Foreign Direct Investment, Infrastructure Development and Economic Growth in African Economies

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Abstract: The primary objective of this study was to explore the relationship between FDI, infrastructural development and economic growth using a panel of nine African countries, over the period 2009 -2016. There is no single economic theory, which explains the effect of infrastructure on economic growth. Using panel data analysis the results from Fixed Effects model show that economic growth is positively related to both infrastructure development and FDI. However, the relationship is not significant. Furthermore, government spending and domestic credit to the private sector are positively related to economic growth and the relationship is significant. It is therefore recommended that the Governments of these African countries intervene and put policies in place to develop their local infrastructure so that it can further grow its economy, thereby increasing employment and trade opportunities, especially if it wishes to attract foreign investors. Also, African countries are encouraged to put in place polices that promotes political stability, property rights, human rights and rule of law in order to attract FDI.

Keywords: FDI; Infrastructure; economic growth; principal component analysis; Africa

JEL Classification: F21; F36; F45; G15; O10; O57

1. Introduction

Foreign direct investment (FDI) is international investment made by one economy's resident entity, in the business operations of an entity resident in a different economy, with the intention of establishing a lasting interest (International Monetary Fund [IMF], 1993). Foreign direct investment has the potential to generate employment, raise productivity, transfer skills and technology, enhance exports as well as contribute to the long-term economic growth of the world´s developing nations (UNCTAD, 2006). Although FDI is deemed important in promoting growth and economic integration, the inflows of foreign direct investment into Africa have been

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significantly lower than those of other developing economies in Asia and Latin America.

According to Babatunde (2011), in order to meet some objectives of the sustainable development goals (SDGs) by achieving economic growth and poverty alleviation, there is need to foster domestic and foreign investment; as well as further financial market development which stimulates economic growth. Despite this, empirical evidence has reached ambiguous conclusions on the impact of FDI on economic growth. Some studies have shown that FDI has a positive impact on economic growth (Balasubramanyam et al., 1996; Borensztein et al., 1998), while others such as Mecinger (2003) found a negative effect of FDI on economic growth.

Khadaroo and Seetanah (2008) argued that the quality of a country's infrastructure plays a part in its ability to attract inward FDI. The relationship between infrastructure and economic growth was explored in Mexico during the period 1985-2008 by German-Soto and Bustillos (2014). They found that where major infrastructure provision exists, higher rates of growth are also taking place, thus concluding that if infrastructure provision is inadequate, it could stifle growth. Generally, it is expected that the higher the quality of infrastructure, the more attractive the host country's potential to foreign investors, particularly those keen on FDI.

In this study, we want to examine the impact of foreign direct investment and infrastructure on economic growth in selected African countries. We depart from the traditional approach that has been followed in the literature, particularly with regard to the measurement of infrastructure variables using telephone lines per 1000 people. We propose to use principal component analysis to construct an infrastructural development composite index using variables from telecommunications, transport and energy.

Thus the question that we want to answer is: What effect do FDI and infrastructure development have on economic growth in selected African countries? The remainder of the paper is organised as follows: the next section considers a review of the existing literature on the effects of FDI and infrastructure on economic growth. This is followed by the methodology in which we lay out our econometric model and steps followed. The findings are discussed thereafter, and conclusions and recommendations wind up the paper.

2. Literature Review

According to Almfraji and Almsafi (2014), economic growth is the growth of potential output, i.e., production at full employment of available assets, which is caused by growth in aggregate demand or observed output. The real gross domestic

product growth rate (GDPG) is presumed to be the most efficient proxy for economic growth. Anyanwu and Yameogo (2015) describe the real GDP growth rate as a measure of a country's track record; while it also serves as an indicator to potential investors of the existence of profitable investment opportunities, as well as the attractiveness of the host country's market (Asiedu, 2013).

