

ASSESSING THE RELATIONSHIP BETWEEN INFRASTRUCTURAL DEVELOPMENT AND PRIVATE SECTOR INVESTMENT IN NIGERIA.

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ABSTRACT

This study primarily examined the impact of infrastructure development on private sector investments in Nigeria. Using time series data spanning from 1986 to 2010, the study adopted an *ex-post facto* design and employed the Co-integration and error correction model (ECM) estimation techniques to test the long-run dynamics of the relationship between private sector investment and infrastructure in road sector, private sector investment and infrastructure in power sector and private sector investment and infrastructure in telecommunication sector in Nigeria. The results of the study revealed that investment in road, telecommunication infrastructure and inflation rate had significant positive impact on private sector development while investment in power sector had negative impact on private sector investment in Nigeria. The economic implications are that infrastructural development can be said to ‘crowd in’ private sector investment in Nigeria. We recommend that better policies such as policy on infrastructural development are needed which will encourage private sector participation in funding and maintenance of investment in infrastructural development in Nigeria.

INTRODUCTION

Investment is an essential component of aggregate demand and fluctuations in investment have considerable impacts on economic activities and long-term economic growth. The view that investments in infrastructure are essential to economic growth is reflected in the development strategies and economic policies of many countries (Serven, 1996). In other words, investment in infrastructure is essential to economic growth in Nigeria which will in turn help in knowing the quality of life, poverty reduction, access to education, good quality healthcare and achieving many other goals. But it is a difficult task for private sector to get infrastructure right.

Nigeria like most other developing economies, has adopted various forms of fiscal and monetary policy reforms since independence. One of the major objectives of the reforms is to place the private sector in the driver’s seat of economic growth and development (Muyiwa, 2010). Busari and Fashanu (1998) posit that prior to the adoption of market economy, which resulted in the adoption of Structural Adjustment Programme (SAP) in the early 1986; the Nigerian economy was characterized by excessive government control of production, financial intermediation process and foreign trade variables via the administrative determination of interest rates, prices and exchange rates. The adoption of Keynesian economic doctrine was premised on the need to sustain the pace of economic growth and development within the environment of a shallow and weak private entrepreneurial class (Ndebbio and Ekpo, 1991).

Keith (2013) defined private sector investment as a process of investing in a commodity that is not traded publicly. It also refers to a private business that has a limited number of shareholders.

A close examination of the aggregate domestic investment income reveals that the collapse of investment which began in the early 1970s was broad based (Donwa and Agbontaen, 2010). According to Donwa and Agbontaen (2010), the aggregate investment income level in the early 1970s was between N128.6 to N297.8 million, but fell as low as N404.1 and – N334.7 million in the early 1980s. They further confirm that In

1987, the level of investment in Nigeria rose to as high as N2452.8 million and reached its peak of N258, 388.6 million in 2003. However, since 2004, domestic investment in Nigeria has witnessed a continuous decline which has fallen below any other level of loss ever recorded since independence. With as low as N1921.2 million in 2005 to as drastically low as N114484.4 million in 2008. All these, they argued, resulted to the level of domestic investment in the Nigerian economy has fallen with over 145 percent below its position in 2004 (Donwa and Agbontaen, 2010).

Apparently, if private investment remains at the current low level, it will slow down potential growth and reduce long-run levels of per capital consumption and income, thus militating against the sustainability of economic growth and any hopes of meaningful poverty alleviation (Iyoha, 1999).

Sanusi (2012) opines that the current level of infrastructure deficit in terms of road infrastructure, power and information communication technology (ICT) infrastructure in Nigeria has been a major constraint toward achieving vision 2020. He further state that about 70 percent of the 193,000 kilometers of Nigerian roads are in bad or poor condition; the power outages in the country amount to over 320 cost every day in a year with over 60 percent of the population lacking access to electricity and ICT.

Therefore, a clear understanding of the important of road, power and telecommunication infrastructure and their impact on private sector investment in Nigeria is essential in order to find the major sources. This is because of the level of fluctuations in the aggregate private sector investment in the Nigeria. Thus, this is the focus of this work.

