The Impact of Infrastructure Development on Economic Growth in Nigeria

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pp 270 - 275

Abstract

It is the belief of scholars that for developing countries to achieve sustainable economic growth, it is necessary for policy makers to design economic policies targeted at improving infrastructure. In view of this, this paper examines the role of infrastructure development in promoting economic growth in Nigeria over the period 1980-2015. A Cobb-Douglas production function which models infrastructure as a stock variable is specified and estimated using the ordinary least squares method. The study finds positive and significant effects of total air transport infrastructure, communication infrastructure, power infrastructure and total rail lines on economic growth with estimated elasticities of 0.035, 0.016, 0.141 and 0.132, respectively. The study recommends that it will be worthwhile for the Nigerian government and policymakers to implement policies geared towards the development of infrastructure. Also, since the government cannot do it alone, an enabling environment should be created to encourage Public-Private Partnership in infrastructure development.

Key words: Infrastructure development, Infrastructure components, Economic growth,

1. Introduction

Governments around the world are continually looking for new strategies to increase the ability of their economies to produce goods and services. In this light, over the last two and half decades attention has shifted to infrastructure development as a veritable tool for raising the productive capacity of the economy. Infrastructure plays a very important role in the growth process of an economy. In fact, development economists have considered infrastructure to be a precondition for industrialization and economic development (Sawada, 2015). Infrastructural development has been on the top of priority list for governments all over the world. Policymakers believe that appropriate infrastructural investment holds the key to social and economic development and growth. According to World Bank (2007), improving infrastructure in the world is key to reducing poverty, increasing growth and achieving the Millennium Development Goals (MDGs).

The need for infrastructure development is indeed crucial for developing countries, especially Africa. The lack of modern infrastructure has been regarded as an impediment to economic development and a major constraint not only on poverty reduction, but also on the attainment of the Millennium Development Goals (MDGs) in SSA countries (Habitat, 2011). Also, Ondiege et al. (2013) attributed the rise in the transaction costs of business in most African countries to inadequate infrastructure. Today, African countries exhibit the lowest levels of productivity of all low-income countries and are among the least competitive economies in the world.

In the case of Nigeria, the importance of infrastructure cannot be over-emphasized. Olaseni and Alade (2012) as well as Sanusi (2012) argue that infrastructural development is critical to the achievement of the Vision 20:2020 which is a vision set to make Nigeria one of the top 20 economies in the world by 2020 with a minimum GDP of $900 billion and a per capita income of not less than $4000 per annum.

How big is the contribution of infrastructure to aggregate economic performance? The answer is critical for many policy decisions. For example, it is important for gauging the growth effects of fiscal interventions in the form of public investment changes, or for assessing if public infrastructure investments can be self-financing. Understanding this long lasting debate is essential to have a balanced quantitative view on the relevance of infrastructure for growth (Estache and Garsous, 2012). Economists, however, hold a mixed view about the consequences of infrastructure development. One of the views about infrastructural investment is that high rate of infrastructure growth raises the level of productivity in the current period, and also leads to a higher potential level of output for the future (Koner et al, 2012). The argument in opposition is that rapid infrastructural development leads to unbalanced form of development process (Koner et al, 2012). Consequently, some areas develop rapidly, whereas other areas remain underdeveloped. Population from underdeveloped areas move to developed areas imposing a burden on resources in these areas.

2 Literature Review

2.1 Theoretical Approaches to Modelling the Impact of Infrastructure on Growth

Following Dissou and Didic (2013), we can distinguish between two theoretical approaches to modelling the impact of infrastructure on growth. The first treats infrastructure expenditures as a flow variable which directly enters the production function. The second treats infrastructure as accumulated capital, rather than as current flows, and thereby represents infrastructure as a stock variable in the aggregate production function.

2.1.1 Modelling Infrastructure as a Flow Variable

Barro (1990) models infrastructure in the context of a simple AK endogenous growth model. The two building blocks of his model are a production function that incorporates public services (an expenditure flows variable) as an input to private production, and a Ramsey equation that captures the representative consumer's optimization behaviour.

The main advantage of modelling infrastructure as a flow variable is that it produces highly manageable models (Fisher and Turnovsky 2013). Agenor (2007) observes that the flow specification generates results that are not qualitatively very different from studies employing the stock specification of infrastructure. However, it has been argued that as long as one is interested in modelling the impact of infrastructure on growth, the stock variable specification may be more appropriate or acceptable (Dissou and Didic, 2013). Another criticism of the flow specification approach captures the idea that it may not be realistic to describe government expenditures on infrastructure

as a non-rival good like aggregate knowledge. Public infrastructural expenditures may not always be complementary to private capital in the aggregate production function, and instead may be rival at the level of the aggregate economy through crowding out effects.

