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EFFECT OF GOVERNMENT INFRASTRUCTURE INVESTMENT ON ECONOMIC GROWTH IN SUB-SAHARAN AFRICA: EVIDENCE FROM NIGERIA, SOUTH AFRICA AND GHANA (1980-2013)

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ABSTRACT

This study examines the effect of government infrastructure expenditure on the economic growth of three Sub-Sahara African (SSA) countries of Nigeria, South Africa and Ghana from 1980 to 2013. The objective is to analyze the growth effect of three infrastructure variables of communication, power and railways on the economies of these countries; Secondary data are sourced from World Development Indicators (WDI) online Database and analyzed, using Co-integration techniques and Vector Error Correction mechanism (ECM), at 1% and 5% significance levels. The results indicate that two out, of the three infrastructure proxy variables (communication,(GFCOM), and railway, (GFRAIL) show significant positive effect on growth only in South Africa, implying that infrastructure gaps exist in SSA;). This study concludes that the economies of SSA countries still exhibit the potentials for enhanced economic growth in the long run judging from the VECM test results. The study recommends increased budgetary allocations, as well as to access both concessional and non-concessional loans to finance infrastructure gaps.

KEYWORDS: *Government Infrastructure Expenditure, Infrastructure Gaps, Economic Growth, Cointegration and Vector Error Correction Model, Sub-Sahara African, Economies.*

INTRODUCTION

Background to the Study

The resolution of the controversy whether government spending stimulates economic growth still remains a big research burden (Nwinee & Torbira, 2012). Some theories and past empirical studies have identified public expenditure as a major driver of economic growth through the channel of fiscal operation. In developing countries, public spending plays an active role in reducing business overhead cost and creating infrastructure for economic growth in the form of power, transport and communication facilities, among others (Bhatia, 2006). According to Mwafaq, (2011) the popular view among economists and policy makers is that government can play a very important role using fiscal policy instrument to intervene in the economy, to control fluctuations in the real gross domestic product (GDP). Currently, Sub-Sahara African (SSA) countries and other developing countries are using fiscal policy to counter the effect of economic down turn. Governments are the most prominent financiers of infrastructure investment in Sub-Saharan Africa. Except in the middle-income countries, governments are responsible for between 80-90 per cent of total capital investment, consistently allocating at least 80 percent of their infrastructure budgets to investment.(Briceño-G., Smits, & Forster, 2008)

Infrastructures are public goods and services that go into the production process as complimentary inputs for traditional factors of production such as capital, labour and entrepreneur. They help to increase returns on investments by reducing production cost

and improving transaction efficiency. The availability of infrastructure facilities and services, as well as the efficiency of such services to a large extent, determine the success or otherwise of all other production endeavours. The importance of infrastructural facilities and services in promoting economic growth has been acknowledged by different organisations. The Organisation of Economic Cooperation and Development OECD (2006) for instance, states that investments in infrastructure such as energy, water, transportation, and information and communication technologies (ICT), promote economic growth and help to alleviate poverty and improve living conditions in developing countries. International Labour Organisation (ILO) report (2010), equally emphasized that without infrastructure development many of the MDGs target will not be met, and sustainable infrastructure is an essential part of livelihood of the poor: through provision of opportunities for creating jobs during development, operation, and maintenance. Calderon and Serven, (2008)) observed that the deficient quantity and quality of Africa's infrastructure is potentially a major obstacle to poverty reduction across the region. Consequently, SSA ranks at the bottom of all developing regions in terms of infrastructure performance. Briceno-G., Smits, & Foster (2008), noted that a favourable external environment (notably high commodity prices) for several years running, and sustained economic growth averaging at least 4.5 percent annually have, expanded the resources available to the governments of Sub-Saharan Africa as well as their budgets. For instance, in the period 2001-05, the Sub-Saharan Africa government's budgets grew by almost 1.9 percent of GDP with regional average driven largely by increases in middle- income countries. The additional budgetary resources helped the low-income aid-dependent countries to bolster capital investments including infrastructure to which at least 40 percent of the additional resources were allocated. However, it is striking to note that the oil-exporting and middle-income countries have decreased their investment despite having more fiscal resources available. The oil-exporting countries lowered their capital expenditures on average by 3.3 percent of GDP. In oil-exporting countries, the decrease in budgetary expenditure was largely absorbed by a significant reduction in infrastructure expenditures. To a large extent this reflects developments in Nigeria, where infrastructure expenditures decreased by 2.2 percent points of GDP for the period 2001-05. The middle-income countries appear to have chosen to devote more resources to maintenance. Most of their capital budget was allocated outside infrastructure (Briceno-G, Smits, & Foster 2008)