One of the most important factors determining the potential success of reform programmes is the extent and pace at which private investment responds to policy changes (Busari and Omoke, 2008). The behaviour of private investment has been a major focus of attention in assessing the efficiency of economic policy and financial reforms. Existing evidence generally points to a decline or stagnation of private investment in developing countries (Lemi and Sisay, 2000 and Dehn, 2000).

Despite the far-reaching economic policies and financial reform measures put in place in Nigeria with the hope that private investment share of the gross domestic product (GDP) through infrastructural development will improve, the result has been disappointing as the ratio is declining. Private investment share of the GDP is still below 10% (Central Bank of Nigeria (CBN), 2010). It is also surprising to note that domestic credit to the private sector has continued to grow but the expected investment associated with such favourable investment climate and macroeconomic stability measures been pursued by the government has been elusive. Studies have been carried out to examine the determinants of private investment behaviour in Nigeria, but unfortunately the results have been controversial and hence inconclusive (Busari and Omoke, 2008). More attention has been concentrated on the traditional determinants of private investment such as output, credit/liquidity, and relative prices. Very few studies exist on how infrastructural development affects private sector investment in Nigeria. It is also likely that the prevalence of infrastructure challenges in the country may be responsible of the inability of private investment flows to respond to policy changes and incentives.

Sadly enough, public investments in Nigeria in terms of road infrastructure, the level of electricity generation and ICT infrastructure have not improve the state of infrastructure in the country. Businesses are left to provide their own power supply and to cope with high cost of transportation in the country. This study therefore seek to identify those major determinants of infrastructure development and their effect on private sector investment in Nigeria with a view to making far-reaching policy recommendations that if implemented, will boost and encourage private sector investment in Nigeria.

REVIEW OF RELATED LITERATURE

Conceptual Review

Theoretically, we expect a positive relationship between government size and private investment behaviour. This is because increase in government size is likely to have a positive effect on economic growth as it increases the tempo of economic activities. This in turn increases real income and aggregate demand. Empirical literature on the impact of public investment on private sector development has been very scanty. To the best of our knowledge no study in Nigeria has attempted to examine the impact of public investment on private sector development. Most studies focus on the impact of government expenditure on growth and the

results are mixed. Aschauer (1989), Ram (1996), Esfahani and Ramirez (2003), for example found evidence that larger government size is positively correlated with economic growth. Landau (1983), Uwatt (2006), Barro (1991), among others, found a negative relationship between government size and economic growth. In addition, public investment is expected to complements private investment both on the demand and supply sides. On the demand side, government is a big spender most firms in Nigeria rely on government expenditure to deplete their stock of inventory. Government expenditure on infrastructures such as roads, electricity, water and transportation complement private businesses by reducing the costs of doing business on the supply side.

Exchange rate reforms may have positive or negative effects on investment depending on whether or not the reform leads to real appreciation or depreciation. Exchange rate appreciation will increase the cost of imported capital especially in Nigeria where most of the capital goods are imported and intermediate goods and subsequently depress investment. On the other hand, exchange rate depreciation that raises the profitability of traded goods sector would stimulate investment. Studies conducted by Akpokodje, (1998), Oshikoya (1994), and Chete and Akpokodje (1997) for developing countries have found a negative association of exchange rate and private investment. Moreover, private entrepreneurs may defer investment until they are sure the reform would be permanent.

Financial sector reforms such as an increase in real deposit rate or reduction in directed credit allocation policies, which increases the availability of bank credit to the productive private entrepreneurs, may also have a positive impact on investment. The received theory predicts an inverse relation between interest rate and investment. Empirical literatures that attempt to investigate the impact of macroeconomic uncertainty on investment have used a variety of measures Precious (1985), Pindyck (1991), Solimano (1986), and Serven and Solimano (1993). In this paper we used the standard deviation of inflation as measures of uncertainty.

