analysis, a budget allocation model was formulated with the help of linear programming technique. This offered a fresh viewpoint of the prospective inclination of government budget, and its extent of allocation to the diversity of infrastructure sectors. The study found that investment in telecom, industry minerals and water are the most significant sectors driving Country Economic Performance and Prudence Indicator (CEPPI) in India, Hence, the study recommended that government should prioritize these sectors in budgetary allocations.

METHODOLOGY AND VARIABLE DESCRIPTION

Nature and Source of Data

Following the adoption of ex post facto research design, this paper utilized annual time series data. Data on the indices of real sector development comprising agricultural and manufacturing value added were sourced from the World Development Indicators. In addition, data on the measures of public investment were collected from the Central Bank of Nigeria (2017) Statistical Bulletin. Each of the datasets spanned from 1981-2017.

Variables of Interest

The indices of real sector development employed in this study include agricultural and manufacturing value added. Whilst agricultural value added encompasses net agricultural output to GDP after adding all manufacturing outputs and deducting intermediate inputs, manufacturing value added is measured by ratio of manufacturing to GDP after summing up all manufacturing outputs and deducting intermediate inputs. Each of these indices of real sector development is measure in percentage. Additionally, public investment is measured in this paper by public capital expenditure segmented into investment in economic services, investment in social and community services and gross capital expenditure as a ratio of GDP. Following Central bank of Nigeria (2017) classification, investment in economic services includes investments in agricultural, construction, communication and transport while investment in social and community services encompasses investments in education, health and other social services.

Model Specification

The model set up for this paper adapts to the work of Adigun (2017) who employed the ARDL to evaluate the link between government expenditure and economic growth in Nigeria. However, this paper improved upon the model was improved by focusing on sector-specific growth effects of public investment. In addition, this study disaggregated public investment into investment in human capital formation and physical infrastructure as well included ratio of gross public capital expenditure to GDP as part of the explanatory variables. The models set up are of the form:

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

$$AGD_t = m_0 + \sum_{i=1}^{k} m_{1i}\Delta AGD_{t-1} + \sum_{i=1}^{k} m_{2i}\Delta PIE_{t-1} + \sum_{i=1}^{k} m_{3i}\Delta PIS_{t-1} + \sum_{i=1}^{k} m_{4i}\Delta GIG_{t-1} + a_{1i}AGD_{t-1} + a_{2i}PIE_{t-1} + a_{3i}PIS_{t-1} + a_{4i}GIG_{t-1} + U_{1t} \quad (1)$$

$$MGD_t = n_0 + \sum_{i=1}^{k} n_{1i}\Delta MGD_{t-1} + \sum_{i=1}^{k} n_{2i}\Delta PIE_{t-1} + \sum_{i=1}^{k} n_{3i}\Delta PIS_{t-1} + \sum_{i=1}^{k} n_{4i}\Delta GIG_{t-1} + b_{1i}MGD_{t-1} + b_{2i}PIE_{t-1} + b_{3i}PIS_{t-1} + b_{4i}GIG_{t-1} + U_{2t} \quad (2)$$

Where: AGD and MGD are agricultural and manufacturing value added respectively while PIE and PIS are public investment in economic services and public investment in social and community services respectively. GIG denotes gross capital expenditure as a ratio of GDP while m_0 and n_0 represent the constant term. m_1 - m_4 and n_1 -n_4 are short run dynamic coefficients of the regressors while a_1 - a_4 and b_1 - b_4 denote long run multipliers. U_{1t} and U_{2t} = white noise error process, Δ = first difference notation, k = order of lag [automatically selected using Bayesian information criterion (BIC)], i and t represent the country of study (Nigeria) and study sample (1981-2017) respectively.

