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The impact of foreign capital inflows on economic growth on selected African countries

Impact of FCIs
on economic
growth

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Abstract

Purpose – Nowadays, foreign capital inflow (FCI) is considered as a catalyst for economic development and an important source of transferring technology and foreign exchange earnings from developed to developing countries. The purpose of this paper is to study, first, the impact of different forms of FCIs, namely, foreign direct investment (FDI), personal remittances (PR) and official development assistant (ODA) on economic growth on 26 top African countries; and, second, which of them is more effective on economic growth of the studied countries. The results of this paper are very important for host governments' policy and help them to design their economic plans to absorb the suitable foreign inflow.

Design/methodology/approach – The paper uses Pooled Mean Group (PMG) econometric technique to estimate the heterogeneous panels over the period 1992–2016.

Findings – The results of the study show that all three forms of FCIs have positive and significant effects on economic growth in the long and short run. However, the PR had the most effect on economic growth in the long and short run. The study suggests that the governments should design and implement appropriate fiscal, monetary and trade policies in order to create and improve an enabling environment to attract FCIs as a supplementary source of domestic investment.

Research limitations/implications – The research limitations of this paper are as follows: data sets of FDI, PR and ODA were available not for all African countries; and, data sets that were available were of before the year 1992. Thus, the research is done for the African countries which had the data sets after the year 1992.

Practical implications – The result of this paper indicates the impact of each FDI, PR and ODA in economic growth. So, countries can take more attentions to each of them on economic planning.

Social implications – FCIs are one of the important external source of exchange for each country. So, the study of importance of each of them is necessary for economic planning.

Originality/value – Most of the previous studies have examined the impact of three different forms of FCIs on economic growth separately, on different countries and regions and using various models and econometric techniques. One of the contributions of this paper is focused on the impacts of FDI, PR and ODA on economic growth separately and simultaneously in 26 top recipient African countries and using the PMG technique which is an advanced econometrical estimation and studied less about it. The other contribution of this research is the comparison of the impact of different FCIs on economic growth, and it is very important for governments' economic policy.

Keywords Economic growth, African countries, Foreign capital inflows, Pooled Mean Group

Paper type Research paper

1. Introduction

The developing countries can accelerate the speed of economic growth through the transfer of advanced technology and innovations of developed countries through attracting various forms of foreign capital inflows (FCIs). Most of the economists confirm a positive relationship between FCIs and economic growth. Of course, the effect of FCIs varies from one country to the others and also from one group of countries or region to the others; and it depends on the economic environment and governments' policies (Nwaogu and Ryan, 2015).

The different forms of FCIs are foreign direct investment (FDI), personal remittance (PR), official development assistance (ODA) and foreign portfolio investment. Among them, FDI, PR and ODA are the most important sources of FCIs in the most host (or recipient) countries.



FDI is an investment in a business by an investor country for which the foreign investor has control over the company purchased. OECD defines “control” as owing 10 percent or more of business. FDI can be a tremendous source of external capital for a developing country, which can lead to economic development. FDI may also provide some great advantages for multinational corporations such as access to foreign markets, access to natural resources and it reduces the cost of factors production (www.oecd.org, 2016).

Remittances are mainly in the form sent by non-resident to their household (resident) in the home country. In other words, PR are defined as transfers of a sum of money that follow unidirectional paths from a migrant to his or her sending relations and or friends, community, and country (Majumder and Donghui, 2016). PR are one of the largest sources of external funding for developing countries and three times the size of ODA while supplementing the domestic incomes of millions of poor families across the world.

ODA refers to foreign aids, in other words, the flow of financial resources from the central or local government of donor countries and multilateral agencies to developing countries. ODA is intended to promote the economic development and to improve the quality of life in developing countries (www.oecd.org, 2016).

Most of the African countries suffer from the low finance sources or old technology to develop their industrial projects, and the domestic savings or native technology is not enough and suitable to implement advanced plans. So, they have to provide the shortage of financial reserves or modern technology from abroad. The African countries have not been more successful to attract FCIs. In the last two decades, for instance, the ratio of investment to GDP in African countries averaged at about 18 percent of GDP which was well below the ratios attained by similar countries of Asia (30–32 percent) and Latin America (20–25 percent) (www.world bank.org, 2016). The African countries also face the difficulties such as severe unemployment, heavy external debts and economic stagnation. They are trying to generate enough funds domestically to finance the public expenditures for the supplement of infrastructure plans. Since the internal finance reserves are insufficient, they have to provide their shortage of fiscal reserves through different forms of FCIs. The various FCIs are expected to not only improve economic growth but also to raise the welfare of the people and reduce poverty in African countries.