Government Policy and Private Investment

The central issue of public policy in an economy is how best to use available resources, capital and natural endowments to achieve economic development. In the Tanzanian economy a significant part of resources is privately owned by numerous relatively small farmers and businesses who, acting independently, contribute to flexibility and entrepreneurship, features not typical of the public sector.

A viable private sector is an important economic agent for stimulating growth. The public sector should provide at a manageable economic cost the necessary infrastructure and an overall environment conducive to sound investment. Without this, the private sector is unlikely to make its full contribution to development. An inefficient and ineffective government, or one with policies that significantly distort private sector decision making, will have a negative impact on both the private and public sector.

It has been observed that monetary, fiscal and exchange rate policies for correcting unsustainable macroeconomic imbalances are bound to affect private investment (Serven and Solimano, 1992).

There are two ways by which restrictive monetary and credit policies included in stabilization packages affect investment. These are the rise in the real cost of bank credit and the opportunity cost of retained earnings from higher interest rates. The user cost of capital is increased by both mechanisms, leading to a reduction in investment. These effects have been pointed out by, for example, Greene and Villanueva (1987), and Solimano (1989). Van Wijnbergen (1982), and Blejer and Khan (1984), differ, however, noting that credit policy affects investment directly, because credit is allocated to firms with access to preferential interest rates rather than through the indirect interest rate channel. Thus the effect of monetary and credit policy on investment and the means of transmission depend on the institutional structure of financial markets.

Road Infrastructure

Aderamo (2012) states that road infrastructure is a very important element of improving Nigerian economy. He went further to state that:

Road infrastructure is by far the most important element in the country's transportation network carrying about 95 per cent of all the nation's goods and passengers. Also, about 70% of public sector investments in the transport sector have on the average been on highway. The estimated total road length in 1946 was 11, 427Km of Trunk A and Trunk B roads and 40,225Km of feeder roads.

By 1985, road length had increased to 114,800 Km and as at January, 1996, the road length totaled 193, 200Km, out of this figure 32,100km (17.0%) can be classified under federal or trunk roads; 30,500Km (16.0%) under state roads and 130,600Km (67.0%) under local government roads.

Buhari (2000) opine that only 50% of the federal roads and 20% of the state roads were in reasonably good condition as at June, 1996 and only an estimated 5% of the total rural roads were freely motor able. Nigeria has the largest road network in West Africa and the second largest South of the Sahara. However, the roads are poorly maintained and are often cited as a cause for the country's high rate of traffic fatalities. In 2004, Nigeria's Federal Road Maintenance Agency (FERMA) began to patch 32,000Km federal roads and in 2005, FERMA initiated a more substantial rehabilitation. In Nigeria, the rainy season and poor equipment pose challenges to road maintenance (Library of Congress, 2008). Considering these issues, the current arrangement would require review even if adequate funds for road maintenance were being secured through the budgetary process. Sadly, however, road maintenance remains underfunded (Vivien and Nataliya, 2011).

Theoretical Framework

Investment literature abounds with the description of the determinants of private investment and the channels through which such variables affect investment. The theoretical framework for the study is anchored on three broad categories of variables: Keynesian, neoclassical and uncertainty variables which determine private investment.

The Keynesian investment theory which dates back to Keynes (1936) argues that income and interest rate are important determinants of investment (Obaseki and Onwioduokit, 1998). Variables that may be included in the Keynesian tradition include growth rate of GDP, internal funds (for example, change in credit to the private sector) and capacity utilization.

The Neoclassical theory formulated by Jorgenson (1971) postulates the role of the cost of capital. The neoclassical determinants of private investment include Tobin's (the role of the value of firm), real interest rate, user cost of capital and public investment ratio.

Theory of Investment

The theories of investment date back to Keynes (1936), who first called attention to the existence of an independent investment function in the economy. A central feature of the Keynesian analysis is the observation that although savings and investment must be identical ex-post, savings and investment decisions are, in general, taken by different decision makers and there is no reason why ex-ante savings should equal ex-ante investment (Jorgenson, 1967). The next phase in the evolution of investment theory gave rise to the accelerator theory, which makes investment a linear proportion of changes in output. In the accelerator model, expectations, profitability and capital costs play no role. Keynesians have traditionally favoured the accelerator theory of investment while disregarding the role of factor costs (Lawanson, 2009).

