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Determinants of Foreign Direct Investment: A Comparative Study between Central and East Africa

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Abstract

In the recent decades, East African region has been attracting more inflows of Foreign Direct Investment (FDI) than Central Africa, while the trend was different for the period before 1990. This study aimed at identifying factors that determine FDI attraction in the two regions using a panel data of six countries (three in Central Africa and other three in East Africa) over the year 1990-2018. We applied the Panel Autoregressive Distributed Lag (P-ARDL) model based on the Pooled Mean Group (PMG) estimation to capture short and long-run relationships amongst variables. Results indicated that in the long-run, infrastructure quality, trade openness and market size explain the attraction of FDI inflows in both Central and East Africa. A comparison of the two regions shows a sharp contrast of factors that attract FDI. While trade openness and natural resources endowment are key factors for Central Africa, infrastructure quality and market size are critical in East Africa. However, resource curse hypothesis has been found in Central Africa since the increase in resource rents decreases the attraction of FDI inflows. Therefore, policies which promote cooperation among countries by increasing the levels of trade, reduce the costs of doing business and invest in infrastructures should be implemented in the two regions.

Keywords

Foreign Direct Investment, Central Africa, East Africa

1. Introduction

The attraction of Foreign Direct Investment (FDI) has been a major policy in most of the developing countries. This is due to the perspective that FDI is not only a vital source of skills improvement, knowledge transmission, creation of

employment, and opportunities in trade (Lipsey, 2001) but also a critical factor of technological transfer in the host country (Chenaf-Nicet & Rougier, 2016). In this regard, Wooster & Diebel (2010) stated that inflows of FDI help such countries to diversify their economies, which directly boost economic activities, leading to the enhancement of host countries' economic development.

As a result, inflows of FDI have increased over time in developing countries. For instance, in Africa for example, from 1990 to 2018, they expanded by over US $45 Billion. On average, they shot up at US $31.7 billion in 2018 in Sub-Saharan Africa (SSA) region. But they are low compared to other regions such as the Caribbean and Latin America region, which attracted US $147 billion, and the Southeast Asia region which gained over US $148 billion in FDI inflows within the similar period. The SSA region and its sub-regions still have a long way to go, particularly the East and Central Africa. Inflows of FDI expanded from US $353 million in 1980 to US $2.7 billion in 2018 and from US $197 million to US $13.7 billion in the same period, respectively in Central and East Africa (UNCTAD, 2019).

This study compares the short and long run determinants of FDI attraction in Central and East Africa. This comparison is motivated by the observation of the reversal of fortunes between Central and East Africa; where in 1980, Central African region attracted more inflows of FDI than East Africa. However more than three decades later, East African countries are experiencing a phenomenal increase in the attraction of FDI inflows, while Central Africa is slowing down.

There is a number of empirical evidence on determinants of FDI in developing countries, but there is no investigation that has been conducted to analyze drivers of FDI focusing on East and/or Central Africa. Also, in the recent decades, the East African region has attracted more inflows of FDI than Central Africa, but there is lack of empirical study that explains these differences. This paper, therefore, seeks to identify factors that attract FDI inflows and determine whether they differ across the two regions.

The paper brings several contributions to the existing literature. It participates in the scientific debate regarding determinants of FDI. Secondly, the study links FDI and the economic performance of two regions further by comparing two sub-regions of SSA region, that is, Central and East Africa in order to tackle potential differences in factors that attract FDI, where no empirical investigation has been conducted before. The ideal was to include all countries of Central Africa as well as those of East Africa in this study, but due to data limitations for many countries over the years, it was not possible. Nevertheless, we believe that countries selected in Central and East Africa represent well the two regions, and the results can be generalized. The Central Africa region refers to Cameroon, the Republic of Chad and Central African Republic while the Eat Africa includes Kenya, Rwanda and Tanzania.

The remainder of this research is presented as follows. The second section presents the review of the literature on drivers of FDI. Section three entails the methodological framework, describes variables and the measurements, data type

and its sources, while the fourth section discusses the outcomes of the study. Conclusion and recommendations are presented in the fifth segment.