The FDI, PR and ODA inflows in African countries over the period 1992–2016 are shown in Figure 1. According to the World Bank, PR is the first largest source of external financial inflows to African countries which have reached \$65,208.29m in 2016. FDI is the second source (\$32,095.23m), and the third external financial source is ODA which is amounted \$13,225.95m in 2016 in real terms.

The paper is organized as follows: after introduction, the next section reviews the relevant literature, Section 3 deals with methodology and source data issues. Section 4 presents the empirical results, and Section 5 concludes the study with policy recommendations.

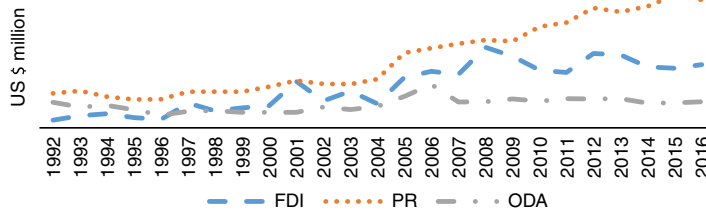


Figure 1. FDI, PR and ODA in selected African countries

Source: World Bank.Org and OECD.Org (2016)

2. Literature review

Although most of the empirical studies on the impacts of FCIs on economic growth among various countries and regions are positive, the relationship between different kinds of FCIs on economic growth is still inconclusive. In the following section, a review of some studies is presented with the specific focus on the link between the following: FDI and growth; remittances and growth; foreign aid (ODA) and growth.

2.1 FDI and economic growth

FDI has been identified in the empirical literature especially in the neoclassical and endogenous growth models as a major or factor that promotes growth. Some of the studies on the relationship between FDI and economic growth have the neoclassical growth models as the basis. One of such studies is Chowdhury and Mavrotas (2005) which identifies the four principal channels through which FDI promotes growth, namely, the determinants of growth; the determinants of FDI; the role of multinational firms in host countries; and the direction of causality between the two variables. The proponents such as De Mello (1997), Tiwari (2011), Shakar and Aslam (2015) and Adusah-Poku (2016) confirm the positive relationship between FDI and economic growth. They believe this positive association can only occur under a certain number of conditions such as existing trade regimes, financial market regulations and banking systems, the degree of openness of their economies as well as the levels of human capital in the host countries. Some other economists believe that FDI may be harmful in the long-run growth for developing countries if this investment comes from the developed country. For instance, Hein (1992) and Khan (2007) argue that if developing economies cannot become fully modernized in their structure, they remain stuck in the world's capitalist system. Therefore, it is suggested that the developing countries should increase their growth without depending on FDI or they should provide the economic conditions for absorbing FDI. Table I provides a summary of some empirical studies about the effect of FDI on economic growth.

According to most of the empirical studies, FDI has a positive impact on economic growth, of course under a suitable and political-economic environment.

2.2 PR and economic growth

Remittances (or PR) are conventionally defined as transfers of a sum of money that follow unidirectional paths from a migrant to his or her sending relatives and or friends, community

Study	Period	Methodology	Sample	Findings: (the effect of FDI on economic growth)
Mansour <i>et al.</i> (2017)	2001–2014	PMG	9 African countries	Positive
Nwosa and Akinbobola (2016)	1980–2010	GMM	6 African countries	Positive
Adusah-Poku (2016)	1990–2010	PMG	36 Sub-Saharan countries (SSA)	Positive
Nwaogu and Ryan (2015)	1970–2009	GMM	53 African countries and 34 Latin American and Caribbean	Positive
Ongo Nkoa (2014)	1980–2010	GMM	6 Sub Saharan African countries	Positive
Natacha (2012b)	1988–2008	ARDL	Cameroon	Positive
Tiwari (2011)	1980–2007	OLS–GMM	28 Asian countries	Positive
Ndambendia and Njoupouo (2010)	1980–2007	PMG	36 Sub-Saharan African countries	Positive
Khadaroo and Seetanah (2010)	1096–2000	ARDL	20 African countries	Positive

Source: Author's research

Table I.
Empirical studies
of FDI on
economic growth

and country (Cohen, 2011; Maimbo and Ratha, 2005). Today, remittances are recognized as one of the most important sources of global development finance, and they are the second largest source, behind FDI, of external funding for developing countries and three times the size of ODA while supplementing the domestic incomes of millions of poor families across the world. Therefore, remittances remain a key source of external resource flows for developing countries like African countries, for exceeding ODA and more stable than private debt and portfolio equity flows (Natacha, 2012a).