However it has been sadly noted that, despite all the laudable efforts of governments in SSA, the region remains consistently behind all other developing regions of the world in terms of infrastructure. For instance;

- Infrastructure investment as a percentage of GDP is about 10% compared to 16% in other developing regions
- Telephone penetration in the region is only about 14% compared to an average of about 52% in America, Asia and Europe.
- A recent estimate shows that SSA region currently has infrastructural deficit of about $31 billion (AICD, 2012)
- In order to close this gap and maintain economic growth by the year 2015, it has been estimated that the region would require approximately $ 93 billion each year (AICD, 2011)
- Current spending on infrastructure from within and outside the region is about $ 45 billion per annum (AICD, 2008).

This paper therefore, re-examines the effect of infrastructure investment on economic growth in three selected Sub-Saharan African countries of Nigeria, South Africa and Ghana from 1980 to 2013.

STATEMENT OF THE PROBLEM

There has been a continued debate among scholars on public expenditure-economic growth nexus, which has given rise to conflicting and inconsistent results .For instance, in terms of government infrastructure investment, Calderon and Serven (2008) found that telephone infrastructure impacts positively on growth by reducing income inequality, while Veredas, Estache and Speciale (2005) equally found that unreliable electricity infrastructure is a significant deterrent of economic growth. Furthermore, Keynes argued that government budgetary expansion (fiscal policy intervention in the economy), helps to improve the failure that might arise from the inefficiencies of the market. Hence government spending augments aggregate demand, and through multiplier effect stimulates economic growth.(Ebiringa & Charles-Anyaogu 2010). This view is in contrast with the position of the neoclassical who held the view that government consumption expenditure crowds out private investment, hampers economic growth in the shortrun and diminishes capital accumulation in the long run.(Diamond, 1989).

However, Al-Yousif (2000), Ranjan and Sharma, (2008), Cooray (2009) in line with the Keynesian model, concluded that when government increases expenditure on socio-economic and physical infrastructures it contributes positively to economic growth. However, Ram (1996) found a stronger positive relationship existing between public expenditure and economic growth in lower income countries than in higher income countries. The reasons adduced for this scenario is that sometimes government activities produce misallocation of resources and impede the growth of national output, as is the case with some politicians and governments in power who engage in unproductive projects.

The fear is that such inconsistencies may have adverse effect on policy-making in the different economies and therefore need to be addressed to avoid the use of blanket policy recommendations for all economies. The contrasting views and inconsistencies of the extant studies could be attributed to the cross-national nature of some of the previous studies which sometimes involve pooling of data. However, Pessaran an& Smith (1995) pointed out that pooling of data often result in inconsistent estimates and that the inconsistency does not disappear even when the size of the cross-section and that of the time period is large.

Since each country is unique, application of cross-national results to policy formulation for each country may therefore, be misleading. The corrective approach therefore, is to avoid pooling of data technique and rather use country specific data and perform separate analyses for each country and to make recommendations based on the observed peculiarities of each economy.

Against this backdrop the present study therefore, instead of using pooled data, uses country–specific data to analyse separately the effect of government infrastructure expenditure on economic growth of Sub-Sahara African countries, taking evidence from Nigeria, South Africa and Ghana. The recommendations of the study are equally based on the observed peculiarities of each country to avoid blanket policy effect; meaning that a common policy may not be suitable for all the countries since each country is unique.