Review of Empirical Studies

Donwa and Agbontaen (2010) used Co-integration econometrics method to estimate the dynamics and trend of the determinants of investment in Nigeria for the period 1970-2008. The study found out that domestic market fundamentals, political and macroeconomic condition which exhibit reasonable level of instability discourage domestic investment. Also, past outcome of domestic investment and past values of rates of exchange encourage domestic private investment.

Ezeoha, Ebele, and Ndidi Okereke, (2009) investigated the nature of the relationship that exists between stock market development and the level of investment (domestic private investment and foreign private investment) flows in Nigeria. The authors discovered that stock market development promotes domestic private investment flows thus suggesting the enhancement of the economy's production capacity as well as promotion of the growth of national output. However, the results show that stock market development has not been able to encourage the flow of foreign private investment in Nigeria.

Awolaye, Okogun, Oguloge, Atoyebi and Ojo (2012) using Statistical Package for Social Sciences (SPSS) to analyse data generated from World Bank development indicator database and central bank of Nigeria

(CBN) statistical bulletin for the study of socio-economic effect of infrastructure development on telecommunication in Nigeria. The result shows that infrastructure in telecommunication is statistically significant and positively correlated with economic growth in Nigeria and that telecommunication contribution to GDP has a negative relationship with economic growth in Nigeria. They recommend that some appropriate policy direction that will guide the government in telecommunication and economic policies in other to promote public as well as private investment in telecommunication which will turn might further boost economic growth. The study fell to list those economic policies that will help government in telecommunication.

Udah (2010) used the co-integration and error correction model to investigate the extent to which government size and macro economic reforms affect private investment behaviour in Nigeria. The result shows that government size did not complement private investment. The study also reveals that private investment, interest rate, political stability and external debt were significant and positively influence private investment.

Muyiwa (2010) in a study of infrastructure development on economic growth in Nigeria: Road map to sustainable development using descriptive survey and questionnaire. It was discovered that for Nigerian economy to grow, strategic investment in infrastructure is an important element of the growth and must be encourage by the Nigerian government, while government need to agree that they lack the resources require the infrastructure that will sustain economic growth in Nigeria. this means that, going by the current rate of infrastructure development and it's contribution to gross domestic product (GDP), a more realistic target put Nigeria's journey more along an attainable date of 2050, that is by reaching current benchmark target.

Nworji and Oluwalaiye (2012) studied government expenditure on road infrastructure and its impact on the growth of Nigerian economy using ordinary least square (OLS) technique. It was found that transportation, communication and defence has a statistical significant impact on economic growth in Nigeria and inflation has positive statistical effect on the growth of Nigeria economy. The study suggested that better coordination is needed in terms of private participation in funding and maintenance of road infrastructure that will enhance economic growth in Nigeria.

Anyadike (2012) in a study of poor infrastructure; the hindrance to foreign investment and economic development in Nigeria using contents analysis. The study observed that foreign investment inflow in Nigeria has not been flourishing and the primary reason is poor infrastructure base of the country in terms of energy, road network and skilled manpower as well as insecurity in the country. The study recommend that the country power sector which the engine room of the nation's economy should be standardized.

Ikpechukwu and Urael (2012) investigated the effect of quality of transport infrastructure on Nigerian economy using pearson correlation coefficient. The study found that insufficient fund was identifying as the ban of growth of transport sector in Nigeria. It also suggests that policy makers should prioritize appropriate and adequate investment on transport infrastructure in Nigeria.

Onakoya, Salisu and Osein (2012) in a study of infrastructure and economic growth in Nigeria using a multivariate approach of simultaneous equations. This study reveals that infrastructure investment has a significant effect on output of the economy through its industrial output and indirectly through the output of other sectors such as manufacturing, oil, road and other services. They recommend increase on investment in infrastructure so that it will help to increase the level of economic growth in Nigeria.

