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Published online: 19 Apr 2020.

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GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

Does Infrastructural Absorptive Capacity Stimulate FDI-Growth Nexus in ECOWAS?

Adeyemi A. Ogundipe[1]*, Queen Esther Oye[1], Oluwatomisin M. Ogundipe[1] and Romanus Osabohien[1]

Abstract: The study assesses the relevance of infrastructural absorptive capacity in the foreign direct investment (FDI)-growth argument in ECOWAS. Though foreign aid has received a vast attention in the literature, however, an assessment of how the infrastructural readiness of the host economies drives the effectiveness of aid was vocal in this re-examination. The study assesses this main thrust in ECOWAS Sub-region for the period 1995–2017 using the system GMM estimation approach. The result suggests that FDI promotes growth though growth responded less proportionately to FDI influx. Alternatively, following the interaction of FDI and physical infrastructures, the responsiveness of FDI declined. Specifically, the responsiveness of GDP growth declined from 29.2% to 0.21% for road infrastructures. It hence becomes expedient for African government and policy makers to channel a viable development path towards enhancing transport and road infrastructures in order to attract financing into the space and the livelihood of poor rural population.

ABOUT THE AUTHORS

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PUBLIC INTEREST STATEMENT

The study looked at how foreign direct investment (FDI) impacts economic growth in ECOWAS sub-region. The study is important because finance gap exists in most African economies and FDI remains a prominent channel of attracting skills and finance into thriving sectors in developing economies. Our study considered the 15 ECOWAS economies and discovered that the contribution of FDI to growth in the sub-region has been minimal compared to the volume of FDI influx. In fact, the impact was further weakened after controlling for the readiness and developmental efforts of these economies in assimilating the spillovers from FDI. Our study suggests that, on one hand, FDI attraction has been rent seeking because a large proportion of FDI in the sub-region went into extractive industries and, on the other hand, physical infrastructures such as road networks, railway lines and technological infrastructures that could easily aid the imitation of foreign skills and knowledge brought by FDI were lacking in the sub-region.

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1. Introduction

Foreign direct investment (FDI) is regarded as one of the largest components of external finance and capital flow in developing economies (Adams, 2009; Gonzalez & Kusek, 2017). Existing theoretical and empirical studies suggest that FDI can be an important catalyst for economic growth and development in developing economies (Adams, 2009; Nistor, 2015; Sunde, 2017). As a growth catalyst, FDI aids in the provision and accumulation of physical capital stock, enhances foreign technology transfer to recipient countries, serves as a source of positive knowledge spillover, generates domestic employment, grants domestic access to foreign markets and exports diversification (Iamsiraroj & Ulubaşoğlu, 2015; Kusek & Silva, 2018; Uwuabanmwen & Ogiemuda, 2016). However, there is mixed evidence on the FDI-growth nexus such that some empirical studies find no significant impact of FDI on economic growth (Alvaredo et al., 2017).

The mixed empirical evidence implies that whether FDI exerts positive spillovers on a host country depends largely on certain pre-existing local conditions, which points to a country's absorptive capacity (Gunby et al., 2017; Sunde, 2017; Wu & Hsu, 2012). These initial conditions include trade openness, financial development, human capital development, institutional quality and sufficient physical infrastructure (Kinishita & Lu, 2006). Against this background, this study examines the growth effect of FDI in the presence of physical infrastructure. Infrastructure is important as a local condition in determining the growth efficiency of FDI. For instance, in the 2017 Global Investment Competitiveness report (World Bank, 2017), 71% of multinational executives responded that good physical infrastructure was one of the major determinants influencing their decision to invest in developing countries. FDI helps to source for capital to build good infrastructural facilities in the economy; good infrastructure can help to increase productivities of sectors in the economy, penetrate to the foreign markets, and allow local firms to benefit from infrastructural efficiency, generate employment, improve the standard of living thereby improving economic growth and development.

With respect to the Economic Community of West African States (ECOWAS) region, the literature on FDI-growth relationship (Adamu & Oriakhi, 2013; Alege & Ogundipe, 2014; Sane, 2016) has largely ignored the role of infrastructure as an absorptive capacity. This study, therefore, contributes to the existing literature on FDI-growth nexus in ECOWAS, by controlling for physical infrastructure. This is expected to provide fresh empirical insights on the FDI-growth debate in the ECOWAS region. The rest of the paper is arranged as follows: Section 2 reviews the literature. In Section 3, stylized facts on the Macro-economy and FDI Inflow into the sub-region are analyzed. The study presents the theoretical and methodology in Section 4. Finally, section 5 presents the results of the estimation and discussion, while Section 6 concludes.

2. Review of related literature

Several studies have been undertaken to analyze the impact of FDI on economic growth and they produced many interesting findings. These findings in FDI-growth literature are mixed, ranging from the positive effect of FDI on growth; some of the existing studies posit an inverse effect, while others suggest a neutral effect of FDI-growth relationship (Adams, 2009; Adeniyi et al., 2012; Alege & Ogundipe, 2014; Lamsiraroj, 2016; Sunde, 2017; UNCTAD, 1999). The study by Gohou and Soumare (2012) examined the relationship between FDI inflows and welfare (or poverty reduction) in Africa, the result shows a positive and strongly significant relationship between FDI net inflows and poverty reduction in Africa but finds significant differences among African regions. They also find that FDI has a greater impact on welfare in poorer countries than it does in wealthier countries. More recent studies have transcended the question of whether FDI influences the host country's economy but rather

concentrating on the factors for the existence of spillovers effect. Nguyen, Duyster, Patterson and Sander (2009) argued that recipient developing economies only benefit from FDI if exist sufficient absorptive capacity of physical infrastructures among others. The study suggests that, though, FDI brings crucial benefits including capital, advanced technology and skills to host countries; however, these benefits do not automatically convert to be host country's spillovers. The host country required sufficient capacities and good initial conditions to absorb the benefits of FDI.