Data Analysis Techniques

The ARDL developed by Pesaran and Shin (1999) was applied in estimating the dynamic relationship between pubic investment and indices of real sector development. It is was specifically applied to determine the long-term and short run dynamic impacts of each of the underlying measures of public investment on real sector development. The choice of ARDL lies in its flexibility as it can be applied when the variables are of a different order of integration (Pesaran and Pesaran 1997). In other words, it is used notwithstanding if the variables are I(0), I(1) or a mixture of I(0) and I(1). More so, the model has been identified as having the capacity of addressing the issue simultaneity often associated with time series data. In addition to the ARDL, unit root and cointegration tests were performed on the series. The Phillips and Perron (1988) method was employed to determine the order of integration of the series. The general specification of the Phillips-Perron unit root test model is of the form:

$$\Delta Q_t = \propto_0 + \propto_1 Q_{t-1} + \sum_{i=1}^{K} \beta_i \Delta Q_{t-i} + \lambda_t \quad (3)$$

Where: Q_t = variables included in the model, $\propto_1$ and β_i = parameter estimates, K = length of lag, Δ= First difference operator and λ_t = Random disturbance term. The bounds test approach to cointegration was employed to determine if the variables have long relationship. Other post estmination tests such as Breusch (1978) and Godfrey (1978) serial correlation LM test, White (1980) heteroscedasticity test and Ramsey (1969) regression equation specification error test (RESET) were performed in this paper.

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

RESULTS AND DISCUSSION

Descriptive Statistics

The basic descriptive statistics for each of the series are summarized in Table 1

	AGD	MGD	PIE	PIS	GIG
Mean	32.05777	6.268523	40.88730	11.76135	3.263784
Median	32.71418	5.754452	43.89000	11.68000	2.840000
Maximum	48.56594	10.43726	67.00000	23.06000	9.380000
Minimum	20.23572	2.410130	5.880000	2.560000	0.620000
Std. Dev.	7.097498	2.584236	15.90918	5.415465	1.901005
Observations	37	37	37	37	37

Source: Authors' calculations from data collected from Central Bank of Nigeria Bulletin and World Development Indicators

As showed in Table 1, the average values of agricultural and manufacturing value added during the study sample (1981-2017) are 32.06 percent and 6.36 percent respectively. The result also shows that public capital investments in economic services averaged 40.89 percent while the mean value of public investment in social and community services is 11.76 percent. As a ratio of GDP, gross public investment averaged 3.26 percent. Additionally, the maximum value of agricultural value added more than doubled that of manufacturing sector. This indicates that agriculture plays dominant role in the growth of non-oil GDP in Nigeria. With a maximum share of 67 percent of the overall public capital expenditure, investment in economic services more than doubled public investment in social and community services which accounted for 23.06 percent of the total public investment. This is a pointer that policy makers focused attention on boasting economic services through investment in agricultural, construction, transportation and communication amongst others. The result further showed that the standard deviation for each of the series is less than its corresponding mean values. This indicates that the observations for each of the variables converged around their respective mean values.

Unit Root Test

The results of the Phillips-Perron unit root test for each of the variables are summarized in Table 2.

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

Table 2: Phillips-Perron unit root tests results for the series

Test at Levels	**Variable**	**Adjusted t-statistic**	**P-value**	**Order of Integration**
	AGD	-3.249	0.091	NS
	MGD	-0.909	0.944	NS
	PIE	-2.964	0.156	NS
	PIS	-5.047	0.001***	I(0)
	GIG	-2.581	0.291	NS
Test at First Difference	**Variable**	**Adjusted t-statistic**	**P-value**	**Order of Integration**
	Δ(AGD)	-11.848	0.000***	I(1)
	Δ(MGD)	-7.061	0.000***	I(1)
	Δ(PIE)	-7.435	0.000***	I(1)
	Δ(GIG)	-8.805	0.000***	I(1)

Source: Authors' calculations from data collected from Central Bank of Nigeria Bulletin and World Development Indicators

*NB: *** denotes rejection of null hypothesis of unit at 1 percent level of significance while Δ and NS respectively imply first difference notation and nonstationary at levels*

The unit root test result in Table 2 was carried out using Phillips-Perron method. The levels test results showed that only public investment in social and community services is stationary at levels. Hence, it is considered to be integrated of order zero [I(0)] which necessitates the rejection of the null hypothesis in this case. The evidence of unit root in the other variables under investigation prompted the first difference test and they were all differenced only once. The results revealed that they are integrated of one [I(1)]. The outcomes of the both the levels and first difference test indicate that the variables are mixed integrated. This necessitated the application of the ARDL bounds test method for cointegration to determine whether the variables actually have long run relationship.