OBJECTIVES OF THE STUDY

The main objective of this study is to investigate the effect of government expenditure in infrastructure on economic growth in Sub-Sahara Africa (SSA) taking evidence from Nigeria, South Africa and Ghana. The specific objectives include; determining the effect of the respective proxy variables of government infrastructure expenditure (GFCOM, GFPOW, and GFRAIL) on economic growth in Sub-Saharan Africa. The formulated null hypothesis says that the proxy variables of government infrastructure expenditure have no statistical effect on economic growth in SSA

THEORETICAL FRAMEWORK

The theory of this study hinges on explaining the effect of public expenditure on economic growth in Sub-Sahara African countries. This explanation is based on the Keynesian view. Keynes in his publication, 'The general theory of employment, interest and money' in 1936, asserted that a key factor that could account for an economy's stagnation and unemployment was the deficiency of aggregate effective demand. His view was that the solution to the problem of economic stagnation rested on the expansion of aggregate demand through massive increase in government expenditure. Thus, in the Keynesian model, public expenditure is an exogenous factor and policy instrument for increasing national income. The Keynesian macroeconomic theory generally assumes that increased government expenditure tends to lead to high aggregate demand and in turn rapid economic growth. In Keynesian macroeconomic thought, it is believed that public spending contributes to economic growth because when government increases consumption expenditure, it will lead to increase in employment, profitability and investment through multiplier effects on aggregate demand. Therefore, government expenditure augments aggregate demand (Ebiringa & Charles-Anyaogu 2012). Hence, the Keynesians believe on the efficacy of fiscal measures to control the economy through aggregate demand, which became necessary due to the prevalence of market failure.

Contrary to this view, the neoclassical growth models argue that fiscal policy does not have any effect on the growth of national output (Abu & Abdullahi 2010). These opponents of the Keynesian proposition claim that higher government expenditure may slow down overall performance of the economy on the grounds that by increasing rising expenditure, government may increase taxes or borrowing. Consequently, higher income taxes may discourage individuals from working for long hours or even searching for jobs, which may result in reducing income and aggregate demand. Similarly, higher profit tax has the tendency to increase production costs and reduce both investment expenditure and profitability of firms. The argument is

that when government increasingly borrows from banks to finance expenditure, it will compete (crowds-out) away the private sector thus reducing private investment. Furthermore, corruption, and activities of some politicians and government officials sometimes result in expenditure and investment in unproductive projects or in goods which the private sector can produce more efficiently. Thus government activities produce misallocation of resources and impede the growth of national output.

Furthermore, although Adolph Wagner in his Theory of Increasing State Activities admits that there is a functional relationship between government expenditure and economic growth, but causality runs from economic growth to government expenditure as against Keynesian proposition that government expenditure causes economic growth. Hence, for Keynes government expenditure is exogenous to economic growth while for Wagner government expenditure is endogenous.

However, there are some extant studies which tend to lend credence to the Keynesian hypothesis; Abdullah (2000) carried out a study on the relationship between government expenditure and economic growth in Saudi Arabia and reported that size of government expenditure is very important in the performance of the economy. He however advised that government should increase its spending on infrastructure, social and economic activities. In addition, government should encourage and support the private sector to accelerate economic growth. Also Olugbenga & Owoye (2007) investigated the relationship between government expenditure and economic growth for a group of 30 OECD countries from 1970 to 2005. The results show both a long run relationship and uni-directional causality from government expenditure to economic growth for 16 out of the 30 countries, thus supporting the Keynesian hypothesis. On the other hand, causality runs from economic growth to government expenditure in 10 out of the 30 countries, thus confirming Wagner's law. Furthermore, Liu Chih, Hsu, and Younis (2008) studied the relationship between government expenditure and economic growth for the US data from1974 to 2002. The Causality results revealed that government expenditure causes growth. On the other hand the growth of GDP does not cause expansion of government expenditure. The authors concluded that judging from the Causality Test, Keynesian hypothesis exert more influence than Wagners Law in US.

Hence, this study can be linked to the Keynesian view since government intervention in the economies of SSA countries through massive increase of public spending in the selected variables, (human capital financing, infrastructure financing, agriculturae financing among others), is expected to expand aggregate demand in the economy and enhance economic growth in the region. Anyanwu and Oaikhenan (1995), reiterated that a key factor identified by Keynes which accounts for an economy's stagnation and unemployment, was the deficiency of aggregate effective demand. In Keynes view, the solution to the problem of economic stagnation rests on the expansion of aggregate effective demand through massive increase in government expenditure.

Hence, this study examines the effect of government expenditure on economic growth in the SSA countries of Nigeria, South Africa, and Ghana through government financing of infrastructures.