There are vast numbers of literature examining the importance of absorptive capacity in FDI-growth nexus, which mostly assess the role of education quality (Borensztein et al. 1998; Blonigen & Wang, 2005; Carkovic & Levine, 2005; Darrat et al., 2005; E. Hanushek & Kimko, 2000; E. A. Hanushek & Woessmann, 2008; Li & Lui, 2005). The literature also witnessed studies assessing the role of trade regimes as absorptive capacity (Balasubramanyam et al., 1996; Khordagui & Saleh, 2013; Makki & Somwaru, 2004). In the same manner, evidence on financial development absorptive capacity abounds in the literature (Hermes & Lensink, 2003; Omran & Bolbol, 2003; Alfaro et al., 2006; Wang, 2003). In spite of the vast discourse in literature, just a few studies considered the importance of infrastructure in absorbing the benefits of FDI in Africa (Asiedu, 2002, 2006; Loree & Guisinger, 1995; Wheeler & Mody, 1992). The infrastructure argument is premised on the fact that investors prefer markets that guarantee the lower cost of production and maximize benefits. When infrastructures in the host country are unreliable and bad, it causes increased cost and waste of time. In the words of Nguyen et al., (2013) wasted time and increased cost arising from inefficient infrastructure would bring less profit to investors and the host country. According to Bakar et al. (2012), good physical infrastructures[1] are likely to attract FDI inwards and benefits to host economies. Also, an empirical study by Coughlin et al. (1991) posits that more intensive transportation infrastructures were closely linked to a high level of FDI inflows into the U.S. for the period 1981–1983. These evidences were corroborated by Khadaroo and Seetanah (2010); and Wheeler and Mody (1992) which found that infrastructural quality are relevant for developing economies in attracting the benefits of FDI.

Using a self-reinforcing model of FDI, Cheng and Kwan (2000) found support for good infrastructure (density of road) as a determinant of FDI into 29 Chinese regions. Fung et al. (2005) examined the role of hard and soft infrastructures; however, they discovered that soft infrastructure is a more important determinant of FDI for countries such as United States, Japan, Korea, Hong Kong and Taiwan and Chinese regions. Bakar et al. (2012) examine the role of infrastructure in stimulating FDI inflows to Malaysia from 1970–2010 using OLS—white Heteroskedasticity-consistent standard errors and covariance. The study found that infrastructure has a significant and positive impact on FDI inflows into Malaysia. Khordagui and Saleh (2013) focused on the absorptive capacity of emerging and MENA economies. The study assesses the role of three absorptive capacities in attracting FDI benefits, these include human capital, trade openness and institutional quality. The study found that spillovers exist in emerging and MENA economies, with schooling stimulating more spillovers, while trade openness and institutional quality appear to be of lower influence.

Furthermore, Fu (2008) investigates the impact of FDI on the development of regional innovation capabilities using a panel dataset from China. The study found FDI stimulating a significant impact on regional innovation capacity; however, the strength of the effect depends on the availability or absorptive capacity and the presence of innovation-complementary assets in the host region. Likewise, Alfaro et al. (2006) and Hermes and Lensink (2003) examined the role of sound financial system as an absorptive capacity found that developed financial system in host countries are positively related to greater gains from FDI. Rafael et al. (2017) investigate the impact of FDI on economic growth in Latin America, using panel data econometrics, the result varies following the incorporation of development levels reached by the countries in the region. FDI has a positive and significant effect on product in high-income countries, while in upper-middle-income countries the effect is uneven and non-significant. Finally, the effect in lower-middle-income countries is negative and statistically significant. Their result shows that FDI is not an adequate mechanism to

accelerate economic growth in Latin America, with the exception of high-income countries. The study of Raheem and Oyinlola (2013) examined the relationship between FDI and economic growth considering the influence of financial sector development (FSD). Fifteen African countries were selected; the result showed that there are conflicting effects of FDI on growth caused by different FSD indicators used.

In summary, the emerging studies on FDI-growth nexus reviewed indicate an indirect positive effect of FDI on growth, thus implying that FDI impacts growth through interaction with certain economic factors; however, there are limited studies examining the role of infrastructure.