2.1.2 Modelling Infrastructure as a Stock Variable

Futagami et al. (1993) combine Barro's (1990) model with the assumption that government spending does not influence the aggregate production function directly, but only indirectly via the stock of public capital. By including two stock variables, Futagami et al. (1993) bring transitional dynamics into the model in contrast to the endogenous growth models employing the flow specification. The main finding of the Futagami et al. (1993) study is that Barro's (1990) result about optimal fiscal policy remains valid in the steady-state equilibrium even if government services are proportional to the stock of public capital (rather than capital expenditure flows), but not in the development transition phase.

Futagami et al.'s (1993) modelling strategy of incorporating public infrastructure into an endogenous growth model differs from that of Barro (1990) in that government services are now accumulated like physical capital. In this framework, the steady-state per capita capital equation implies that consumption growth is positively related to infrastructure accumulation and is negatively related to the tax rate, the capital depreciation rate and the time preference rate.

2.2 Review of Empirical Literature

The empirical literature on the infrastructure-growth nexus was pioneered by Aschauer (1989a, 1989b). The results of Aschauer's (1989a, 1989b) papers, which revealed a strong empirical positive relation between public capital and GDP growth in developed economies, provoked intense interest. More specifically, he found that a 1% rise in the public capital stock would raise total factor productivity by 0.39%. One of the major issues which have played a role in the subsequent literature concerns the statistical problems with infrastructure data availability. This section, therefore, presents a review of the findings of some of the studies in Nigeria, especially the very recent ones, for lack of enough space.

2.2.1 Evidence from Nigeria

In Nigeria, some authors have also attempted to examine the relationship between infrastructure and economic growth. For example, Imobighe and Awogbemi (2006) regressed private capital stock, non-military, net investment, time to capture the effects of the technical changes in economic growth, one year lag GDP and electricity supplied against Gross Domestic Product to assess the impact of capital stock in Nigeria's economic growth from 1980-1998. They found gross domestic product to be positively related to private capital stock by one year lag, while electricity supply was found to be negatively related to recurrent and capital expenditure, except expenditure on defence and technical change.

Nurudeen and Usman (2010) use cointegration and error correction methods to analyze the relationship between government expenditure and economic growth in Nigeria over the period 1970-2008. Their results reveal that government total capital expenditure, total recurrent expenditures, and government expenditure on education have negative effect on economic growth. On the contrary, rising government expenditure on transport and communication results to an increase in economic growth.

Using Ordinary Least Squares and Granger Causality econometric techniques, Owolabi-Merus (2015) investigates the infrastructural development-economic growth nexus in Nigeria over the period 1983 to 2013. His empirical results reveal that infrastructure (measured by Gross Fixed Capital Formation) has a positive and statistically significant impact on Nigeria's economic growth. However, the Granger Causality test connotes that there is no mutual correlation between both variables in Nigeria in the period under review.

Using both primary and secondary data, Siyan, Eremionkhale and Makwe (2015) examined the impact of road transportation on economic growth in Nigeria. Probit model was used to analyse the primary data while multivariate model was used for analysing the secondary data to determine the long run relationship between growth and road transportation. Their results show that the transport sector has a positive impact on the economic growth in Nigeria.

In an empirical analysis of the relationship between infrastructural development and economic growth in Nigeria between 1981 and 2013, Michael (2016) collapsed two models, one of which is a Cobb-Douglas production function, into one which he

estimated using OLS. From the results, it is clear that infrastructure (measured by the road component alone) is an integral part of Nigeria economic growth.

This study is an improvement on other studies on the infrastructure-growth nexus in Nigeria for two reasons. Firstly, unlike some of the previous studies in Nigeria which use data on public capital as proxy for infrastructure, it uses data on infrastructure. Public capital seems to be attractive because it is somewhat easier to identify in many countries. But it is a broader concept that is itself quite unclear. For instance, it can include all public buildings, including often hospitals, schools or public housing and office stocks, or police and fire stations. Thus the extent of its relevance to assess the impact of infrastructure on growth is at best unclear. It is in fact worsening since, as pointed out by Straub (2011), the relative importance of the private sector in infrastructure has increased a lot more than in other activities. Some other studies used government total capital expenditure. Even for those that used infrastructure stocks, they concentrated on just one component of infrastructure at a time. Secondly, this work extends the study period to 2015.

3. Methodology

This section focuses mainly on the theoretical framework, model specification, estimation technique, source of data, description and measurement of variables as well as expected contribution to knowledge.