ARDL bounds test for Cointegration

The integration test for each of the models was performed with the application of the ARDL bounds test method. The results for the models are summarized in Table 3 and 4.

Table 3: Cointegration test result for model 1

Series: AGD PIE PIS GIG		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	9.552	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10 percent	2.72	3.77
5 percent	3.23	4.35
2.5 percent	3.69	4.89
1 percent	4.29	5.61

Source: Authors' calculations from data collected from Central Bank of Nigeria Bulletin and World Development Indicators

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

NB: k denotes number of regressors in the model

Table 4: Cointegration test result for model 2

Series: MGD PIE PIS GIG		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	5.696	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10 percent	2.72	3.77
5 percent	3.23	4.35
2.5 percent	3.69	4.89
1 percent	4.29	5.61

Source: Authors' calculations from data collected from Central Bank of Nigeria Bulletin and World Development Indicators

NB: k denotes number of regressors in the model

The bounds test result in Table 3 shows that the computed F-statistic (9.552) is greater than its corresponding 5 percent upper bound critical value (4.35). Hence, the null hypothesis of no long run relationship is rejected. This implies that the ratio of agricultural value added to GDP is cointegrated with the underlying measures of public investment in Nigeria. Similarly, it was observed from the result in Table 4 that the computed F-ratio 5.696 exceeds its corresponding 5 percent upper bound critical value (4.35). This equally prompts the rejection of the null hypothesis of no cointegration. Hence, the variables in the model have long run relationship. The evidence of cointegration in each of the models forms basis for estimating the dynamic short run and long run parameters of the regressors.

Model Estimation

Following the order of integration [I(0) and I(1)] of the variables in each of the models, the ARDL formed basis for estimating the empirical models. The results are summarized in Tables 5 and 6.

Table 5: ARDL estimates for model 1

Dependent Variable: AGD				
Short run result				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(PIE)	0.119992	0.070957	1.691060	0.1102
D(PIE(-1))	0.378782	0.071606	5.289845	0.0001
D(PIE(-2))	0.135501	0.077103	1.757405	0.0980
D(PIE(-3))	-0.066429	0.071243	-0.932435	0.3650
D(PIE(-4))	-0.276012	0.075002	-3.680089	0.0020
D(PIS)	0.267675	0.213029	1.256518	0.2270
D(PIS(-1))	-0.443178	0.174645	-2.537590	0.0219

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

D(PIS(-2))	0.085086	0.153090	0.555794	0.5860
D(PIS(-3))	0.572491	0.142122	4.028173	0.0010
D(PIS(-4))	0.406498	0.147214	2.761269	0.0139
D(GIG)	2.211733	0.606598	3.646125	0.0022
CointEq(-1)	-0.799221	0.147000	-5.436880	0.0001
Long run Results				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
PIE	-0.036585	0.077320	-0.473168	0.6425
PIS	0.289105	0.471514	0.613141	0.5484
GIG	3.924289	0.687512	5.707958	0.0000
C	17.078107	7.659302	2.229721	0.0404
R-squared	0.908	F-statistic	10.487	Prob(F-stat.) = 0.000

Source: Authors' calculations from data collected from Central Bank of Nigeria Bulletin and World Development Indicators