Methodology

This study used the *Ex-post facto* research design. A set of regression estimation techniques were applied to resolve the three hypotheses stated while time series analysis was utilized to examine the magnitude and significance of the relationship among the research variables. This study covered private sector investment in Nigeria for the period under review (1986-2011). Given that the study used secondary data, the sample size was taken to be the same with the population of the study. This study exclusively used secondary sources of data generated from the Central Bank of Nigeria Statistical Bulletin and those of the Federal Bureau of Statistics. The Error Correction Mechanism (ECM) was used as a framework for establishing the links between the long-run and short-run approaches in econometric modeling.

Description of Research Variables

The research variables which are time Series in nature are grouped into dependent and independent variables. The dependent variable which forms the basis for this study is the private sector investment to real GDP ratio (PRI/GDP). In measures of national income and output, "gross investment" (represented by the variable I) is a component of Gross Domestic Product (GDP), given in the formula $GDP = C + I + G + NX$, where C is consumption, G is government spending, and NX is net exports, given by the difference between the exports and imports, $X - M$. Thus investment is everything that remains of total expenditure after consumption, government spending, and net exports are subtracted (i.e. $I = GDP - C - G - NX$). The independent variables are investment in road infrastructure (Road) which was measured using the amount allocated to road construction under the Federal Ministry of Works.

Model Specification

The extended investment model has been used by Asante (2000), Busari and Omoke (2008), Donwa and Agbontaen (2010) and Isa (2012) for similar studies. The model therefore estimates that:

$$PRI/GDP_t = \beta_0 + \beta_1 INFRA\ ROAD_t + \beta_2 INFRA\ POWER_t + \beta_3 INFRA\ TELECOM_t + \beta_4 REX_t + \beta_5 RIR_t + \beta_6 INF\mu_t \dots (1)$$

Where,

PRI/GDP = Private Investment to real GDP ratio

INFRA ROAD= Infrastructure Development in Road.

INFRA POWER= Infrastructure Development in Power.

INFRA ICT = Infrastructure Development in ICT.

REX = Real Exchange Rate measures the rate of exchange risk as a direct domestic risk.

RIR = Real Interest Rate (Proxied by the real Lending Rates)

INF = Macroeconomic uncertainty measured by of inflation rate.

Descriptive Result

Error Correction Mechanism (ECM)

As noted, the ECM is meant to tie the short-run dynamics of the cointegrating equations to their long-run static dispositions. Below is the ECM test for the given data:

The regression result is based on table 3 below.

Dependent Variable: PI_RGDP

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|-----------|-------------|--------------------|-------------|----------|
| C | 8.383902 | 2.950948 | 2.841088 | 0.0000 |
| IROAD | 0.678141 | 0.564120 | -1.173484 | 0.0000 |
| IPOWER | -0.894127 | 5.373745 | -2.364811 | 0.0000 |
| ICT | 0.458222 | 4.456129 | 1.716891 | 0.0002 |
| INFL | -0.960632 | 0.630704 | -1.974738 | 0.0038 |
| REX | 0.788815 | 0.410440 | 2.844397 | 0.4095 |
| R-squared | 0.973163 | Mean dependent var | | 6.977200 |

| | | | |
|--------------------|-----------|-----------------------|----------|
| Adjusted R-squared | 0.930885 | S.D. dependent var | 3.059820 |
| S.E. of regression | 2.308320 | Akaike info criterion | 4.742413 |
| Sum squared resid | 95.91013 | Schwarz criterion | 5.083698 |
| Log likelihood | -52.28016 | Hannan-Quinn criter. | 4.837071 |
| F-statistic | 20.58745 | Durbin-Watson stat | 2.688652 |
| Prob(F-statistic) | 0.000000 | | |

Source: E-View (Error Correction Model Estimates).