The inflow of remittances on the macro-economy can lead to accelerated long-run growth as a result of additional investments in physical and human capital. Chami *et al.* (2003) and Jan Singh *et al.* (2009) believe remittances in physical capital and human capital, and by developing the financial system in the recipient country.

If there are significant financial constraints in the country that keep a large growth of households from the credit market, remittances may help ease that constraint and lead to an increase in the domestic investment rate. A significant portion of remittances is spent on acquiring education and nutrition, leading to a higher rate of human capital accumulation. This leads to total factor productivity (TFP) and subsequent growth. In addition to the increase in higher accumulation of physical and human capital, remittances can have a positive impact on growth by affecting the recipient countries' financial system. Remittances can lead to an increase in the demand for money, and expand the supply of funds in the recipient economies and subsequently causes higher economic growth (Majumder and Donghui, 2016).

However, some studies that confirm a negative relationship between growth and remittances argue that remittances tend to degrade long-run growth by creating labor substitution and "Dutch disease" effects, influencing inflation, appreciating the real exchange rate and reducing the labor market participation rates by substituting remittance income for labor income (Barajas *et al.*, 2009). Table II provides a summary of some empirical studies about the impact of remittance on economic growth.

According to the above studies, remittance has a positive impact on economic growth, but in some countries, it may have an adverse impact in domestic investment.

2.3 ODA and economic growth

ODA is one of the most important tools for financing development given low levels of domestic savings and limited access to private capital flows. ODA refers to foreign aids, in

Study	Period	Methodology	Sample	Findings: (the effect of personal remittance (PR) on economic growth)
Majumder and Donghui (2016)	1966–1967 2004–2005	ARDL	Bangladesh	Positive
Adusah-Poku (2016)	1990–2010	PMG	45 Sub-Saharan African countries	Positive in long-run
Nwosa and Akinbobola (2016)	1970–2013	ARDL	Nigeria	Positive
Ahamada and Coulibaly (2013)	1980–2007	Panel Casualty testing	20 Sub-Saharan African countries	No causality between remittances and growth
Mallick (2012)	1966–1967 2004–2005	PMG	India	Negative impact on private investment
Katushi <i>et al.</i> (2014)	1980–2009	VAR	24 Asian countries	Positive
Vargas-Silva <i>et al.</i> (2009)	1988–2008	Panel data	20 Asian countries	Positive

Source: Author's research

Table II.
Empirical Studies of
PR on Economic
Growth

other words, the flow of finance resources from the central or local government of donor countries and multilateral agencies to developing countries. The main aim of ODA is to help the poor countries to reduce poverty and achieve sustainable development. Some types of foreign aid (ODA) are various grants (such as debt forgiveness and other debt grants), rescheduled debt, equity investment, technical cooperation, development food aid and humanitarian aids (Dutta *et al.*, 2016).

ODA may also contribute to economic growth through some mechanisms. For example, this could happen by increasing investment in physical and human capital, by increasing the capacity to import capital goods or technology, by not discouraging domestic investment or savings rate through indirect effect and by increasing the productivity of capital and promoting endogenous technical change in the case of aid linked technology transfer programs (Tiwari, 2011).

The most important objective of donors ODA is that aid works in reducing poverty in developing countries. The donors worry about the fungibility of foreign aids. In simple terms, fungibility is a broad term that describes situations when recipients respond to aid by changing the way they use their resources. Aid could be used to decrease taxes, to fund projects in a different sector, or simply to line the pockets of corrupt official (Van de Sijpe, 2013). Some economists believe additional support to ODA may discourage taxation by recipient governments (Benedek *et al.*, 2012). Table III shows a summary of some empirical studies about the impact of ODA on economic growth.

As it can be seen in Table III, the impact of ODA on economic growth of studied regions and countries is positive or negative; it depends on the way of using foreign aids.