2. Literature Review

2.1. Theoretical Literature

A fundamental understating of motives for undertaking FDI from the investors' perspective and the determinants of FDI are provided by the Neoclassical Investment theory (Henry, 2007) as well as the Dunning (2001) electric theory. Henry (2007) posits from a perspective of neoclassical theory that capital account opening aids in the effective allocation of cross-border funds. In this approach, investors in developed economies have ample capital but low capital returns. Hence they are more than willing to transfer their capital to developing nations that have higher returns on capital, leading to a decline in cost associated with capital flows as a result of these developed economies' having financial resources in developing nations. Via convergence process acceleration, developing nations experience a temporary increment in investment and growth of their economy, which leads to permanent advancement in the standards of living (Rogoff, 1999; Summers, 2000).

Moreover, multinational companies have different motives when it comes to deciding on investing in a country. According to Dunning (2001), based on motivations, there exists different types of FDI: 1) Natural-resource seeking FDI, that targets gaining access to natural resources which are not available in the home market of the company. 2) Market-seeking FDI, that purports to gain access to new customers, clients, and export markets. 3) Efficiency seeking FDI, that targets to reduce the costs of production by assimilating the current new technologies or acceptable prices in labor input and workforce. 4) Strategic-asset seeking FDI, that purposes to look for strategic assets in a host country, such as brands, new technologies, or distribution channels (Hornberger et al., 2011).

According to the electric paradigm theory, we can classify determinants of FDI into two categories: micro factors (firm-level), which are specific to each company and involve ownership and internalization advantages, and macro factors (macro-level), which includes the local advantages of the host country. The benefits of individual factors in finding out external investment inflows is massively defined by destination's country, the sector where inflows of FDI are oriented, and the entry's model of FDI in the host country.

2.2. Empirical Literature

Previous studies analyzing determinants of FDI inflows found that their attraction into a given host country is driven by many factors. For instance, Ezeoha & Cattaneo (2012) utilized a panel data from 38 nations in SSA by applying a dynamic system GMM model to investigate individual and interactive effects of financial development, FDI flows and institutional quality from natural resource endowed countries. The study found that the quality of infrastructure, gover-

nance and legal structures were crucial for the financial systems to buttress FDI inflows. The research proposed that the level of endowment in natural resources and market size are pivotal channels that can support FDI to improve the quality of infrastructure. Likewize, Petrović-Ranđelović et al. (2017) analyzed the role of market size in the attraction of FDI in Balkan countries over the year 2007-2015. They used a multi-regression model and found that market size has a significant positive effect on the FDI inflows in these economies. However, trade openness was found to have a statistically insignificant impact on FDI.

Asamoah et al. (2016) analyzed macroeconomic volatility and FDI and how institutional quality affects the two components in 40 SSA nations from the year 1996 to the year 2011. The research applied Engle GARCH and Dynamic Panel data models. They discovered that institutional quality is a pivotal determinant of FDI attraction in SSA countries. Although, macroeconomic uncertainties were found to have a negative effect on FDI. Likewise, Zeneli (2014) discovered that institutional quality improvement increases FDI inflows in Southeast European countries. Results showcase that countries with a favourable climate of doing business, a large market size, high level of trade openness, and strategic geographical location do attract more FDI inflows.

Similarly, Henri & Larissa (2018) utilized the system GMM estimation technique to investigate the relationship between governance, FDI and the economic growth in 51 African countries from the year 1998 to 2015. They discovered that good governance is essential for both economic growth and FDI. Hence, they advised that African economies ought to enhance their governance structures in order to attract more FDI inflows, which will help these countries to attain better outcomes in matters regarding economic growth. Mottaleb & Kalirajan (2010) also estimated random-effect model to identify factors that determine FDI using panel data from 68 low-income and low-middle income countries over the period 2005-2007. Results revealed that countries with large economies, high levels of trade openness and with a friendly climate of business tend to attract more FDI inflows.

Wako (2018) used a dynamic panel model to study the relationship amongst economic growth, FDI, institutional quality and the value added in manufacturing in SSA from 1970 to 2014. Results indicated that FDI inflows are attracted by countries which are highly endowed in natural resources, higher rate of economic growth, and good institutional quality. Also, the study realized that economic growth is a result of improvement in institutional quality, while FDI inflows tended to undermine the accountability to the rule of law by exacerbating corruption. The research also indicated that in case FDI inflows are resource-seeking, it does not accentuate industrialization but the institutional resource curse. The only exemption is when it is non-resource seeking. Hence, SSA countries should be specific on the type and nature of FDI that they require in order to balance between FDI that enhances the economic growth of the host country with the one that exacerbates deindustrialization creating adverse institutional effects.