METHODOLOGY

The ex-post facto research design is used. The ex-post-facto design will be used because the data type for this study are already documented by highly research- based institutions like the World Bank, IMF, OECD, CBN, among others. Thus, researchers have to rely on such official publications for valid academic exercise.

The data for the study was collected from the World Bank Development Indicator (WDI) Online Database, which provides the detailed information about the Gross Domestic Product (GDP) growth rates, , government infrastructure financing variables, for the selected Sub-Saharan African (SSA) countries. The data covers annual time series for the period (1980 – 2013). The countries selected for the study, Nigeria, South Africa and Ghana, are in the same homogenous class (middle- income Sub-Sahara Africa) and are randomly selected.

The variables used in this study include the variable of economic growth and the explanatory variables of government infrastructure spending. Since all the data for the variables were collected from the World Development Indicator (WDI) on-line database, the description to these variables is in line with those of the WDI metadata indicator source notes 2013.

The GDP is the proxy for economic growth. It is the dependent variable in this study. The GDP growth rate (annual %) is used. This is the annual percentage growth rate of GDP at market prices based on constant local currency.

The explanatory variables of Government Financing of Infrastructure include Government Financing of Communication (GFCOM), Government Financing of Power (GFPOW) and Government Financing of Railways (GFRAIL).

The model designed for the study is based on the Keynesian proposition that government expenditure is an exogenous variable that propels economic growth. The model was a modification of the models from Lopez (2003) which used telephone as proxy for infrastructure; Estache, Speciale and Veredas (2005) that include roads, power and telecommunication. This present study therefore, included the variables of communication, power and railway as shown in the function below;

GDP = f(GFCOM, GFPOW, GFRAIL)

Where:

GDP = the growth rate of the GDP at current market prices. It is the dependent variables.

GFCOM =Government Financing of Communication is proxied by Telephone lines (per 100 people).

GFPOW = Government Financing of Power is proxied by electricity production (kWh).

GFRAIL= Government Financing of Railways is proxied by rail lines (total route-km).

The relationship can be explicitly formulated into an econometric equation thus:

$$GDP = b_0 + b_1GFCOM + b_2GFPOW + b_3GFRAIL + \mu \quad \text{Equation (4)}$$

Where b_0 is a constant or intercept. b_1, b_2 and b_3 are the coefficients of the explanatory variables. μ is stochastic error term.

Econometric techniques were used for data analysis namely; the unit root, co integration, and vector error correction model. Economic time series often have non-stationary character (Sirucek, 2012). The study adopted the Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979) and the Phillips-Perron (PP) (Phillips and Peron, 1988) tests for the unit root analysis. Both techniques were used so that they can validate the result of each other.

If all the variables used are stationary, Co-integration test is equally performed to ascertain the presence or otherwise of cointegration between the series of the same order of integration through forming a cointegration equation. This tests for the existence of long-run relationship between dependent and independent variables. The Johansen (1991) cointegration technique was adopted to determine the order of integration.

If cointegration is found to exist, error correction mechanism is constructed to model dynamic relationship.The error correction model is designed to capture the short-run deviations that might have occurred in estimating the long-run co-integrating equation. The purpose of error correction model is to indicate the speed of adjustment from short run equilibrium to the long run equilibrium state. The error correction model is as follows:

$$\Delta Y_t = \emptyset_0 + \sum_{i=1}^{p-1} \emptyset_i \Delta Y_{t-1} + EC_{t-1} + \mu$$

Where

ECt-1 indicates the error-correction term.

The VECM provides a means whereby a proportion of the disequilibrium in the short run is corrected in the long run; thus, error correction mechanism is a means to reconcile the short-run and long-run behaviours of the variables (Gujarati, 2003). The size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long run equilibrium state. However, the greater the coefficient of the parameter, the higher the speed of the adjustment of the model from short run equilibrium to the long run equilibrium state

DATA PRESENTATION, ANALYSIS AND INTERPRETATION OF RESULTS

Unit Root Test

The Augmented Dickey-Fuller (ADF) and the Phillips and Perron (PP) tests are conducted on the variables, to determine whether they are stationary or non-stationary series. The two tests were employed to reinforce one another, to ensure their robustness and boost confidence in their reliability. The tested null hypotheses for both unit root tests are to determine the presence of a unit root.