An important conclusion to be drawn from the studies above is that the impact of FDI, remittance and ODA on economic growth is significant and positive, but this result is not decisive for any country; the effect of FCI on growth is contingent on the economic policies of the recipient countries.

Most of the previous studies have examined separately the impact of three different forms of FCIs (namely, FDI, PR or ODA) on economic growth, on different countries and regions and using various models and econometric techniques. One of the contributions of this paper is to focus on the impacts of FDI, PR and ODA on economic growth separately and simultaneously in 26 top recipient African countries and using the Pooled Mean Group (PMG) technique which is an advanced econometrical estimation and studied less about it. The other contribution of this research is the comparison of the impact of different FCIs on economic growth, and it is very important for governments' economic policy.

Study	Period	Methodology	Sample	Findings: (the effect of ODA on economic growth)
Tang and Bundhoo (2017)	1990–2012	Pooled OLS	Ten largest recipient of aid in Sub-Saharan countries	Positive
Adedokun (2017)	1996–2012	GMM	20 Sub-Saharan African countries	Insignificant and negative
Dutta <i>et al.</i> (2016)	1992–2014	GMM	64 Sub-Saharan and Mena countries	Negative
Natacha (2012b)	1980–2008	ARDL	Cameroon	Positive
Siraj (2012)	1970–2010	VECM	Ethiopia	Positive
Bakhtiari (2013)	1991–2010	Panel data	25 developing countries	Positive

Source: Author's research

Table III.
Empirical studies of
ODA on economic
growth

3. Methodology

3.1 The theoretical model

According to empirical studies, FCI can apply to economic growth models directly (Mah, 2010) or through the spillover impacts (Kotrajaras *et al.*, 2011). In this study, it is postulated that FCIs affect economic growth through the spillover impacts. The econometric model of this study is used by a Cobb–Douglas form given as follows:

$$Y_{it} = A_{it} L_{it}^{\alpha} K_{it}^{\beta} e^{\varepsilon_{it}}, \quad (1)$$

where (Y_{it}) denotes the real GDP; (A_{it}) is TFP as the proxy for the technology. The variable (A_{it}) has to be endogenized as a function of FDI, PR and ODA. In other words, in this study, the endogenous growth model is formulated by FDI, PR and ODA which affect the output growth through enhancing the TFP (Natacha, 2012b). Thus, it is assumed that (A_{it}) is a function of FDI, PR and ODA.

Equation (3) is obtained by combining Equations (1) and (2):

$$A_{it} = F(FDI_{it}, PR_{it}, ODA_{it}) = FDI_{it}^{\delta} PR_{it}^{\phi} ODA_{it}^{\theta}, \quad (2)$$

$$Y_{it} = L_{it}^{\alpha} K_{it}^{\beta} FDI_{it}^{\delta} PR_{it}^{\phi} ODA_{it}^{\theta} e^{\varepsilon_{it}}. \quad (3)$$

Taking natural logs of Equation (3) gives:

$$\ln Y_{it} = \alpha \ln L_{it} + \beta \ln K_{it} + \delta \ln FDI_{it} + \phi \ln PR_{it} + \theta \ln ODA_{it} + \varepsilon_{it}, \quad (4)$$

where α , β , δ , ϕ and θ are the constant elasticity coefficient of output relative to L , K , FDI , PR and ODA . For estimation purposes, Equation (4) can be written as:

$$\ln Y_{it} = \phi + \alpha \ln L_{it} + \beta \ln K_{it} + \delta \ln FDI_{it} + \phi \ln PR_{it} + \theta \ln ODA_{it} + \varepsilon_{it}, \quad (5)$$

where all the variables are defined previously; ϕ is the constant term and ε_{it} is the disturbance term assumed to be independently and normally distributed with zero mean and constant variance.

The variables of the model of this study are as follows.

Y_{it} is the real GDP (US\$ million); L_{it} the total labor force (of the country, million); K_{it} the capital stock (US\$ million); FDI_{it} the foreign direct investment (net inflows, US\$ million); PR_{it} the net PR received by residents (US\$ million) and ODA_{it} the net official development received by governments (US\$ million); and ε_{it} the disbursement term. Subscripts i and t stand for country and period, respectively.

The selected model of this research and the variables are justified by some empirical studies such as Kim and Bang (2008), Mah (2010), Natacha (2012b) and Adusah-Poku (2016).