Hayat (2018) employed the dynamic panel model and applied the GMM estimation to examine the relationship between economic growth and FDI by controlling for the role of natural resources in 104 high, middle, and low-income countries from 1996 to 2015. The outcome revealed that FDI had a positive significant effect on the economic growth of these economies. In contrast, the study found that natural resources had a significant negative effect on economic growth in countries that attracted a mean level of FDI inflows, meaning that FDI inflows in countries with a high natural resource endowment accelerates the growth-hampering effect of the natural resources. The abundance in natural resources tilts FDI in favor of resource-endowed sectors hindering growth in non-resource sector.

The study suggested that in order to benefit from FDI spillovers, countries should engage in reforms in the market and non-market trade sectors, security and finance. Nevertheless, Borensztein (1998) used cross-country data from 69 countries over the period 1970-1989 to examine the relationship between FDI and the GDP. The study suggested that in order to gain from FDI inflows spillovers, host countries should have a certain human capital threshold level.

Jaiblai & Shenai (2019) utilized cross-sectional data from 10 SSA countries to identify determinants of FDI from the year 1990 to 2017 using the ARDL estimation technique. They discovered that countries with smaller markets, great infrastructure networks, a depreciated exchange rate regime, low levels of income, and high trade openness attracted more FDDI inflows. Likewise, Faroh & Shen (2015), in Sierra Leone, investigated the impact of interest rates on FDI using multi-regression time-series data over the year 1985-2012. The research found that trade openness and a stable exchange rate are significantly related to the attraction of FDI inflows, while interest rate does not have a significant effect on FDI attraction. Inflation rate was found to negatively affect FDI.

Besides, Asiedu (2002) examined whether factors that attract FDI in other developing countries apply to SSA countries using a cross-section data of 71 countries over the period spanning 1988 to 1997. The author applied the OLS estimation and results revealed that trade openness does attract FDI in SSA as well as in other developing economies. But, the marginal returns from the levels of openness are lesser in SSA region as compared to the other developing countries. Besides, while great returns and good infrastructure networks are positively related to the attraction of FDI in other developing economies, such factors barely attract FDI in SSA countries. The study, therefore, surmised that SSA region ails from the unfavorable regional effects due to its geographical location.

From the reviewed literature, we can make the following observations. First, these studies used different methods and techniques to examine determinants of FDI, which led to mixed results. Second, in analyzing factors attracting FDI, endogeneity issue could arise. And in the case of panel data analysis, cross-section dependence would be another major issue. However, most of these studies did not show how they addressed these issues. Third, some of these studies have con-

ducted a comparative analysis (Asiedu, 2002) on determinants of FDI in Africa and other developing regions. But none of them analyzed drivers of FDI by comparing two SSA sub-regions. In the case of our study therefore, we will examine and compare determinants of FDI attraction using the Panel ARDL model based on the Pooled Mean Group (PMG) estimation to capture short and long-run relationships among variables in two sub-regions of SSA region, that is, Central and East Africa and address endogeneity and cross-section dependency since from the reviewed literature, no investigation has been conducted before.

3. Methodology and Model Specification

3.1. Theoretical Framework

From the existing literature on FDI and for analytical convenience, we can classify FDI's determinants into three categories based on the country-specific effects: 1) the host country's policy, 2) economic determinants, and 3) business facilities (UNCTAD, 1999). In the case of our study, we will use the Dunning (2001) eclectic theory and only focus on the economic determinants, with special emphasis on natural resources endowment, trade openness, market size and the infrastructure quality as important factors of FDI's attraction.

We therefore have;

$$\text{FDI} = f(X) \tag{1}$$

where FDI denotes foreign direct investments; X represents a set of control variables that influence FDI, such as natural resource endowment, market size, infrastructure quality and trade openness.

3.2. Empirical Model

According to Mottaleb & Kalirajan (2010), Petrović-Ranđelović et al. (2017), and Jaiblai & Shenai (2019), FDI is a function of technological transfer, trade openness, friendly environment of doing business, and GDP per-capita. In this study, we hypothesize that FDI is a function of infrastructure quality, trade openness, market size, and endowment in natural resources.