3. Methodology

3.1. Data trends, sources and measurement

Figures 1 and 2 show the trend for FDI inflows and corresponding regional performance in ECOWAS and SSA. The inflow of FDI has consistently been on the increase in the region with the statistics gaining a steeper rise starting from 1990 and 2000 in SSA and ECOWAS, respectively (see Figure 1). The upward trend continues until 2015 and 2012 in SSA and ECOWAS where a sharp decline was witnessed. In spite of the rising trend in FDI inflow, the world share of FDI inflow into the regions has been declining from 1970 with a historic fall in 1980. Considering the corresponding economic indicators, the structure of the economies seems more deteriorated than the 1990 condition, as the share of dependence on primary commodities exports gained a steady rise from about 75% and 80% in 1995 to 82% and 95% in 2015 for SSA and ECOWAS, respectively (see Figure 2). A rising and continuous dependence on primary commodity exports shows that export basket has not
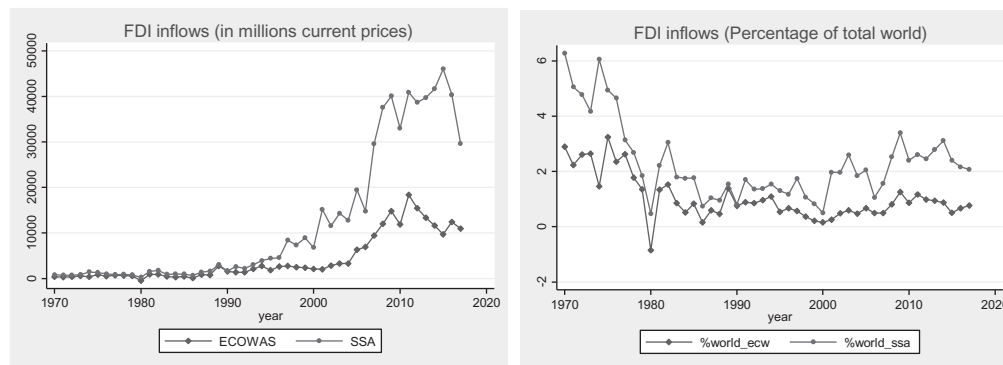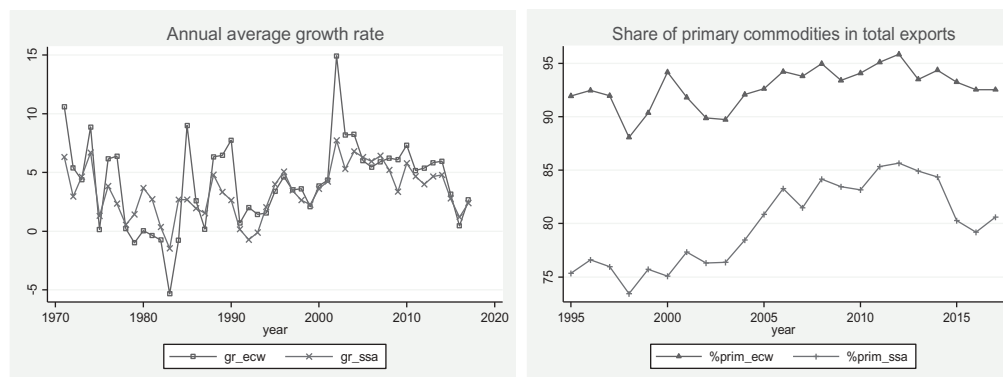
Figure 1. FDI inflows.

Figure 2. Economic performance.

Table 1. Data sources and measurements			
Variable	**Description**	**Measurement**	**Source**
GDPr	Gross Domestic Product (Growth rates)	Constant 2010 US$	World Development Indicators of World Bank Publication (2018)
GFCF	Gross fixed capital formation	Constant 2010 US$	WDI
LAB	Labour force	Number	WDI
EDU	School enrolment, secondary	Number	WDI
FDI	Foreign Direct Investment (Net inflows)	Index	UNCTAD
M2GDP	Financial depth	Money Supply/GDP	WDI
OPN	Trade openness	(Export + Import)/100	WDI
EXCR	Exchange rate	Official exchange rate, LCU	WDI
INST	Average of the six indicators including: control of corruption, government effectiveness, political stability and absence of violence & terrorism, regulatory quality, rule of law and voice and accountability	Scale	World Governance Inductor of World Bank Publication (2018)
RWL	Foreign Direct Investment (Net inflows)	Index	UNCTAD
ICTgoods	ICT goods export (% of total goods exports)	percentage of total goods exports	WDI
INTURS	Individuals using internet services (% of population)	Percentage	WDI
LMCS	Mobile cellular subscription (per 100 people)	Proportion	WDI
sisvrs	Secure internet services (per million people)	Proportion	WDI

Source: compiled by authors from WDI, 2017

been sufficiently diversified, implying that the economies are still plagued with macroeconomic distortions arising from volatile commodity prices.

More so, in spite of the vast untapped natural and human resources in the region, on the average, rate has dropped considerably compared to the 1970 value. These worsening indicators and the fairly static economic structure do not reflect the rising inflow of FDI in the regions; hence, it implies that FDI attracted in the period has not significantly translated to economic benefits.

The data for the empirical investigation were obtained from reputable sources (see Table 1) including the United Nations Conference on Trade and Development (UNCTAD) country database 2018, the World Development Indicators (WDI) and World Governance Indicators (WGI) published by World Bank.

3.2. Summary statistics of variables
The statistical properties of the variables employed in the model specified are highlighted herein. The description enables a clearer understanding of the trend and pattern of behaviour of the variables for the period considered. The properties considered include the mean, standard

deviation, minimum, maximum, variance, skewness, kurtosis and Jarque Bera statistics (See Table 2). The growth of GDP has a mean of 4.92%, a minimum of −30.15% and a maximum of 106.28%. The magnitude of the negative minimum growth rate shows the extent of economic repression a number of ECOWAS countries have experienced. Also, the quantum of the maximum growth rate reveals the growth potentials of the economies. The wide difference as revealed between the maximum and the mean growth rate further shows the untapped growth tendencies inherent in Africa's natural and human resources. The evidence supports the acclaimed paradox that the African being the continent with the largest deposit of natural resources yet the economies have remained poor and retarded. In the same manner, the gross fixed capital formation which constitutes the capital resources in the region has a mean of 370 USD billion, a maximum of 7.080 USD trillion and a minimum of $-370 million. The divergence between the mean and maximum value shows that capital stock volume differs significantly across economies in the region. Also, the median value of 9.3 USD billion indicates a considerable improvement in the capital stock volume in African economies.