Regarding the prior expectations, the literature predicts a positive relationship between L_{it} , K_{it} and real GDP ; but the impact of FDI_{it} , PR_{it} and ODA_{it} on GDP may be positive or negative.

3.2 Estimation technique

Pesaran *et al.* (1999) suggested the PMG estimator for dynamic heterogeneous panels. It is a panel version of Auto-regressive distributed lag (ARDL) bounds testing approach and is used for estimation of long-run and short-run parameters jointly. The main interest of ARDL models is that long-run relationship and short-run parameters are estimated jointly. They also allow to deal with variables that are possible of a different order of integration, namely, $I(0)$ and $I(1)$, and not simply $I(1)$. This property is extremely useful given the low power of panel unit root tests in short samples. The PMG estimator allows the short-run

coefficients and the speeds of adjustment to vary freely across countries but imposes common long-run coefficients. In other words, the Mean Group (MG) estimator proposed by Pesaran and Smith (1995) allows both short- and long-run parameters heterogeneity. It derives the long-run parameters for the panel as the unweighted average of the long-run estimates from the N individual country regressions. The long-run slope homogeneity hypothesis is tested via a Hausman test, where under the null hypothesis, the difference in the estimated coefficients between the MG and PMG is not significantly different and PMG is not significantly different and PMG estimators are consistent and more efficient than MG estimators (Pesaran *et al.*, 1999). Adusah-Poku (2016), Kehoy (2016), Bangake and Eggoh (2012) and Ndambendia and Njoupouognigni (2010) used the PMG technique for estimation of their econometric models.

Thus, the reduced form of the ARDL dynamic panel model is viewed as:

$$Y_{it} = \sum_{j=1}^m \lambda_{ij} Y_{it-j} + \sum_{j=0}^n \delta_{ij} X_{it} + \mu_{it} + \varepsilon_{it}, \quad (6)$$

where Y_{it} is the real GDP; $X_{it} = (L_{it}, K_{it}, FDI_{it}, PR_{it}, ODA_{it})$ is a vector of explanatory variables; λ_{ij} the scalars; and μ_i represents the country-specific effect; and ε_{it} the disturbance term.

From the above model, the long-run relation is derived as follows:

$$y_{it} = \theta'_i + x_{it} + u_{it}. \quad (7)$$

An error correction model (ECM) of an ARDL (p, q, q, \dots, q) specification can be considered as shown in the following equation:

$$\Delta(Y)_{it} = \phi(Y)_{i,t-1} + \alpha(X)_{i,t-1} + \sum_{i=1}^{p-1} \lambda_{i,j} \Delta(Y)_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta(X)_{i,t-j} + \mu_{it} + \varepsilon_{it}, \quad (8)$$

where X is a vector of explanatory variables; α contains the long-run dynamics; ϕ is the error correction term; and δ_{ij} contains the short-run dynamics.

The ARDL approach is first carried out by estimating the unrestricted error correction model in Equation (7) using the OLS:

$$\begin{aligned} \Delta \text{Ln}(Y)_{it} = & \theta + \sum_{j=0}^a \lambda_{1j} \Delta \text{Ln}(Y)_{t-j} + \sum_{j=0}^b \lambda_{2j} \Delta \text{Ln} K_{t-j} + \sum_{j=0}^c \lambda_{3j} \Delta \text{Ln} L_{t-j} \\ & + \sum_{j=0}^d \lambda_{4j} \Delta \text{Ln}(FDI)_{t-j} + \sum_{j=0}^e \lambda_{5j} \Delta \text{Ln}(PR)_{t-j} + \sum_{j=0}^f \lambda_{6j} \Delta \text{Ln}(ODA)_{it}, \quad (9) \end{aligned}$$

where Δ is a different operator, a, b, c, d, f represent the lag length on the regression variables and ε_t is the error term assumed to be white noise. The parameters λ_{nj} for $n = 1, 2, \dots, 6$ represent the short-run dynamics of the ECM model whereas the parameters for the long-run relationships are given by the δ s. The study employs the Schwartz–Bayesian information criterion to determine the optimal lag length.