Gorg and Greenaway (2004) stated that there is ambiguity on the effect of FDI on economic growth. Theoretically, in the neoclassical growth model, FDI is seen as promoting economic growth by augmenting capital stock. On the other hand, in the endogenous growth model, FDI increases economic growth by generating technological spillovers from developed countries to under-developed countries (Malikane & Chitambara, 2017).

Dunning (1980)'s eclectic theory argued that the structure and intensity of MNCs foreign direct investment decisions are influenced by three factors: ownership-specific, location-specific and internalisation advantages. Earlier empirical literature has revealed that the impact of FDI on economic growth is dependent on certain locational characteristics such as the level of human capital, the level of financial market development, the level of infrastructural development, the level of economic development, the level of trade openness and the level of institutional quality, amongst others.[1]

Although Dunning's eclectic theory emphasised locational advantages, it was only after the early 1990s when there was growing emphasis on the role of infrastructure in economic growth that FDI theorists began to incorporate the role of these supply side variables in explaining FDI (Gwenhamo, 2009). In particular, recent extensions to the ownership location and internalisation (OLI) framework have placed a vital role on infrastructural factors as determinants of FDI in developing countries. Thus Dunning and Lundan (2008) contributed towards fusing the traditional OLI framework with infrastructural factors, arguing that good infrastructure create location advantages that foreign firms seek before operating and investing in the host country.

Earlier empirical studies revealed mixed results insofar as the effect of FDI on economic growth goes. Duarte, Kedong and Xuemei (2017) found bi-directional causality between FDI and economic growth in Cabo Verde. Other scholars such as Choe (2003) in his study of 80 countries between 1971 and 1995, found that FDI granger causes economic growth; while Chowdhury and Mavrotas (2006) also concluded bidirectional causality in Malaysia and Thailand but found no causality in Chile, when examining such relationships in the three countries using data from 1969 to 2000. In the African context, findings similar to the latter were reached by Umoh et al. (2012) for Nigeria using times series data from 1970 to 2008. However, no

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[1] See (Makoni, 2016).

causality between FDI and economic growth could be established in India in the study by Chakraborty and Nunnenkamp (2006).

According to Carlsson, Otto and Hall (2013), although there is no single macroeconomic theory that examines the economic effects of infrastructural development, it is often assumed that infrastructure promotes economic growth. The existing infrastructural classes include energy, water, transport, telecommunications and waste. For the purposes of this study, we are interested only in energy, transport and telecommunications variables which are deemed to bring about economic benefits rather than social ones. Energy is required for productive purposes, while transportation facilitates the distribution of people, resources, goods and services across spatial structures. Telecommunication infrastructure ensures fast and reliable dissemination of information between parties. Based on the characteristics of these infrastructure classes, the unavailability of or presence of poor infrastructure can result in the considerable increase of transaction costs, thus hindering access to local and international markets; and therefore discouraging FDI to host countries. According to Palei (2015), reliable and efficient infrastructural development supports economic growth; further adding that infrastructure influences the investment potential and attractiveness of a country or region.

Kessides (1993) argued that the quality and availability of infrastructure facilities such as transport, water, telecommunication and electricity is important in enhancing the marginal productivity of factors of production like capital and labour. She went on to argue that infrastructure services are intermediate inputs and any reduction in their cost raises the profitability of production, thus resulting in higher levels of output, income and employment. Therefore, as a result of this spillover effect, infrastructure is often described as an "unpaid factor of production", since its availability and quality leads to higher returns obtainable for other factor inputs (Kessides, 1993).

Using panel data from a sample of 24 Chinese provinces between 1985 and 1998, Démurger (2001) found links between infrastructure investment and economic growth in China. The growth model showed that geographical location and infrastructure endowment accounted significantly for observed differences in growth performance across Chinese provinces. Canning and Pedroni (2008) investigated the effects of various types of infrastructure provision in a panel of countries from 1950 to 1992, and found that although infrastructure causes long-run economic growth, there is substantial variation across countries. Babatunde (2011) examined the relationships between trade openness, infrastructure, FDI and economic growth for a panel of forty-two Sub-Saharan African countries from 1980 to 2003. He found that FDI has a positive and significant impact on economic growth, and also that FDI and infrastructural development both have a positive effect on economic growth.