Moreover, the average labour force in the region is 6.23 million, a minimum of 13.3 million and a maximum of 57.5 million. The varying sizes of ECOWAS economies and population account for the disparity between the mean and maximum value. For instance, the bulk of the labour force in the region will be accounted for by the three largest economies by population (Nigeria, Ghana, and Cote d'Ivoire). The indicator of education (secondary enrollment) has a mean of 33.9 million, a maximum of 94.2 million and a minimum of 6.52 million. In the same vein, FDI inflow into the region shows a mean of 14.88 USD billion and a maximum of 85.96 USD billion. The bulk of FDI inflow into the region goes to the Nigerian extractive sector, evidence from statistics shows that in 2015, the FDI attracted into Nigeria was more than that of the remaining ECOWAS region combined. Also, credit to private sector (an indicator of financial depth) is at a maximum of 102% with a mean of 28.67% and a minimum of 6.19%. The indicator of openness degree shows that ECOWAS economies are considerably open with a minimum of 20% and a mean of 88.7%. The quality of the institution has been generally weak with a negative mean value and slightly weak maximum.

In addition, the symmetric properties of the series are determined by their skewness, kurtosis and Jarque Bera statistics. The indicators of GDP growth rates, gross fixed capital formation, labour force, education, FDI, financial depth, openness and exchange rate exhibit non-symmetric distribution. This implies that the series do not follow normal distribution; hence, the null hypothesis of normality was rejected. Alternatively, a normal series distribution exists for institution variable.

The study proceeds by examining the time series property of the variables using the pairwise correlation matrix (see Table 3). The assessment becomes relevant in order to ensure that collinear dependence among the explanatory variable does not exist and ascertain that the unique influence of the explanatory variables on the explained variable is achievable. The strongest linear relationship exists between capital stock and labour force; this is expected, as economies with large capital stock tend to possess the expected economy resources to assimilate more labour force compared with economies with minimal capital stock. A critical observation reveals that multicollinearity problems are not inherent in the model. Hence, the parameter estimates are expected to be reliable and suitable for drawing inferences.

3.3. Model specification

The theoretical framework is built around the two-gap model of growth attributable to the seminal contribution by Chenery and Stout (1966). The model advances the Harrod-Domar growth model and shares the ideology of the public interest theory. It suggests that developing economies are constrained with domestic savings and investment gap; foreign direct investment is prominent to fill this gap and stimulate growth. The emerging literature in the subject matter (Alege & Ogundipe, 2014; Ogundipe & Ola-David, 2015) espoused this assertion and developed an empirical model assessing the FDI-growth nexus based on the Harrod-Domar framework. The standard

Table 2. Summary statistics of variables

Variable	GDPR	GFCF	LAB	EDU	FDI	M2GDP	OPN	EXCR	INST
Mean	4.9158	3.70E+09	6,235,238	33.9822	4.8836	28.66894	0.8869	749.4173	−0.6255
Median	4.4785	9.32E+08	3,267,098	32.6412	2.1463	23.97028	0.6705	495.277	−0.6619
Maximum	106.2798	7.08E+10	57,461,870	94.2452	85.9631	102.58	11.3776	7485.517	0.5431
Minimum	−30.1452	−3.7E+07	133,921	6.5236	−65.4109	6.1953	0.2044	0.1199	−1.9786
Std. Dev.	8.0149	1.00E+10	10,696,157	17.8525	10.4157	16.6847	0.9734	1237.616	0.5110
Skewness	6.2807	4.8564	3.298658	0.9247	2.8526	1.9647	7.2512	3.3542	0.1953
Kurtosis	85.6808	27.8317	13.1356	3.9329	29.0341	7.3503	70.8874	14.7543	2.6380
Jarque-Bera	91,795.05	9331.203	1919.598	56.3127	9322.981	451.0366	63,249.71	2404.051	3.0139
Probability	0	0	0	0	0	0	0	0	0.2216
Sum	1548.472	1.17E+12	1.96E+09	10,704.39	1538.336	9030.715	279.386	236,066.5	−159.491
Sum Sq. Dev.	20,171.32	3.16E+22	3.59E+16	100,075.3	34,065.14	87,411.3	297.5092	4.81E+08	66.3363
Observations	315	315	315	315	315	315	315	315	255

Source: Computed by Authors

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Table 3. Correlation test

Variable	GDPR	GFCF	LAB	EDU	FDI	M2GDP	OPN	EXCR	INST
GDPR	1	0.0890	0.1195	0.0319	−0.1074	0.0199	0.1479	−0.0852	0.0735
GFCF		1	0.9293	0.0738	−0.0854	−0.0962	−0.1611	−0.1514	−0.1641
LAB			1	−0.0141	−0.1107	−0.1752	−0.2118	−0.1241	−0.2302
EDU				1	0.1785	0.7596	0.2408	−0.1230	0.3469
FDI					1	−0.0369	−0.0234	0.0324	−0.0112
M2GDP						1	0.3713	−0.1824	0.4763
OPN							1	−0.1247	−0.1555
EXCR								1	−0.2868
INST								-	1

Source: Computed by Authors

growth model was argumented to include foreign aid indicators and other pertinent control variables. The empirical model is specified below:

$$Y_{i,t} = A_{i,t}K_{i,t}^{\alpha}L_{i,t}^{1-\alpha}$$

$$GDPr_{i,t} = AGFCF_{i,t}^{\alpha_1}LAB_{i,t}^{\alpha_2}EDU_{i,t}^{\alpha_3}FDI_{i,t}^{\alpha_4}M2GDP_{i,t}^{\alpha_5}OPN_{i,t}^{\alpha_6}EXCR_{i,t}^{\alpha_7}e^{inst_{i,t}^{\alpha_8}}U_{i,t}$$