Decision rule: Reject the null hypothesis when the test statistical value is less than the critical value. Otherwise, accept and test at higher difference (1 or 2). The significance level for the analysis is at 5%.

The tests are done at levels and first difference and presented in Tables 1,2 and 3 for variables on Nigeria, South Africa and Ghana respectively.

Table 1: Test of Stationarity of Variables

VARIABLES		Levels		First Difference		Order of Integration
		ADF	PP	ADF	PP	
		NIGERIA				
GDP		-3.47**	-4.07*	-	-	1(0)
GFCOM		-1.36	-1.49	-1.88	-4.60*	1(1)
LnGFPOW		-1.82	-2.01	-4.74*	-6.53*	1(1)
LnGFRAIL		-3.22**	-2.85	-4.11*	-5.56*	1(1)
		SOUTH AFRICA				
GDP		-3.90*	-4.07*	-	-	1(0)
GFCOM		-1.97	-2.08	-2.62***	-3.45**	1(1)
LnGFPOW		-2.49	-4.15*	-4.21*	-5.57*	1(1)
LnGFRAIL		-2.87	-2.71	-4.78*	-5.90*	1(1)
		GHANA				
GDP		-3.17**	-2.67	-6.58*	-7.41*	1(1)
GFCOM		-0.93	-1.09	-4.67*	-7.44*	1(1)
LnGFPOW		-1.96	-1.68	-5.15*	-4.87*	1(1)
LnGFRAIL		-2.05	-2.14	-3.74*	-5.48*	1(1)
Critical Values	**1%**	**-3.6496**	**-3.6422**	**-3.6576**	**-3.6496**	
	5%	**-2.9558**	**-2.9527**	**-2.9591**	**-2.9558**	
	10%%	**-2.6164**	**-2.6148**	**-2.6181**	**-2.6164**	

, **, * denotes significance at 1%, 5% and 10% respectively.*

The results on Table 1 show in Nigeria and South Africa, respectively, GDP, is stationary at level, while GFCOM, LnGFPOW and LnGFRAIL are stationary at first difference. This means that GDP is integrated in 1(0) while GFCOM, LnGFPOW and LnGFRAIL are integrated at 1(1) in Nigeria and South Africa respectively. In the case of Ghana, all the variables (GDP, GFCOM, LnGFPOW and LnGFRAIL) are stationary at first difference and thus integrated in the order of 1(1).

Tests for Co-integration

This study adopts Johansen co-integration test (Johansen, 1991).A co-integration test is carried out to determine the long-run relationship between the dependent and independent variables. Co-integration of two or more time series suggests that there is long run equilibrium (relationship) between them (Gujarati and Porter, 2009).

Decision Rule: The decision rule is to reject the null hypothesis if the value of the Likelihood Ratio is greater than the Critical Value. Otherwise, we do not reject.

Table 2: Test of Co-integration among Variables of Government Financing of Infrastructure and Economic Growth in Nigeria, South Africa and Ghana

Nigeria			South Africa			Ghana		
Likelihood Ratio	5% Critical Value	1% Critical Value	Likelihood Ratio	5% Critical Value	1% Critical Value	Likelihood Ratio	5% Critical Value	1% Critical Value
59.1605**	47.21	54.46	54.5832**	47.21	54.46	69.4588**	47.21	54.46
31.4617*	29.68	35.65	29.3938	29.68	35.65	27.6728	29.68	35.65
14.3086	15.41	20.04	12.4646	15.41	20.04	10.1616	15.41	20.04
1.1629	3.76	6.65	2.2589	3.76	6.65	0.4119	3.76	6.65

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
Test assumption: Linear deterministic trend in the data
Series: GDP GFCOM LNGFPOW LNGFRAIL

The results of the co-integration test for long run relationship between government financing of infrastructure and economic growth for Nigeria, South Africa and Ghana are presented on Table 2. The results show two (2) cointegrating equations for Nigeria, and one cointegrating equation for South Africa and Ghana respectively. It becomes necessary to reject the null hypothesis of no co-integration and conclude that there is the existence of long-run relationship among the variables in Nigeria, South Africa and Ghana respectively. It thus becomes necessary to reject the null hypothesis of no co-integration and conclude that

there is the existence of long-run relationship among the variables in Ghana.