Table 6: ARDL estimates for model 2

Dependent Variable: MGD				
Short run result				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MGD(-1))	-0.269208	0.178984	-1.504086	0.1607
D(MGD(-2))	-0.430131	0.180417	-2.384088	0.0362
D(PIE)	0.066906	0.016616	4.026569	0.0020
D(PIS)	-0.044475	0.058160	-0.764701	0.4605
D(PIS(-1))	-0.048248	0.065440	-0.737286	0.4764
D(PIS(-2))	-0.130113	0.049851	-2.610024	0.0243
D(PIS(-3))	-0.123040	0.055972	-2.198228	0.0502
D(PIS(-4))	-0.171685	0.045327	-3.787683	0.0030
D(GIG)	-0.135708	0.164537	-0.824785	0.4270
D(GIG(-1))	-0.276516	0.194444	-1.422089	0.1827
D(GIG(-2))	0.148451	0.172258	0.861790	0.4072
D(GIG(-3))	-0.152690	0.199332	-0.766012	0.4598
D(GIG(-4))	-0.494212	0.217276	-2.274582	0.0440
D(GIG(-5))	0.126096	0.160435	0.785962	0.4485
D(GIG(-6))	0.534624	0.132635	4.030790	0.0020
CointEq(-1)	-0.059700	0.118380	-0.504309	0.6240
Long run result				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
PIE	1.120696	2.402469	0.466477	0.6500
PIS	5.677148	12.999576	0.436718	0.6708
GIG	-0.905776	3.378065	-0.268135	0.7936
C	-99.98653	249.354970	-0.400981	0.6961
R-squared	0.96	F-statistic	19.51	Prob(F-stat.) = 0.000

Source: Authors' calculations from data collected from Central Bank of Nigeria Bulletin and World Development Indicators

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

The short run result showed that one period lag in public investment in economic services has significant positive impact on agricultural value added. A percentage increase in public investment in economic services boosts agricultural GDP by 0.379 percent. In a like manner, the third and fourth lag of public investments on social and community services are found to impact positively on agricultural value added to the tune of 0.572 percent and 0.406 percent respectively. The result further indicated that total capital expenditure as a ratio of GDP has positive impact on agricultural value added in the short run. 1 percent increase in gross investment leads to more than proportionate increase in agricultural value added to the tune of 2.211 percent. On the contrary, the fourth lag of public investment in economic services and first lag of public investment in social and community services are negatively related to agricultural value added. Interestingly, the error correction coefficient (-0.799) has the hypothesized negative sign and highly significant at 1 percent level of significance. This indicates that any short run disequilibrium in the system can be reconciled at a speed of 79.9 percent. More importantly, gross investment also exerts significant positive impact on agricultural value added in the long run. Agricultural value added increases by 3.924 percent following 1 percent increase in total capital expenditure. The F-ratio (10.49) with a probability value of 0.000 indicates that the explanatory variables are jointly significant in explaining changes in agricultural value added. The coefficient of determination (0.908) indicates that the regressors have strong explanatory power for the systematic variations in agricultural productivity.

The result in Table 6 showed that public investment in economic services has positive impact on manufacturing vale added in the short run. A percentage increase in the former increases the latter by 0.067 percent. Again, the sixth lag of gross capital expenditure is positively related to manufacturing valued added. On the other hand, public investment in social and community services as well as four period lag of gross capital expenditure negatively influenced manufacturing value added in the short run. The long run result showed that individually, none of the explanatory variables exerts significant impact on manufacturing value added. However, the f-test result showed that the explanatory variables are collectively significant in influencing manufacturing value added in the long run. This suggests that they are jointly important in predicting changes in manufacturing value added.

Diagnostics Test

Post-estimation diagnostics tests were carried out for each of the models at 5 percent level of significance. The results are showed in Table 7.

Table 7: Post-estimation diagnostics tests results

Tests results for model 1		
Test type	**Test stat.**	**P-value**
Breush-Godfrey serial correlation LM test	X^2-statistic	0.6569
White's heteroscedasticity test	X^2-statistic	0.5671
Ramsey RESET test	F-statistic	0.2086
Tests results for model 2		
Test type	**Test stat.**	**P-value**
Breush-Godfrey serial correlation LM test	X^2-statistic	0.2897
White's heteroscedasticity test	X^2-statistic	0.7573
Ramsey RESET test	F-statistic	0.5050

Source: Authors' calculations from estimated ARDL models

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

The post-estimation diagnostics tests focused on serial correlation focused on Breusch-Godfrey LM test for serial correlation, White's heteroscedasticity test and Ramsey regression equation specification error test (RESET). It was observed from the Breusch-Godfrey test results that the probability values of chi-square statistic for both models are greater than 0.05. Thus, the null hypothesis of no serial correlation in each of the residuals cannot be rejected. More so, the results for White's heteroscedasticity test and Ramsey RESET test show no evidence of heteroscedasticity and functional misspecification in each of the model. The outcomes of these tests are very welcoming as they authenticate the reliability of the estimated ARDL for forecasting.