In order to estimate the parameter of the model using the classical approach, the model is linearized by invoking a double logged linearization procedure. Hence, the model becomes:

$$logGDPr_{i,t} = \alpha_0 + \alpha_1 logGFCF_{i,t} + \alpha_2 logLAB_{i,t} + \alpha_3 logEDU_{i,t} + \alpha_4 logFDI_{i,t} + \alpha_5 logM2GDP_{i,t}$$
$$+\alpha_6 logOPN_{i,t} + \alpha_7 logEXCR_{i,t} + \alpha_8 INST_{i,t} + V$$

where *GDPr* is the growth rates of GDP, *GFCF* is gross fixed capital formation, *EDU* is education/human capital, *FDI* is foreign direct investment (net inflow), *M2GDP* is the strength of the financial system (financial depth), *OPN* is trade openness, *EXCR* is the exchange rate, *INST* is institutions and *V* is the stochastic term. In the same manner, $\log A = \alpha_0$ and $\log U = V$.

A critical aspect of this study centers on examining the role of infrastructural absorptive capacity in stimulating FDI induced growth for the ECOWAS region. In achieving this, the study accesses the role of physical infrastructure and technological infrastructures. This is achieved by employing an interactive model, where a new variable is developing by employing a simple multiplicative method. The study simply conditioned FDI on the level of infrastructure development in ECOWAS sub-region and access the effect on growth. The interactive model is specified below:

$$logGDPr_{i,t} = \alpha_0 + \alpha_1 logGFCF_{i,t} + \alpha_2 logLAB_{i,t} + \alpha_3 logEDU_{i,t} + \sum_4^8 \alpha_i logFDI_{i,t} * (infrast)'$$
$$+\alpha_9 logM2GDP_{i,t} + \alpha_{10} logOPN_{i,t} + \alpha_{11} logEXCR_{i,t} + \alpha_{12} INST_{i,t} + V$$

where (*infrast*) is a column vector comprising four indicators of infrastructural absorptive capacity which are divided basically into physical and technological capacities.

3.4. Technique of estimation

The model is estimated using the system generalized method of moments (SGMM) in order to overcome the inherent problem of simultanety (see Alege & Ogundipe, 2014) in the FDI-growth argument. The estimation procedure adopts the predetermined and endogenous variables (with appropriate lags) as the model instruments. The empirical model stated in the GMM structure is presented below:

$$\Delta logGDPr = \alpha_1 \Delta logGDPr_{t-1} + \alpha_2 \Delta logGFCF + \alpha_3 \Delta logLAB + \alpha_4 \Delta logEDU + \alpha_5 \Delta logFDI + \alpha_6 \Delta logM2GDP$$
$$+ \alpha_7 \Delta logOPN + \alpha_8 \Delta logEXCR + \alpha_9 inst + \Delta v$$

This approach is efficient in dealing with endogeneity bias arising from measurement errors in the FDI-Growth analysis. The study adopts the system generalized method of moments, which has been adjudged more efficiently than the standard GMM technique (Blundell, Bond, & Windmeijer, 2000).

4. Result presentation and discussion

The result contained in Table 4 shows the regression results depicting the relationship between FDI and GDP growth rate in ECOWAS Sub-region. The relationship was evaluated using the pooled ordinary least square (POLS), the static panel analysis (with fixed and random effects specification) and the generalized method of moment estimation technique. The GMM represents the technique of interest due to its capability to overcome the endogeneity problem associated with FDI-GDP Growth nexus. The OLS and static panel analysis serve as the lower bound and upper bound, respectively, for the GMM result. Furthermore, the study adopted Roodman's system GMM

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Table 4. FDI-growth regression model

Variables	(OLS) lgdpr	(FE) Lgdpr	(RE) lgdpr	(DGMM) lgdpr	(SGMM) lgdpr	(XTABOND2) lgdpr
L.lgdpr				-0.370	-0.728	0.698***
				(0.258)	(0.843)	(0.165)
L2.lgdpr					0.142	
					(0.512)	
lgfcf	0.132	0.159	0.0907	1.179***	4.424	3.848**
	(0.0908)	(0.221)	(0.132)	(0.432)	(5.781)	(1.523)
Llab	-0.114	-2.625***	-0.0463	-7.212***	-1.232	-4.071**
	(0.118)	(0.748)	(0.175)	(2.309)	(3.396)	(1.839)
ledu	0.0922	1.120**	-0.154	12.78*	-3.207	4.866***
	(0.222)	(0.520)	(0.289)	(6.642)	(5.780)	(1.420)
Lfdi	0.0499	0.0133	0.0344	0.0427	-0.0440	-0.292*
	(0.0489)	(0.0549)	(0.0524)	(0.0589)	(0.105)	(0.158)
lm2gdp	-0.297*	0.460**	-0.112	-2.825	1.413	-3.462***
	(0.173)	(0.229)	(0.194)	(1.898)	(2.376)	(0.979)
lopn	0.101	0.621**	0.360*	-0.984*	-0.692	-2.910*
	(0.137)	(0.277)	(0.189)	(0.530)	(2.962)	(1.489)
lexcr	-0.0485*	0.0215	-0.0397	-0.513	-0.296	-1.463**
	(0.0290)	(0.147)	(0.0486)	(0.826)	(2.279)	(0.610)
linst_1	-0.219	0.502	-0.0723	-11.97	0.597	-6.124
	(0.529)	(0.804)	(0.685)	(8.834)	(7.063)	(7.965)
Constant	1.426	30.07***	1.767	48.56*	-60.18	-16.79
	(1.385)	(7.128)	(1.817)	(24.95)	(76.95)	(12.99)
Observations	230	230	230	156	184	212
R-squared	0.062	0.125				