3.3 Data

In this paper, the annual time series data for 26 selected African countries over the period 1992–2016 are used. Countries were selected only based on the availability of data, especially based on the GDP, ODA, PR and FDI. The data for GDP, L, K, FDI and PR were sourced from the World Development Indicators by World Bank, and ODA data are

obtained from OECD's Creditor Reporting System. All data are in real terms (constant 2010 US\$). The top recipient African countries in this paper are Algeria, Benin, Burkina-Faso, Cameroon, Cob Verde, Cote d'Ivoire, Egypt, Ethiopia, Kenya, Lesotho, Liberia, Libya, Madagascar, Mali, Mozambique, Morocco, Mauritius, Namibia, Niger, Nigeria, Rwanda, Senegal, Sudan, Tunisia, South Africa and Swaziland.

4. Empirical results

4.1 Panel unit root tests

Table I presents the results of the panel unit root tests. There are two types of panel unit root processes. When the persistence parameters are common across section, then these types of processes are called a common unit root process. Levin–Lin–Chu's (LLC), Breitung and Hardi employ this assumption. When the persistence parameters freely move across cross-section, then this type of unit root process is called an individual unit root process. Im–Pesaran and Shin (IPS) and ADF–Fisher test are based on this form.

The test results from Table IV show that except K , and PR , the other variables (Y , L , FDI and ODA) are not stationary. Stationary tests are then carried out at the difference for variables that were not stationary at levels with the results shown in Table V.

4.2 Panel co-integration results

Table VI presents the results of the null hypothesis of no co-integration. The results from the Pedroni's co-integration test show the rejection of the null hypothesis of no co-integration at 1 percent level significance of within (common auto-regression coefficients) and between (individual auto-regression coefficients) dimensions. The Kao's test confirms Pedroni's test with the existence of co-integration using the assumption of between-dimensions.

Table IV.

Result of panel unit root tests

Series name	Testing assuming a common unit root			Testing assuming individual unit root	
	LLC t -stat	Breitung t -stat	Hardi z -stat	IPS w - t -bar stat	ADF–Fisher χ^2
Ln Y	2.38643 (0.9397)	2.13954 (0.0760)	9.32175 (0.7642)	5.12074 (0.08457)	196.392 (0.0800)
Ln L	–3.1254 (0.6218)	0.46216 (0.7252)	10.5221 (0.5643)	–4.76231 (0.3206)	151.124 (0.3219)
Ln K	–4.12757 (0.0000)	5.74281 (0.0000)	10.28317 (0.0000)	4.32196 (0.0000)	213.621 (0.0000)
Ln FDI	2.10424 (0.0717)	–5.74234 (0.1264)	9.75328 (0.8321)	–4.73219 (0.7642)	185.134 (0.0643)
Ln PR	–3.12865 (0.0000)	4.17532 (0.0000)	13.75391 (0.0000)	41.53295 (0.0000)	2.7641 (0.0000)
Ln ODA	0.75381 (0.3621)	0.21042 (0.7543)	18.3251 (0.9753)	7.12435 (0.3217)	58.10543 (0.7643)

Note: Values in () are p -value

Source: Author's estimations

Table V.

Result of panel unit root tests (at first different)

Series name	Testing assuming a common unit root			Testing assuming individual unit root	
	LLC t -stat	Breitung t -stat	Hardi z -stat	IPS w - t -bar stat	ADF–Fisher χ^2
Ln Y	12.5438 (0.0000)	6.21653 (0.0000)	11.7653 (0.0000)	8.32076 (0.0000)	254.128 (0.0000)
Ln L	–12.2365 (0.0000)	4.24852 (0.0000)	13.86534 (0.0000)	–12.76538 (0.0000)	427.124 (0.0000)
Ln FDI	4.12641 (0.0000)	–3.76412 (0.0000)	10.13642 (0.0000)	–5.87374 (0.0000)	231.076 (0.0000)
Ln ODA	9.21864 (0.0000)	–9.15436 (0.0000)	23.10646 (0.0000)	18.15428 (0.0000)	175.30763 (0.0000)

Note: Values in () are p -value

Source: Author's estimations

	Statistic	Prob	Weighted statistic	Prob	Impact of FCIs on economic growth
<i>Pedroni's co-integration test</i>					
Panel v	2.475321	0.0021	-0.85421	0.0000	
panel ρ	0.428753	0.0000	0.17321	0.0002	
Panel PP	4.98427	0.0000	-4.12852	0.0000	
Panel ADF	5.31279	0.0002	-5.32177	0.0003	
<i>^aIndividual AR coefficient (between dimension)</i>					
Group ρ	0.86436	0.0018			
Group PP	-6.428642***	0.0000			
Group ADF	-3.542815***	0.0000			
<i>Kao residual co-integration test</i>					
Test statistic = -4.407421 (0.0001)					
Notes: ^a Common AR coefficients (within dimension). ***Significant at 1 percent level					
Source: Author's estimations					

Table VI.
Results of panel
co-integration test

4.3 The results of long-run and short-run estimations

Table VII shows the long- and short-run estimates based on PMG estimation. Four alternative models are presented in Table VII. In models 1–3, the study includes only one of the FCI as a time in addition to the control variables. All three FCIs and control variables are included in the model 4.