We therefore estimate the following model to capture factors that attract FDI in Central and East Africa:

$$\text{FDI}_{it} = \beta_0 + \beta_1 \ln \text{Infrqual}_{it} + \beta_2 \ln \text{Trade}_{it} + \beta_3 \ln \text{MktSize}_{it} + \beta_4 \ln \text{NatRes}_{it} + u_{it} \tag{2}$$

where; FDI is the dependent variable, Infrqual denotes infrastructure quality, trade denotes trade openness and MktSize represents market size, NatRes denotes natural resource endowments (all the independent variables are expressed in the natural logarithm form), β's denotes unknown parameters that will be estimated, u_{it} denotes the error term, i and t represent region and time indices respectively.

3.3. Description of the Variables in the Model

In this study, Net inflows of foreign direct investment measured as a percentage

of GDP is used for Foreign Direct Investment as the dependent variable. We identify four main variables as determinants of FDI attraction in Central and East Africa: 1) Infrastructure quality, 2) Market size, 3) Trade Openness, and 4) Natural resources endowment.

Infrastructure quality measures the attractiveness and the investment environment of a country or region. In this study, we use the total number of fixed telephone lines per one hundred people as a proxy for the infrastructure quality. According to the existing literature, countries or regions with high quality of infrastructure attract more FDI (see for example Jaiblai & Shenai, 2019).

GDP per capita captures the size of the market of a country or a region. We can expect that larger markets attract more inflows of FDI. Besides, GDP per capita measures the purchasing power of an economy in an internationally comparable way. Previous studies have found the variable to be positively related to the attraction of FDI inflows (see Petrović-Ranđelović et al., 2017).

Trade openness is measured using the sum of exports and imports divided by GDP ((X + M)/GDP). The level of trade openness measured using the above expression can positively impact on the attraction of FDI as shown by Asiedu (2002) and Zeneli (2014).

We measure Natural resources endowment using total natural resource rents as a percentage of GDP as proxy. According to the existing literature on the role of natural resources in the attraction of FDI, there are mixed results. Some studies found the natural resource abundance to have a positive effect on the attraction of FDI (Wako, 2018) while others found a resource curse hypothesis where the abundance of natural resources decreases the attraction of FDI (Hayat, 2018).

One of the shortcomings in the measurement of these variables is that we did not take into consideration all the indicators for the variables like trade openness and market size. Nevertheless, since the measurements used are in the line with the previous studies, we believe that it will facilitate achieving the objective of this research.

3.4. Data

This research uses secondary data extracted from UNCTAD's database for FDI and from World Development Indicators database for Natural resource endowment, Infrastructure quality, Market size and Trade openness. The study uses data for selected countries in East Africa (Kenya, Rwanda and Tanzania) and in Central Africa (Cameroon, Central African Republic and Chad) over the year 1990-2018 (UNCTAD, 2020 and WDI, 2020).

3.5. Estimation Method

3.5.1. The Biased-Adjusted Langrage Multiplier Test for Cross-Sectional Dependence

Prior to proceeding with the other steps, it is pivotal to test for the cross-sectional dependence. Otherwise, our results will be inconsistent and biased (Breusch & Pagan, 1980; Pesaran, 2004). That is why the existence of cross-sectional depen-

dence in the series is supposed to be analyzed among countries using the Breusch-Pagan (1980) Langrage Multiplier test (LM test) and the cointegration equation since our time-dimension supersedes cross-section dimension, that is, $T > N$. This test was improved by Pesaran (2004) in cases where time-dimension is greater than cross-section dimension as well as when time dimension is smaller than cross-section dimension. However, the test will be biased if the aggregate group is zero, but aggregate individuals differ from zero. Pesaran et al. (2008) adjusted the deviation by addition of variance. Hence, the aggregate to test statistics is known as biased-adjusted LM tes (LM_{adj}). Its adjusted form is as follows:

$$LM_{adj} = \left(\frac{2}{N(N-1)}\right)^{1/2} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \left(\hat{\rho}_{ij}^{2} \frac{(T-K-1)\hat{\rho}_{ij} - \hat{\mu}_{Tij}}{\upsilon_{Tij}}\right) \sim N(0,1) \quad (3)$$

Whereby, $\hat{\mu}_{Tij}$ denotes average; υ_{Tij}, variance. The null hypothesis of LM_{adj} test is that there is no cross-sectional dependency.