(Continued)

Table 4. (Continued)

Variables	(OLS) lgdpr	(FE) Lgdpr	(RE) lgdpr	(DGMM) lgdpr	(SGMM) lgdpr	(XTABOND2) lgdpr
Number of id		15	15	15	15	15
F-stat (Wald test)	[0.0000]	[0.0000]	2135 [0.0000]	23,152.43 [0.0000]	14,254.98 [0.0000]	12,462.13 [0.0000]
F-stat (p-values)						
Sargan				0.976	0.852	0.964
Hansen				0.0023	0.789	0.876
AR(1)				0.0812	0.0001	0.093
AR(2)				22	0.3241	0.208
No. of instruments					157	20

Standard errors in parentheses, *** p < 0.01, ** p < 0.05, * p < 0.1
Source: Computed using Stata 14.0

specification (xtabond2) due to its ability to handle short panel and controls for unnecessary duplication of instrument vectors. Following the estimation procedure, the parameter estimates obtained were tested for the presence of autocorrelation using the Arrelano–Bond tests—AR(1) and AR(2) and the instruments adopted in the estimation were tested for validity using the Sargan and the Hansen J test. The empirical results as presented in Tables 4 and 5 are void of auto-correlation and instruments were strongly valid. Similarly, the F-test was conducted and shows the joint significance of the explanatory variables in explaining the dynamism in the dependent variable. The estimation procedure adopts appropriate lags that purge the models of inherent autocorrelation. All diagnosis results are presented in the lower panel of Tables 4 and 5.

The system GMM results (following Roodman's specification) readily available in Table 4 show that FDI, though significant, exerts an inelastic variation on growth rate in ECOWAS. The evidence suggests that GDP growth rates exhibit decreasing returns to changes in FDI, as a 100% change in FDI causes about 29.2% change in GDP growth rate in ECOWAS. It hence implies that improvement in GDP growth rate is less proportionate to the volume of FDI inflows in the region. This evidence is consistent with Alege and Ogundipe (2014); Umeora (2013) and Lamsiraroj and Ulubasogbu (2015). This evidence would not be unconnected to the reality that a larger proportion of FDI into developing African economies are rent-seeking and directed into extractive industries with weak spillover to the national economies. For instance, FDI inflows target oil-producing sectors in African economies, accounting for the massively large FDI inflows into Nigeria which is far larger than that for other ECOWAS economies combined. The oil and gas sector has predominantly witnessed a massive influx of foreign capital for discovery and exploration of mineral in Africa. The economic resources are varied out of the shores of the host economies under the guise of refining into consumer goods in order to command price in the international market. In the process, the real economic value of the resources are transferred across the border, while nations hosting the resources only acquire its commodity worth. In the same manner, FDI has been detrimental to economic progress in a number of African economies, as economies hosting natural resources have become a battle field for a proxy war between two or more giant economies/investors seeking possession of resource fields. An instance of investment tussle for control of petroleum between United States and China led to the secession of Sudan and the continuous conflict in the Southern hemisphere.

A critical consideration of the sign obtained shows that FDI exerts a significant negative influence on GDP growth rate in the ECOWAS Sub-region. This evidently portrays the rent-seeking behaviour of foreign investors in these economies. The weak institutional arrangement and lack of required governance "will" to enforce stringent regulations regarding profit retention, surveillance on the pattern of resource usage, environmental regulation and abatement, wage rate and working condition of domestic labour and monetary compensation for negative externalities has contributively worsened the growth potential of FDI in African economies. Furthermore, other explanatory variables adopted in the model were significant in explaining GDP growth rate dynamism in ECOWAS. The stock of capital (gfcf) was significant and exerts an elastic variation on GDP growth rate in the sub-region, as a 100% change in capital stock brings about 380% change in GDP growth rate. This implies that GDP growth rate in ECOWAS witnessed increased returns to scale due to changes in capital stock. The argument conforms to theoretical expectation, as abundant capital stock in an economy in terms of economic resources, which can be human, material and natural resources, enhances the productivity of an economy, hence improving the GDP growth rates. Also, the sign showed a direct significant relationship between capital stock and GDP growth rate in ECOWAS; implying that as capital stock increases, growth rates increase more than proportionately in ECOWAS.

The indicator of labour force exerts a significant elastic influence on GDP growth rate in the Sub-region. A 100% change in labour force causes about 400% change in GDP growth rate, implying that a change in labour force brings about a more proportionate change in GDP growth rate. This suggests that labour force is critical to the economies in the sub-region, as most African

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Table 5. FDI-growth regression (FDI interacted with infrastructural absorptive measures)