CONCLUSION

This paper employed country-specific time series data to analyze the channel through which public investment impact on real sector development. Econometric methods such as Phillips-Perron test for unit root, bounds test for cointegration and ADRL estimation procedure were employed to analyze the data. The short run result showed that public investment in economic, social and community services impact positively on agricultural value added in the short run. The positive impact of investment in social and economic services was greater than that of economic services. This suggests that investments in human capital formation such education and healthcare delivery seems to greater opportunities for agricultural development than investment in physical infrastructure. Additionally, public investment in economic services also exerts significant positive impact on manufacturing value added. The result further showed that gross capital expenditure as a ratio of GDP impact positively on agricultural and manufacturing value added in the short run. It was evidence from the result that its impact on agricultural value added was stronger in the long run. This suggests that the effectiveness of public investment manifest in the long run. More so, the positive impact of gross public investment on agriculture and manufacturing outputs in the short run align with the findings of Njoku *et al.* (2014) and Olayemi (2017) amongst others. Owing to the findings, it is concluded that on balance, public investment play a key role in driving the process of real sector development in Nigeria. Accordingly, it is recommended for public policy makers to step up investment in social and community services in order to build the human capital required for real sector development in Nigeria.

REFERENCES

Adigun, Ismail.2017. "Is Nigerian Growth Public Spending-Spurred?." *Asian Journal of Economic Modelling* 5, no. 3: 354-363.

Barro, Robert J. 1990. "Government spending in a simple model of endogeneous growth." *Journal of political economy* 98, 5, Part 2 (1990): S103-S125.

Breusch, Trevor S. 1978. "Testing for autocorrelation in dynamic linear models." *Australian Economic Papers* 17(31):334-355.

Ekesiobi, Chukwunonso S., Dimnwobi, Stephen K., Ifebi, Ogonna E. and Ibekilo, Bruno N. 2016. "Public Sector Education Investment and Manufacturing Output in Nigeria: Empirics and Policy Options". *Public Policy and Administration Research, 6(7): 95-106.*

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

Central Bank of Nigeria. 2017. Annual Statistical Bulletin. Available on: https://www.cbn.gov.ng/documents/statbulletin.asp

Emmanuel, Falade Olanipekun, and Olagbaju Ifeolu Oladiran. 2015. "Effect of government capital expenditure on manufacturing sector output in Nigeria." *Business and Economic Research* 5, no. 2: 136-152.

Ewubare, Dennis Brown, and J. Ajayi Eyitope. 2015. "The effects of public expenditure on agricultural production output in Nigeria." *J of Res in Hum and Soc Sci* 11, no. 3: 07-23.

Eze, Onyekachi Richard, and Festus O. Ogiji. 2014. "Impact of fiscal policy on the manufacturing sector output in Nigeria: An error correction analysis." *British Journal of Business and Management Research* 1, no. 2: 31-54.

Godfrey, Leslie G. 1978. "Testing against general autoregressive and moving average error models when the regressors include lagged dependent variables." *Econometrica: Journal of the Econometric Society*, 1293-1301.

Gupta, Mukul, Rahul Budhadev, Varun Chotia, and N. V. Rao. "Integrating the issue of infrastructural investment with economic growth: The case of India." *Theoretical & Applied Economics* 23, no. 3 (2016).

Hofman, André, Claudio Aravena, and Jorge Friedman.2017. "Sources of Productivity and Economic Growth in Latin America and the Caribbean, 1990-2013." *International Productivity Monitor* 33: 51-76.