4.3.1 Long-run results. In this study, all coefficients are interpreted as elasticities. All the three FCIs were found to be long-run drivers of economic growth in all the four models. Moreover, all coefficients of FCIs variables were consistent regarding the signs and statistically significance.

PR to African countries have been increased considerably and increased from \$17,491.19 to \$65,208.29m in 1992 and 2016, respectively, indicating a 272.80 percent increase (in real terms). In all, 1 percent increase in PR increases growth by 2.41 and 9.82 percent in

	Model 1	Model 2	Model 3	Model 4
Convergence coefficients	-0.0157*** (0.0014)	-0.0921** (0.0361)	-0.0793** (0.0364)	-0.0932*** (0.0201)
<i>Long-run coefficient</i>				
Ln L	0.02843*** (0.0054)	0.03701*** (0.0092)	0.0495*** (0.0117)	0.0532*** (0.0093)
Ln K	0.0513*** (0.0120)	0.0392*** (0.0106)	0.0493*** (0.0086)	0.07321*** (0.0157)
Ln FDI	0.0563*** (0.0113)			0.0673*** (0.0124)
Ln PR		0.0241** (0.0122)		0.0982*** (0.0201)
Ln ODA			0.0141** (0.0063)	0.0252** (0.0091)
<i>Short-run coefficient</i>				
Δ Ln L	0.0321* (0.0191)	0.02631** (0.0092)	0.03218*** (0.0076)	0.0621** (0.0023)
Δ Ln K	0.0418** (0.0116)	0.0291*** (0.0063)	0.0274** (0.0011)	0.04173*** (0.0085)
Δ Ln FDI	0.0312** (0.0105)			0.0417* (0.0222)
Δ Ln PR		0.0952*** (0.0164)		1.0692*** (1.3286)
Δ Ln ODA			0.0752*** (0.0042)	0.0304*** (0.0065)
No. of countries	26	26	26	26
No. of obs.	650	650	650	650

Notes: Values in () are standard errors. All variables are in their logarithmic forms. *, **, ***Significant at 10, 5 and 1 percent level, respectively

Source: Author's estimation

Table VII.
The PMG
estimation results

models 2 and 4, respectively. The increase in remittances over the past years have had a positive and significant impact on consumption, health, education, investment pattern and the economic growth of African countries. This result is consistent with other studies from other developing countries such as Vargas-Silva *et al.* (2009), Mallick (2012), Abida and Sghaier (2014) and Adusah-Poku (2016).

FDI is the second FCIs in African countries. It was reached about \$3,833.45 and \$32,095.23m in 1992 and 2016, respectively, indicating a 737.24 percent increase (in real terms). In all, 1 percent increase in FDI increases growth by 5.63 and 6.73 percent in models 1 and 4, respectively. This result is consistent with other findings from other studies about developing countries such as Ndambendia and Njoupouognigni (2010), Tiwari (2011), Natacha (2012b), Inekwe (2013), Insah (2013), Ali and Mingque (2018).

The share of foreign aid (ODA) in GDP of the African countries is not considerable over the past years, and it has reached about \$13,023.12 and \$13,225.95m in 1992 and 2016, indicating a 1.55 percent increase (in real terms). In all, 1 percent increase in ODA increases growth by 1.41 and 2.52 percent – all other variables constant in models 3 and 4, respectively.

According to OECD statistics, the African countries receive the most ODA to the other regions in the world (which is about 26 percent of the world in 2016). Even though the ODA to African countries has not been increasing over the recent years, but it has a positive and significant impact on their physical and social infrastructure. This result is consistent with the other studies such as Quattara (2006), Felix (2012), Adams and Atsu (2014), Adams and Opoku (2015), Dutta *et al.* (2016) and Adedokum (2017).