Variables	(xtabond2) Lgdpr	(xtabond2) lgdpr	(xtabond2) lgdpr	(xtabond2) lgdpr	(xtabond2) lgdpr	(xtabond2) lgdpr	(xtabond2) lgdpr
L.lgdpr	0.698***	−1.581	−1.000**	0.515*	0.460*	−0.462	−0.0400
	(0.165)	(1.115)	(0.479)	(0.311)	(0.270)	(0.443)	(0.320)
Lgfcf	3.848**	−2.371	0.722	1.524	0.863**	0.155	−0.878
	(1.523)	(2.334)	(0.955)	(1.230)	(0.413)	(0.771)	(1.330)
Llab	−4.071**	2.932	−1.767	−1.642	−0.462	1.018	2.643
	(1.839)	(2.350)	(1.592)	(1.897)	(0.524)	(1.137)	(2.267)
Ledu	4.866***	18.26*	9.468	7.721***	−0.243	7.422***	1.420
	(1.420)	(10.42)	(6.581)	(1.752)	(2.150)	(2.250)	(1.536)
Lfdi	−0.292*						
	(0.158)						
lm2gdp	−3.462***	−10.06**	−3.874	−4.544***	−1.147	−6.862***	−1.947**
	(0.979)	(3.977)	(3.015)	(0.916)	(1.121)	(1.425)	(0.890)
Lopn	−2.910*	−0.045*	−2.957	−1.414	0.501	0.979	2.013
	(1.489)	(1.249)	(2.034)	(1.293)	(0.975)	(0.793)	(1.656)
Lexcr	−1.463**	−3.206**	−0.220	−1.314***	−0.184	−1.380***	−0.913**
	(0.610)	(1.275)	(0.546)	(0.350)	(0.207)	(0.464)	(0.378)
linst_1	−6.124	−3.783	14.18*	6.559	1.357	14.53***	9.309
	(7.965)	(5.891)	(7.571)	(7.002)	(3.825)	(5.312)	(6.236)
lfdi_rwl		−0.00213**					
		(0.000888)					
lfdi_ictgxp			−5.546**				
			(2.276)				
lfdi_inturs				−0.0897***			
				(0.0196)			

(Continued)

Table 5. (Continued)

Variables	(xtabond2) Lgdpr	(xtabond2) lgdpr	(xtabond2) lgdpr	(xtabond2) lgdpr	(xtabond2) lgdpr	(xtabond2) lgdpr	(xtabond2) lgdpr
lfdi_lmcs					0.00484		
					(0.00949)		
lfdi_sisvrs						−0.0102**	
						(0.00416)	
Constant	−16.79	−26.16	−32.69*	−28.53***	−5.652	−36.33***	−24.32*
	(12.99)	(18.13)	(16.86)	(11.01)	(9.384)	(10.13)	(12.66)
Observations	212	122	181	212	207	209	212
Number of id	15	8	13	15	15	15	15
F-stat (Wald test)	3218	8921.56	9218.62	7219.12	8729	29,173	5236.8
F-stat (p-values)	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Sargan	0.871	0.879	0.883	0.842	0.921	0.943	0.896
Hansen	0.592	0.596	0.310	0.724	0.260	0.521	0.321
AR(1)	0.090	0.094	0.035	0.093	0.031	0.024	0.008
AR(2)	0.023	0.214	0.344	0.427	0.342	0.1131	0.8945
No. of instruments	20	20	20	20	20	20	20

Standard errors in parentheses, *** p < 0.01, ** p < 0.05, * p < 0.1
Source: Computed using Stata 14.0

economies are predominantly labour intensive and hence requires labour efficiency to stimulate the growth processes. The sign shows that labour force exerts a significant variation on GDP growth rate implying that GDP growth rate declines with increasing labour force in the region. This can be attributed to labour efficiency emanating from poor educational funding, inadequate access to healthcare services and lack of sufficient remuneration and vocation training to boost productive skills necessary to promote productivity. Also, education contributes significantly and exerts more than proportionate influence on GDP growth rate in ECOWAS. The evidence suggests that a 100% change in education causes about 487% change in GDP growth rate; implying that GDP growth rate responds more proportionately to changes in education. This confirms the vast theoretical consensus on the importance of human capital development (especially education). Education tends to boost the efficiency, innovative and imaginative thinking of labour force which ultimately improves economic productivity. Considering the obtained sign, education exerts a positive significant variation on GDP growth rates, suggesting that as education level improves, GDP growth rises. This is not far fetched from present reality, as education has been adjudged a critical determinant of growth stimulator, especially for emerging economies.

In the same manner, financial depth (M2GDP), openness degree (OPN) and exchange rate (EXCR) exert a significant elastic influence on GDP growth rate. This implies that a change in financial depth, degree of openness and exchange rate brings about a more than proportionate change in GDP growth rate in ECOWAS. It suggests that a 100% change in financial depth, openness and exchange rate causes about 346%, 290% and 140% change, respectively, in GDP growth rate. This evidence suggests that financial depth, openness and exchange rate are important determinants of GDP growth, with financial depth exerting the largest influence on GDP growth. This implies that the financial strength is critical to GDP growth outcome in ECOWAS economies. This is important to smoothen expenditure financing of government, business and household. In the same manner, some degree of openness is important to bridge the investment, consumption and resource gap in an economy, though excessive and unchecked openness can also be detrimental. It can destroy local innovations by exposing local industries to unhealthy competition, increase dumping, and encourage trans-border economic resources and wealth repatriation. Also, the exchange rate is critical in explaining the economic wellbeing, as it defines the performance of a domestic currency with respect to the world currencies and serves as the basis for trading with the rest of the world. Considering the sign, financial depth, openness and exchange rate exerts an inverse and significant influence on GDP growth in ECOWAS. This implies that GDP growth declines as financial depth, openness and exchange rate increases in the sub-region. This suggests that excessive openness and the rising exchange rate is detrimental to GDP growth in ECOWAS. For instance, when the exchange rate increases, it literally implies that domestic currency is further depreciated, producing a negative net effect on GDP growth due to the fact that most western African economies are net importers. Finally, the indicator of institution exerts an elastic influence on GDP growth but the influence was not significant. The insignificance can be explained by the absolute and conspicuous absence of institutional arrangement in most African economies, which serves as a limiting factor for GDP growth in the region.