Idrees, Alvina Sabah, and Muhammad Wasif Siddiqi. 2013. "Does public education expenditure cause economic growth? Comparison of developed and developing countries." *Pakistan Journal of Commerce and Social Sciences* 7, no. 1: 174.

Ighodaro, Clement AU, and Dickson E. Oriakhi. 2010. "Does the Relationship Between Government Expenditure and Economic Growth Follow Wagner‟ s Law in Nigeria." *Annals of University of Petrosani Economics* 10, no. 2: 185-198.

Kaminsky, Graciela , Carmen Reinhart and Carlos A. Vegh. 2004. "When It-Rains-It-Pours: Procyclical Capital Flows and Macroeconomic Policies." in NBER Macroeconomics Annual, edited by Mark Gertler and Kenneth Rogo, Cambridge, MA: MIT Press.

Keynes, John Maynard. 1936. *The general Theory of Employment, Interest and Money.* Harcourt: Brace and co, New York.

King, Robert G., and Sergio Rebelo. 1990. "Public policy and economic growth: developing neoclassical implications." *Journal of Political Economy* 98, no. 5, Part 2: S126-S150.

Magazzino, Cosimo, Lorenzo Giolli, and Marco Mele. 2015. "Wagner's Law and Peacock and Wiseman's Displacement Effect In European Union Countries: A Panel Data Study. *International Journal of Economics and Financial Issues, 5(3):812–819.*

Musgrave Richard A. 1959. *"Theory of public finance*".New York : McGraw-Hill.

Njoku, A. C., Okezie A. Ihugba, and Ngozi Idika. 2014. "Is Government Capital Expenditure Productive? Evidence from Nigerian Manufacturing Sector (1971-2012)." *Journal of Educational and Social Research* 4(5): 143.

Peacock, Alan T., and Jack Wiseman. 1961. "Front matter, the growth of public expenditure in the United Kingdom." In *The growth of public expenditure in the United Kingdom*, pp. 32-0. Princeton University Press.

Pervez, Sikander. 2014. Impact of Education on Poverty Reduction: A Co-integration Analysis for Pakistan. *Journal of Research in Economics and International Finance (JREIF), 3(4) pp. 83–89.*

Pesaran, M. Hashem, and Yongcheol Shin. 1997. Stock return predictability and the role of monetary policy. *Journal of Finance*, 1(52), 1951–1972.

Pesaran, M. Hashem, and Yongcheol Shin. 1999. "An autoregressive distributed lag modelling approach to cointegration analysis". Chapter 11 in S. Strom (ed.),

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)

Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium. Cambridge University Press, Cambridge.

Ramsey, James Bernard. 1969. "Tests for specification errors in classical linear least-squares regression analysis." *Journal of the Royal Statistical Society. Series B (Methodological)*, 350-371.

Sanusi, Lamido Sanusi. 2011. "Growing Nigeria's real sector for employment and economic development: The role of Central Bank of Nigeria." Paper delivered at the inaugural memorial lecture in honour of late Professor Okefie Uzoaga at the University of Nigeria, Enugu Campus July 12.

Singh, Balvir, and Balbir S. Sahni.1984. "Causality between public expenditure and national income." *The Review of economics and Statistics*: 630-644.

Straub, Stéphane, and Akiko Terada-Hagiwara.2010. "Infrastructure and growth in developing Asia.".*Asian Development Bank Economics Working Paper Series No. 231*

Talvi, Ernesto, and Carlos A. Vegh. 2005. "Tax base variability and procyclical fiscal policy in developing countries." *Journal of Development economics* 78, no. 1: 156-190.

Ukwueze, Ezebuilo Romanus. 2015. "Determinants of the Size of Public Expenditure in Nigeria." *SAGE Open* 5,.

Wagner, Adoph. 1890. *Finanzwissenchaft*, Winter, C. F., Leipzig.

White, Halbert. 1980 "A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity." *Econometrica: Journal of the Econometric Society*, 817-838.

World Bank. 2017. World Development Indicators. Available on: https://data.worldbank.org/products/wdi.

Print ISSN: 2052-6350(Print), Online ISSN: 2052-6369(Online)