4.3.2 Short-run results. Table VII also shows the short-run impacts of FCIs on economic growth are positive and statistically significant. The result indicates that all the three FCIs were found to be short-run drivers of economic growth in all the four models. Of course, the impact of PR on economic growth is more than FDI and ODA in short-run.

The result of model 4 also shows that when three FCIs are used simultaneously, their effects on economic growth are more than using them separately.

The error correction terms (ECTs) are negative and significant in all the four models and confirm the conclusion of co-integration among the variables. The ECTs of -0.0157 , -0.0921 , -0.793 and -0.0932 suggest that when economic growth of African countries is above or below its equilibrium level, it adjusts by almost 1.57, 9.21, 7.93 and 9.32 percent in models 1, 2, 3 and 4, respectively.

5. Conclusion

This study tries to investigate empirically the impacts of FDI, PR and ODA on economic growth of 26 top host African countries over the period 1992–2016 by PMG estimator. All the three forms of FCIs used in this study affect economic growth in the studied African countries positively and statistically significant in the long- and short-run. However, PR had more impact than FDI and ODA on economic growth of 26 African countries over the study period. The result of this study is consistent with some recent research such as Ali and Mingque (2018), Adedokum (2017), Adusah-Poku (2016) and Dutta *et al.* (2016). In these studies, remittance is the most important sources of FCIs in the host countries, and the governments try to encourage the migrants to send external revenues back home country.

In the recent years, remittances to African countries are decisive to most African countries' economies not only in the long-run but also in the short-run as well. The World Bank figures show that for instance, in 2016, remittance to African countries was \$65,208.29m, as compared to the FDI which stood at \$32,095.23m and ODA \$13,225.95m in real terms (world bank, org., 2016). According to the World Bank in 2016, PR can greatly contribute to the welfare and productivity of people and households. As a result of this

study, PR proves to be a viable contribution to the economy in the long-run. It is necessary to provide helpful terms like high-interest rate, exemptions in tax and flexible currency conversion to increase remittances inflow. The government should also steer remittances toward small business. Existing financial payment mechanisms make remittances very expensive and migrants who want to send money home face obstacles such as hidden charges and fees, slow fulfillment, limited infrastructure for pay points, and transfers (both countries or within country), legal and regulatory barriers, coordination failures among institutional actors, individual risk such as loss of funds in transit, and systemic risk such as money laundering, etc. A policy should be made convenient and should encourage minimum pay point, strong coordination between financial institutions by developing countries to save regulatory barriers and risk of money laundering. The government policy should be designed toward inducing the private sector to allocate more resources for investment in leveling up the rate of growth. Otherwise, a significant portion of remittances would result an increase in private consumption without any contributory impact on the economy.

FDI can be an enormous source of external capital for a developing country, which can lead to economic development. FDI inflows can help to transfer the advanced technologies from abroad, increase the export values and foreign exchange earnings. Of course, it is proved that the effect of FDI on economic growth is highly dependent upon the local conditions of the recipient economy. These conditions also seem to be a requirement for stimulating FDI as well as domestic investment. Therefore, ensuring the right economic environment should be a political demand in transition economies if they are seeking to modernize their physical capital stock. Thus, the developing countries like African countries should obtain the benefits of FDI through domestic facilities such as infrastructure, financial system evolution, human capital development and macroeconomic stability.

The most important objective of donors ODA is that aid works in reducing poverty. ODA is also suitable to spend for economic development investment in areas of infrastructure expenditure. If the ODA is allocated for the infrastructure investment, and domestic resource mobilization, it improves economic growth in the countries.

Finally, the impact of FCI on economic growth is contingent on the appropriate fiscal and monetary policies of recipient countries. The governments should allocate the FCI for physical (transportation, communication, sewage, water and electric system) and social (health, education, nutrition) infrastructure and avoid crowding out government revenues. In other words, they should provide a sufficient absorptive capability of the advanced technologies to attract FCIs. Meanwhile, the host African countries should match the internal factors with the external factors by making some initial conditions such as the suitable fiscal and monetary policy, good governance and remove the large barriers of the entrance of FCIs inflows. They should also promote the level of domestic investment and focus on the internal factors (especially human capital and domestic savings).

According to the results of this study, remittance is one of the most important sources of absorbing revenue from abroad to African countries. For future study, it is suggested to study the determinants of absorbing remittance by host African countries and the ways of using it in infrastructure investment and increasing employment.

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