3. Methodology

3.1. Data and Variables

In this study, we want to examine the interrelationship between foreign direct investment, infrastructure and economic growth using World Bank panel data for Botswana, Cote D'Ivoire, Egypt, Ghana, Kenya, Mauritius, Morocco, Nigeria, and South Africa from 2008 to 2016.

FDI is measured as the ratio of net FDI inflows to GDP. We depart from the traditional approach of measuring infrastructural development using telephone lines per 1,000 people that has been followed in the literature. We propose to use the principal component analysis to construct a composite index of infrastructure development using various infrastructure indicators from the communication, transport and energy measures. Economic growth is reflected as the real GDP growth rate of a country. Our control variables include domestic credit to the private sector by deposit banks as a share of GDP, stock market capitalisation, gross capital formation, government spending, human capital development, and trade openness the sum of imports and exports to GDP. For the measure of natural resources, we use total natural resources rent to GDP, while institutional quality is accounted for by the average of Kuncic's institutional quality variables (Alfaro et al., 2004; Asiedu, 2006; Agbloyor et al., 2014; Kuncic, 2014; Otchere et al., 2015).

3.2. Econometric Model

In determining the relationship between FDI, infrastructural development and economic growth, we estimated the following model:

$$RGDPG_{it} = \alpha_0 FDI_{it} + \alpha_1 INFRADEX_{it} + \alpha_2 NATRES_{it} + \alpha_3 TRDOPN_{it} + \alpha_4 INSTQ_{it} + \alpha_5 GOVSP_{it} + \alpha_6 GCF_{it} + \alpha_7 PCRED_{it} + \alpha_8 HUMCA_{it} + \alpha_9 SMCAP_{it} + \varepsilon_{it} \qquad (1)$$

where, i denotes country, t denotes time, α_0 is a constant term, ε_{it} is a random error term and the other variables are defined as:

FDI_{it} = the inflow of FDI as a percentage of GDP into country i for time t

$RGDPG_{it}$ = the real GDP growth rate

$INFRADEX_{it}$ = composite PCA index of 5 infrastructure variables

$TRDOPN_{it}$ = the openness index proxied by total trade as a % of GDP

$INSTQ_{it}$ = the measure of legal, political and economic institutional quality

$NATRES_{it}$ = total natural resources scaled by GDP

$SMCAP_{it}$ = market capitalisation

$PCRED_{it}$= domestic credit to the private sector by deposit banks as a share of GDP

$GOVSP_{it}$= government spending

GCF_{it}= gross capital formation as a percentage of GDP

$HUMCA_{it}$= human capital

Diagnostic tests were applied to the above model before it was estimated. To avoid spurious results of the regression analysis, the data were tested for serial correlation, multicollinearity and heteroskedasticity. The Breusch-Pagan test was used to test for heteroskedasticity. A correlation matrix was used to detect any multicollinearity amongst the variables. The Ordinary Least Squares (OLS) model was applied on the multiple regression to determine the nature of the relationship between the dependent and independent variables. The next section presents the results of the regression analysis and a discussion of the empirical findings.

4. Results

The objective of this study was to find out what effect FDI and infrastructural development have on economic growth in different African countries from 2008 – 2016. The estimation results are presented in Table I below.