3.1 Theoretical Framework

In analysing the impact of infrastructure development on economic growth in Nigeria, this study will employ the theoretical approach which models infrastructure as a stock variable. In view of this, it adopts the approach of Canning and Pedroni (2004) who use a supply side model to analyse the impact of infrastructure on growth with physical measures of infrastructure.

Canning and Pedroni (2004) specify a production function as follows:

Table 1: Unit Roots Tests Results

Variable	ADF Test Statistic (At Level)	ADF Test Statistic (1st Diff)	ADF Test 5% Critical Level	PP Test Statistic (At Level)	PP Test Statistic (1st Diff)	ADF Test 5% Critical Level	Remarks
Log(GDP)	-2.479495	-5.53975*	-3.548490	-2.510766	-5.586195*	-3.548490	I(1)
Log(GFCF)	-1.530115	-3.790329*	-3.557759	-1.367994	-6.620509*	-3.548490	I(1)
Log(LAB)	-2.767721	-5.525181*	-3.548490	-2.947606	-5.666857*	-3.548490	I(1)
Log(AT)	-2.473545	-3.781052*	-3.557759	-2.685813	-6.361448*	-3.548490	I(1)
Log(CI)	-5.420931*		-3.562882	1.430451	-3.614429*	-3.548490	I(1)
Log(PI)	-3.222485	-8.635680*	-3.548490	-3.354348	-8.556179*	-3.548490	I(1)
Log(RL)	-2.983503	-5.507342*	-3.557759	-2.463116	-10.79126*	-3.548490	I(1)

Source: Author's Computation, 2016

The results in Table 1 reveal that all the variables are integrated of order one. We then proceed with the Ordinary Least Squares regression involving equation (3).

4.2 Regression Results

Equation (3) was estimated using the ordinary least square (OLS) technique with Eviews econometric software in order to examine the role of infrastructure development in promoting economic growth in Nigeria. The results are presented in Table 2.

Table 2: OLS Results

Dependent Variable: D(LOGGDP)
Method: Least Squares
Date: 06/30/16 Time: 08:18
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.054844	0.026815	2.045267	0.0503
D(LOGGFCF)	0.051667	0.060023	0.860796	0.0009
D(LOGLAB)	0.648852	0.686721	0.944856	0.0005
D(LOGAT)	0.034637	0.045751	0.757059	0.0005
D(LOGCI)	0.015473	0.059808	0.258710	0.0009
D(LOGPI)	0.141358	0.090604	1.560175	0.0013
D(LOGRL)	0.132155	0.368120	0.358999	0.0023

R-squared	0.944738	Mean dependent var	0.036143
Adjusted R-squared	0.938532	S.D. dependent var	0.073478
S.E. of regression	0.074880	Akaike info criterion	-2.168997
Sum squared resid	0.156997	Schwarz criterion	-1.857927
Log likelihood	44.95745	Hannan-Quinn criter.	-2.061616
F-statistic	26.789751	Durbin-Watson stat	2.004965
Prob(F-statistic)	0.040540		

Source: Author's Computation (2016)

The results in Table 2 above show that there is a positive and significant relationship effect of total air transport infrastructure (AT), communication infrastructure (CI), power infrastructure (PI) and total rail lines (RL) on economic growth (measured by GDP) with elasticities of 0.035, 0.016, 0.141 and 0.132, respectively.

5 Concluding Remarks

Based on the discussion and findings of this study, it is obvious that without adequate infrastructure, the Nigerian economy may not be able to overcome its structural challenges and achieve sustainable growth and development. It will, therefore, be worthwhile for the Nigerian government and policymakers to implement policies geared towards the development of infrastructure. Also, as the government cannot do it all alone, the private sector needs to be actively involved through the Public-Private Partnership (PPP), with the government creating an enabling environment for this to thrive. It is true that the government has taken some steps in this regard such as with the establishment of an Infrastructure Finance Office in March 2010, with an accompanying N300 billion 'Power and Aviation Fund' (PAIF). According to Sanusi (2012), the Fund is administered by the Bank of Industry for onward lending to Deposit Money Banks at a maximum interest rate of 1.0 per cent, and disbursement at concessionary interest rates of not more than 7.0 per cent to client/projects of a 10-15 year tenor. The African Finance Corporation serves as Technical Adviser to the Fund. It is the hope of the government that the Fund will act as a much-needed catalyst to bridge the nation's infrastructural gap through lending at concessionary rates to the private sector. However, the government needs to make sure that such measures are sustained and are not politicised.

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