Vector Error Correction

Since the results above reveal the existence of co-integration among the variables of the models, error correction models (ECM) are required to determine the short run dynamism of the relationships. For theoretical meaningfulness, the coefficient of the error term should be negative and range between zero and one in absolute term (Ogundipe & Oluwatobi, 2014). The error-correction term to be estimated represents the speed of adjustment to equilibrium trends.

The values in bracket are the standard errors while the values in parentheses are the t-statistics (see Table 3). The ECM_{t-1} is the coefficients of the lag dependent variables in their first difference. The decision rule is to accept as statistically significant, when the t-statistics is greater than 2.0. This criterion is described as rule of the thumb in Onuorah and Akujuobi (2012).

The results of the VECM for each model by country are presented as below. The presentation format was adapted from the works of Oluwatobi and Ogunrinola (2011); and Ogundipe and Oluwatobi (2014).

Equally, the nature of the long run relationship that emerged from co-integration test is examined. The contributions of the coefficients (variables) in each model were interpreted and its significance tested at 5% level, as adapted from Onuorah and Akujuobi (2012).

Table 3: Short-run Vector Error Correction (VEC) tests results on Government Financing of Infrastructure and Economic Growth, and Cointegrating equations coefficients for Nigeria, South Africa and Ghana.

Vector Error Correction Model for Nigeria

Variable	D(GDP)	D(GFCOM)	D(LNGFPOW)	D(LNGFRAIL)
ECM_{t-1}	**-0.876059**	0.000323	-0.004518	-0.000915
	(0.18042)	(0.00798)	(0.00680)	(0.00295)
	[-4.85564]	[0.04043]	[-0.66441]	[-0.30984]

Vector Error Correction Model for South Africa

Variable	D(GDP)	D(GFCOM)	D(LNGFPOW)	D(LNGFRAIL)
ECM_{t-1}	**-0.433561**	0.000214	0.002504	-0.011572
	(0.20020)	(0.03895)	(0.00290)	(0.00494)
	[-2.16562]	[0.00549]	[0.86384]	[-2.34074]

Vector Error Correction Model for Ghana

Variable	D(GDP)	D(GFCOM)	D(LNGFPOW)	D(LNGFRAIL)
ECM_{t-1}	**-0.706220**	-0.029904	0.088830	-0.000673
	(0.26050)	(0.01938)	(0.01681)	(0.00082)
	[-2.71099]	[-1.54297]	[5.28535]	[-0.82293]

Table 3 was used to examine the short run dynamism of the Government Financing of Infrastructure and Economic Growth Model as well as the nature of the relationship that exist in the model. The analyses were performed for variables in Nigeria, South Africa and Ghana. In line with the co-integration results, the VEC was performed at three years lag interval for Nigeria, one year for South Africa and two years lag internals for Ghana.

For Nigeria, the co-integrating equation indicate that government financing of communication (-7.218034GFCOM) and railway (-32.94723LnGFRAIL) have negative relationship while power (2.340697LnGFPOW) has positive relationship with GDP. This explains that financing of communication and railway has caused about 721% and 329% shortfalls in GDP respectively. On the other hand, percentage increase in financing of power has resulted in about 234% increase in Nigerian GDP so far. The coefficients (GFCOM, LnGFPOW and LnGFRAIL) are not statistically significant at 5% level. This implies that government financing of infrastructure do not have significant positive effect on GDP in Nigeria. Further to the analysis, VEC result on Nigeria indicates that the model has negative sign; also the magnitude of the error correction term coefficient lies between zero and one. This indicates about 88% (-0.876059) short run disequilibrium adjustment to long run equilibrium per three year, and the significance of the error correction term obtained from the government financing of infrastructure shows that the speed at which economic growth adjusts to equilibrium in the short run path is high. The result thus indicates that government financing of infrastructure has significant short run effect on economic growth in Nigeria.