Table I. Estimation results

	Pooled Model	Fixed Effects	Random Effects	2 step GMM	GLS Model	LSDVC Model
L.RGDPG	-0.0204	0.0215	-0.0204	-0.727	-0.0383	0.149
	(0.225)	(0.125)	(0.0908)	(0.460)	(0.0288)	(0.257)
FDIGDP	0.00424	0.00659	0.00424	-0.00286	0.00442***	0.00695
	(0.00541)	(0.00354)	(0.00529)	(0.00822)	(0.000714)	(0.0163)
GCFGDP	0.125	0.525	0.125*	0	0.112***	0.512***
	(0.0731)	(0.266)	(0.0619)	(0)	(0.0303)	(0.0147)
NATRES	-0.0331	-0.397	-0.0331	0.0917	-0.0308	-0.345**
	(0.0593)	(0.217)	(0.0550)	(0.612)	(0.0397)	(0.122)
TRDOPN	-0.00332	0.00635	-0.00332	-0.327	-0.00422	-0.00883
	(0.0212)	(0.0517)	(0.0110)	(0.417)	(0.00435)	(0.131)
INSTQ	-1.312	3.034	-1.312	0	-0.537	3.983**
	(3.403)	(2.959)	(2.638)	(0)	(0.306)	(1.338)
SMCAP	0.00955	0.0109	0.00955	-0.0636	0.00969**	0.0129
	(0.0178)	(0.0395)	(0.0138)	(0.122)	(0.00295)	(0.0225)
PCRED	-0.0229	0.0238*	-0.0229	0.0578	-0.0216***	0.0246
	(0.0244)	(0.00966)	(0.0213)	(0.139)	(0.00311)	(0.0183)
HUMCA	-0.0276*	-0.00272	-0.0276	-0.0538	-0.0265***	-0.00769
	(0.0122)	(0.0179)	(0.0149)	(0.0470)	(0.00299)	(0.0242)
INFRADEX	0.0884	0.0873	0.0884	0.0851	0.0743***	-0.0759
	(0.189)	(0.111)	(0.281)	(0.528)	(0.0191)	(0.0691)
GOVSP	-0.111	1.386*	-0.111	0.460	-0.0998*	1.568
	(0.131)	(0.595)	(0.114)	(1.836)	(0.0403)	(0.832)
_cons	7.359*	-28.99*	7.359**		7.094***	
	(3.193)	(11.31)	(2.667)		(1.502)	
N	63	63	63	54	63	63
R^2	0.363	0.618	0.3631			

Source: Author's computation using Stata software

Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table II below shows the diagnostic statistics of all the estimation models presented in Table I.

Table II. Diagnostic statistics

	Pooled	Fixed effects	Random effects	Diff GMM	GLS	LSDVC
Observations	63	63	63	54	63	63
Groups	9	9	9	9	9	9
F-stats/Wald chi2	7.93	3289.49	955.66	7.65	548.51	
Prob>F/Prob>Wald chi2	0.0000	0.0000	0.0000	0.0040	0.0000	
Hausman (Chi2)		96.87	96.87			
Prob>chi2		0.0000	0.0000			
R-SQUARED						
Within		0.6175	0.0309			
Between		0.0389	0.8873			
Overall	0.3631	0.4102	0.3631			
Arellano-Bond AR(1)				-0.12		
Prob>z				0.380		
Arellano-Bond AR(2)				-0.94		
Prob>z				0.346		
Sargan test of overid				37.81		
Prob>chi2				0.155		
Hansen test of overid				0.02		
Prob>chi2				0.877		
Instruments				8		

Source: Author's computation using Stata software

We used a sizeable number of estimation techniques that includes the pooled OLS, Least squares dummy variable (LSDV) corrected for Kiviet bias (see Kiviet, 1995), Fixed effects (FE) model, Random effects (RE) model, Generalized Method of Moments (GMM) model, and the generalized least squares (GLS) primarily as a means for rigorous testing (robustness). Since the econometric modelling of panel data is based on two principal estimation techniques, fixed effects and random effects models this study also narrowed the analysis to these estimators. To determine the most appropriate technique between the two approaches, we employed the Hausman (1978) specification test. The test is based on the idea that the set of estimated coefficients obtained from fixed effects approach if considered, as a group should not differ significantly from the set of estimated coefficients from the random estimation approach. If there is a significant difference, the null hypothesis is rejected and we proceed to draw our conclusions based on the fixed-effect approach. In this article, the Hausman test results are presented in Table III.