In order to absolve the short-run dynamics of the relationships, the Error Correction Mechanism holds that a negative error correction coefficient is a necessary condition in the model. In this case, the error correction coefficient is -0.469889. The negative sign of the coefficient satisfies one condition. Hence, the result gives the validity that GDP and the explanatory variables (IROAD, IPOWER, ICT, INFL and REX) have a long run equilibrium relationship. More so, it is concluded that the Error Correction Model (ECM) is not a spurious model as the computed R^2 value of 0.973163 is lower than 2.688652 (Durbin Watson Statistics). The Durbin Watson Statistics of 2.688652 shows the absence of serial correlation in the regression model. Hence the problem of multi-colinearity is non-existent in the model.

The computed R^2 value of 0.973163 which is the coefficient of multiple determination indicates that the model satisfies the requirements for goodness of fit. The value shows that 97.32% of the total variations in Private Investment (PI/GDP) are adequately accounted for, by the Infrastructural Development and other explanatory variables (IROAD, IPOWER, ICT, INFL and REX).

More so, the joint influence of the explanatory variables on the dependent variable is statistically significant. This is also confirmed by the F-probability which is statistically zero.

ECM test is used in testing the first hypothesis while t-test and F-test are used in testing the second and third hypotheses respectively. Judging from the ECM coefficient, it is observed it is negative implying that it is significant and approximately more than or equals to 50% (-0.469889). However, the p-value of the F-statistics is 0.000 implying that it is less than 0.05 level of significance. Thus, the null hypothesis of the second hypothesis is rejected while the alternative is accepted. More so, the t-value of the regression coefficient of ICT as a variable is statistically significant. This is confirmed by the p-value (0.0002) which is less than 0.05 level of significance. Thus, the null hypothesis is rejected as well. Thus, all the null hypotheses are rejected. Hence the acceptance of the alternative hypotheses;

From the table above, the beta coefficient of the investment in road infrastructure variable (IROAD) is 0.678141 while the t-statistic is 1.173484 at 5% level of significance. It is significant and positive, and agrees with the alternate hypothesis. Based on the results, we conclude that investment in road infrastructure have indeed had significant positive impact on private sector investment in Nigeria.

The t-test result as contained in table 3 above indicates that the beta coefficient is -0.894127 while the t-statistic is -2.364811. This indicates support for the alternate hypothesis and rejection of the null hypothesis. It leads to a conclusion that the prevailing investment in electricity generation does encourage private sector investment in Nigeria. Hence, we found that investment in power infrastructure has significant negative impact on private sector investment in Nigeria.

The ECM result as contained in table above indicates that the beta coefficient of investment in ICT infrastructure is 0.458222 while the t-statistic is 1.716891. This indicates a lack of support for the null hypothesis and acceptance of the alternate hypothesis. It leads to a conclusion that even though the investment in telecommunication infrastructure is positive and significant, the level of infrastructural in ICT has indeed supported private sector investment in Nigeria.

Conclusion

From the research findings, the study has yielded empirical evidence and thus concluded that infrastructural development in road and ICT have indeed impacted significantly on private sector investment in Nigeria; that investment in power sector infrastructure and inflation rate have negatively impacted on private

sector investment in Nigeria; and that real exchange rate have insignificant impact on private sector investment in Nigeria.

From the analysis done in this study, we conclude that infrastructure development “crowds in” private sector investment in Nigeria. This indicates that infrastructural development in Nigeria compliments private sector investment in Nigeria.

The economic implication of the findings are that the increase in government expenditure on investment in road and telecommunication infrastructure will help to increase the level of private sector investment in Nigeria; that investment in power sector infrastructure compliments private sector investment.

Recommendations

The study recommends as follows:

1. That greater public expenditure should be on infrastructural development since such investment compliment private sector development.
2. That the power sector of the country should be improved by allocating more funds to the sector which will in turn help the growth of Nigerian economy.
3. That better policies (eg. Budget implementation) is needed which will encourage private sector participation in funding and maintenance of investment in infrastructural development in Nigeria.

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