In the case of South Africa, the co-integrating equation indicate the government financing of communication (1.079762GFCOM) and railway (34.96504Ln GFRAIL) have positive relationship while power (-8.127441LnGFPOW) has negative relationship with GDP. The result show that a percentage increase in financing of communication has brought about 812% rise in South Africa GDP over the years under study. Also, a percent increase in financing of railways gave a massive 3496% attraction to GDP growth within the period studied. However, a rate of increase in financing of power has resulted in about 813% shortfall in GDP. Nonetheless, the t-statistics show statistically significant at 5% level for communication (t=2.42718), power ([-3.48232) and railway (2.79674). This implies that government financing of infrastructure has significant effect on GDP in South Africa. More so, the result for South Africa equally showed an error correction term that is within the expected bound (between 0 and 1) and possesses the expected negative sign. This indicates that the 43.4% (-0.433561) of the drift from the long-run equilibrium value will be restored within a year and the coefficient is equally statistically significant (t-value > 2). The result thus indicates that government financing of infrastructure has a very high significant speed of short run effect on economic growth in South Africa.

The result in Ghana, in the equation of co-integration, indicate that government financing of communication (-0.499036GFCOM) and power (-5.834920Ln GFPOW) have negative relationship with GDP while financing of railway (54.21572LnGFRAIL) has positive relationship. The implication is that investments in communication and power have adverse interaction with GDP in Ghana while investment in railways has positive relationship. The t-statistics indicate that only financing of power has statistically significant long run effect on GDP of Ghana. Furthermore, the error correction analysis was performed at two lag internal. The coefficient is rightly signed and shows that there is a bi-annual speed of adjustment to the long-run equilibrium value is about 71% (-0.706220), statistically significant (t-value > 2). The result thus indicates that government financing of infrastructure has significant short run effect on economic growth in Ghana.

On the overall, the result of the error correction term indicates that the adjustment speed for short run disequilibrium to converge to long run equilibrium is about 88% in Nigeria, 43.4% for South Africa and 71% for Ghana. Thus we conclude that government financing of infrastructure has significant effect in SSA.

SUMMARY AND CONCLUSION

By means of ECM approach, the study investigated the unit roots of the variables and then conducted cointegration and error correction test on the variables of the study and the findings are presented based on the hypothesis. The cointegration test results indicate that in Nigeria, communication and railway infrastructure have insignificant negative effect on GDP growth, while power infrastructure has insignificant positive effect economic growth. In spite of the poor performance of these infrastructure variables in Nigeria, the ECM test indicates that the Nigeria economy adjusts 88% to restore long run equilibrium. In South Africa communication and rail infrastructure have positive effect on growth, while power has significant negative effect on groth the economy exhibits the potential to adjust only 43% to long run equilibrium. On the other hand infrastructure financing in Ghana shows that communication and power are negatively related with economic growth, but the economy posses the potential to adequately adjust 71% to long run equilibrium. In summary government infrastructure financing has insignificant negative effect on economic growth in SSA.

Recommendations

Based on the observed peculiarities in each selected country, the study recommends as follows;

In Nigeria due to the weak influence of infrastructure variables, on economic growth in the economy government should make concerted efforts to provide adequate power supply to enhance productive activities of business firms and equally meet the domestic demands of household consumers, as well as upgrade rail transport facilities for easy access to markets. The communication networks equally need system upgrade for easy communication. All the measures are expected to reduce cost of doing business in the country, boost output productivity increase return on investment and enhance economic growth.

In South Africa due to the positive significant effect of communication and rail infrastructure and significant negative effect of power infrastructure on growth, the study recommends that government financing policy on communication and railway should be sustained, while power which retards growth in the economy should be revamped. The problem of power in South Africa has been attributed to the failure of the Nuclear power Station 'KOEBERG' which often resulted in countrywide rolling blackouts, thus making it difficult to meet routine demands of industry and consumers.

This calls for the urgent need for government and 'Eskom' (the state-owned power supplier) in South Africa to plan for a new power station. This measure is expected to significantly enhance productivity and economic growth in South Africa. Furthermore, other alternative sources of power could be considered such as wind energy, solar energy, Bio-energy among others.

Infrastructure financing in Ghana shows that communication and power are negatively related with economic growth while railway financing has insignificant positive effect on growth , but yet the economy possesses the potential to adequately adjust 88%% to long run equilibrium. The power crisis in Ghana which threatens the ability of many businesses in manufacturing and services is considered the most critical bottleneck to economic growth in Ghana. For these reasons, the study recommends the need for Ghana to access more loans (both concessional and non-concessional) to close the infrastructure gaps in the country.

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