Table III. Hausman test results

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Test:  Ho:  difference in coefficients not systematic


          chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =        96.87
          Prob>chi2 =     0.0000
          (V_b-V_B is not positive definite)
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Source: Author's computation using Stata software

The Hausman test results suggest that we should reject the null hypothesis, that the unobservable, country-specific effects and the regressors are statistically independent (orthogonal). Thus, the fixed-effects estimation approach results are analysed and discussed.

5. Discussion

The fixed effects model shows that the foreign direct investments is positively related with real gross domestic product. This implies that the economy response positively to improvements in FDI inflows. The higher the inflows the higher is the economic growth. There is a direct reason and indirect reason for this nexus. The direct reason is that as foreign companies establish themselves in the domestic market, their capital plus production they bring in counts as part of the gross domestic product. The indirect reason comes through a transmission mechanism, the FDI investment is an injection and therefore, through the multiplier effect the country's GDP is enhanced. Emerging markets are encouraged to put in place policies that attracts FDI as this is beneficial to the growth and development of the country. This is in line with the neoclassical growth model that argues for a positive relationship between economic growth and FDI. Where FDI is confirmed as a driver of economic growth. The results confirms what Malikane and Chitambara (2017) found that FDI is instrumental to developing countries economic growth as they benefit from technological knowhow of developed economies. However, our results are in sharp contrast to Chakraborty and Nunnenkamp's (2006) findings as they found now relationship between FDI and economic growth.

This study confirms the theoretical underpinnings that there is a strong though insignificant relationship between economic growth and infrastructure development. The better the country's infrastructural development, the better that country's growth prospects. Previous studies (for example German-Soto and Bustillos, 2014;

Khadaroo & Seetanah, 2008) argue that higher economic growth rates are associated with countries where there is significant infrastructural provisions. In addition, Démurger (2001) found a positive relationship between infrastructure investment and economic growth in the leading emerging country of China.

Results also show a positive and significant effect of government spending and domestic credit to the private sector by deposit banks as a share of GDP on economic growth. As expected, government spending is an injection and therefore through the multiplier effect results in higher levels of economic growth. Also, in times of economic slowdown, governments tend to boost spending in order to increase GDP growth and create extra jobs in the economy. Our empirical findings are supported by King and Levine (1993) who in examining the relationship between financial development and economic growth, found that the indicators of financial development as measured by the percentage of credit allocated to private firms, and the ratio of credit issued to private firms to GDP are strongly and robustly correlated with economic growth, as well as the efficiency of capital allocation in the economy. King and Levine (1993) further found that, consistent with the propositions of Schumpeter (1911), components of these financial development indicators significantly predict subsequent values of the economic growth indicators.

6. Conclusion and Recommendations

The broad aim of this article was to investigate the effects of foreign direct investment (FDI) and infrastructure development on economic growth in nine selected African economies, from 2006 to 2014. The study employed various econometric techniques such the pooled OLS, Least squares dummy variable (LSDV), Fixed effects (FE) model, Random effects (RE) model, Generalized Method of Moments (GMM) model, and the generalized least squares (GLS). The analysis was done based on the fixed effects model as recommended from Hausman test results. We used the Principal Components Analysis (PCA) to construct an infrastructural development index. The developed infrastructure development index and FDI were analysed as part of independent variables. The results revealed a positive relationship between economic development and FDI. Likewise, there was a positive relationship between economic development and infrastructure development index. The results also highlighted that there is a positive and significant relationship between government spending and economic growth. In light of these findings, the policy implications are that African governments need to put in place polices that promotes political stability, property rights and rule of law in order to attract FDI which, is a major driver of economic growth. African countries are recommended to put a significant budget toward infrastructure development, as this is good for the attraction of FDI and more so have a positive direct influence on economic growth. Further studies may investigate the minimum threshold levels that

needs to be achieved for FDI and infrastructure development to have effect on economic growth.

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