4.1. FDI-growth relationship (FDI interacted with infrastructural absorptive capacity)

This section examines the role of infrastructural absorptive capacity in FDI transition to GDP growth in ECOWAS. The study considers the role of infrastructural development (such as railway lines, ICT good export, internet users, mobile telephone subscription and secured internet users) in FDI-GDP growth nexus. The commitment of the government to develop physical infrastructure and its availability determine to a great deal, the ability to attract FDI and imitate foreign technologies. The provision of physical and ICT infrastructures enable easy interaction with foreign technologies and strengthens the channel for technology spillover. For instance, the provision of efficient transport and communication system prepare the potential and the willingness of domestic labour to attract and imitate development technologies required for industrial revolution and national development. As previously espoused, the interaction variables were developed using a simple

multiplicative procedure; the FDI and the five measures of infrastructural development were merged to form the interaction variables: lfdi_ictgxp, lfdi_inturs, lfdi_lmcs and lfdi_sisurs.

The result readily available in Table 5 indicates the role of infrastructural absorptive measures in the FDI-growth relationship. The evidence shows that the interaction of railway lines and FDI results in a less proportionate returns on GDP growth in ECOWAS. Following the interaction, the responsiveness of GDP growth to FDI declined from 29.2% to 0.21%. This implies that physical infrastructure has not been developed enough to stimulate FDI and guarantee the necessary spillover effect. This is evident in the poor physical infrastructural development in African economies which has deterred foreign investors, and when they come, it is usually clustered in commercial economic centers while the purposed rural communities where financing gap is most needed are disassociated. In the same manner, the interaction of communication infrastructures (such as internet users and secured internet users) mitigated the effect of FDI on GDP growth in ECOWAS; as GDP growth becomes less responsive and declined from 29.2% to 8.97%, 0.48% and 1.02% for internet users, mobile communication subscription and secured internet users, respectively, following a 100% change in FDI.

On the other hand, the study considered the role of real sector ICT infrastructure and the evidence indicates that this stimulates the effect of FDI on GDP growth rate in ECOWAS. It hence implies that ICT targeted at the production of exportable goods stimulates the spillover effect of FDI, as GDP growth rates exhibit increasing returns to scale resulting in an increase in the responsiveness of GDP growth from 29.2% to 554.6%. This suggests that GDP growth rate becomes more elastic to change in FDI, a change in FDI (especially when targeted at improving ICT in the real sector) leads to a more than proportionate increase in GDP growth rate in ECOWAS. This evidence suggests that FDI should be encouraged into the ICT development in the real sector; this is capable of producing real economic goods for domestic sufficiency and exports. The estimation procedure reveals that the development of ICT infrastructures targeted at producing exportable goods is capable of attracting FDI and generates spillover for improved GDP growth. The commitment for infrastructural development in this line and the influx of foreign capital and experts strengthen the capability of domestic labour to imitate technology that can stimulate GDP growth in ECOWAS economies.

5. Conclusion and policy implication

The study assesses the relevance of infrastructural absorptive capacity in the FDI-growth argument in ECOWAS. Though foreign aid has received a vast attention in the literature, however, an assessment of how the infrastructural readiness of the host economies drives the effectiveness of aid was vocal in this re-examination. The study built its argument for the importance of external financing on the two-gap model which depicts that less developed economies need adequate financing inflow to bridge the widening domestic savings and investment discrepancy. The study assesses this main thrust in ECOWAS Sub-region for the period 1995–2017 using the system GMM estimation approach. This is necessary in order to restrain the problem of reverse causality predominant with the FDI-growth relationship. The result suggests that FDI promotes growth though growth responded less proportionately to FDI influx, basically the vast number of FDI targets extractive sectors and predominantly rent-seeking; hence generating weak spill-over to the host economies.

On the other hand, following the interaction of FDI and physical infrastructures, the responsiveness of FDI declined. Specifically, the responsiveness of GDP growth declined from 29.2% to 0.21% for road infrastructures. The evidence reflects why external financing doesn't get to where it is most needed, rather clustered in specific sectors and cities. The lack of transport and road infrastructures has hampered the interest and flow of external resources capable of initiating and stimulating the growth process, especially in the rural and agrarian communities of Africa. The region has received considerably FDI with respect to comparable economies around the world, even though, returns to FDI are relatively higher in Africa. Contrarily, telecommunication infrastructures boost the effectiveness of aid in ECOWAS region. This is unconnected to the appreciable development of telecommunication infrastructural services in the

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ECOWAS. The spread and effectiveness of the telecommunication services and infrastructures have been adjudged as an important achievement of the last century in Africa. This also has boosted FDI, as it enhances the ease of doing business and knowledge spillover. It hence becomes expedient for African government and policy makers to channel a viable development path towards enhancing transport and road infrastructures. For instance, the Nigerian government has recently initiated a commendable policy decree centered on nationwide emergence on road construction. This will open up routes access and attract investment into the space and livelihood of the predominantly large poor population and reduce the incidence of poverty.

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Note
1. According to O'Fallen & Butterfield (2005) as cited in Nguyen et al., (2013) Physical infrastructures are described as a service system associated with energy, water supply, transport, telecommunications, sanitation, and waste facilities, as well as flood protection and drainage. This also includes transport infrastructure entailing railway, road airway, airlines, water road, ships which can carry raw material to manufacturing point and final goods to consuming point.

Correction
This article has been republished with minor changes. These changes do not impact the academic content of the article.

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Cogent Economics & Finance (ISSN: 2332-2039) is published by Cogent OA, part of Taylor & Francis Group.

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