3.5.2. Panel Unit-Root Test

After analyzing for cross-sectional dependence presence, we are going to apply panel unit tests verify the stationarity properties of the variables. In this case, the investigation is made to determine whether variables are either integrated at order zero, that is I(O); or of order one ,that is I(1); or mixed, as this will quickly help in the establishment of the notable long-run relationship. However, major issues in the panel unit-root test are to establish if the cross-sections in our panel are independent of each other or not. The panel unit-root tests are then divided into two generations: the first and the second generational tests. Levin et al., (2002); Breitung (2005); Hadri (2000); Im et al., (2003); Maddala & Wu (1999); Choi (2001) constitute panel unit-root tests of the first generation. If cross-sectional dependence is established among nations in the panel for variables utilized in this study (FDI, lnNRE, lnMktSize, lnInfrastQual, lnTradeOpen), we will analyze the stationarity of the series using the second-generation panel unit-root test, that is, the CADF test for unit root.

3.5.3. CADF Unit-Root Test

Pesaran (2006) developed the test. The unit-root test is performed for each cross-sectional unit in the series that forms the panel through CADF. Stationarity of series, therefore, can also be estimated individually for the overall and for each cross-section of the panel. The hypothesis of the CADF test is that every country is differently affected from the time effects. Considering spatial autocorrelation, the test is utilized in the cases where $T > N$ and $N > T$. In addition, the presence of cross-sectional dependence amongst variables is solved by augmentation of standard Dickey-Fuller regression with the cross-sectional aggregates of the lagged levels and the first differences of individual series (Pesaran, 2007). Stationarity for an individual country is tested by comparing statistical values of the test with the Peseran's CADF values in the critical table. If the CADF's critical

value > CADF statistical value, we reject the H_0 and conclude that the series of the particular nation is stationary. We estimate CADF test statistics as follows:

$$Y_{i,t} = (1-\varnothing_i)\mu_i + \varnothing_i y_{i,t-1} + u_i \quad (4)$$

$i = 1,2,\cdots,N$ and $t = 1,2,\cdots,T$

$$u_{i,t} = \gamma_i f_t + \varepsilon_{i,t} \quad (5)$$

where: f_t denotes the common unobservable effects of each particular nation, $\varepsilon_{i,t}$ is the individual-specific error.

From Equations (4) and (5), the unit root hypothesis is written as follows:

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \gamma_i f_t + \varepsilon_{i,t} \quad (6)$$

$i = 1,2,\cdots,N$ and $t = 1,2,\cdots,T$

$H_0 : \beta_i = 0$, for all i (series is not stationary).

$H_1 : \beta_i < 0, i = 1,2,\cdots,N_1; \beta_i = 0, i = N_1+1, N_1+2,\cdots,N$ (series stationary).

3.5.4. Pedroni Cointegration Test

After determining the order of integration using panel unit-root test, we are verifying the existence of cointegration to establish long-run relationship among variables. Pedroni (2004) introduced 7 test statistics to test the H_0 of no cointegration in the non-stationary panels. These test statistics allow for heterogeneity in the panel, both in short-run dynamics and long-run intercept and slope coefficients. They are grouped into 2 categories: the group's aggregate statistics that averages the results of individual country's test statistics and the panel statistics that pools statistics within-dimensions. Parametric (Augmented Dickey-Fuller (ADF and v) and nonparametric (ρ and t) test statistics are within both groups. These tests can be able to include the common-time dummies to address a simple cross-sectional dependency, which is applied by time-demeaning data for each and every individual and variable as follows:

$$\overline{y}_l = \frac{1}{N}\sum_{i=1}^{N} y_{i,t} \quad (7)$$

All test statistics are residual-based tests with the residuals collected from the following regression:

$$y_{i,t} = \alpha_i + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \cdots + \beta_{Mi} x_{Mi,t} + e_{i,t} \quad (8)$$

$$\hat{e}_{i,t} = \hat{\gamma}_i \hat{e}_{i,t-1} + \sum_{k=1}^{K} \hat{\gamma}_{i,k} \Delta \hat{e}_{i,t-k} + \hat{\mu}^*_{i,t} \quad (9)$$

where $i = 1,2,\cdots,N$ represents number of individuals in panel, $t = 1,2,\cdots,T$ is number of the time periods, $m = 1,2,\cdots,M$ is number of the regressors, while $k = 1,2,\cdots,K$ is lags number in ADF regression.

3.5.5. Panel Autoregressive Distributed Lag Model and the Estimation of Long-Run Coefficients

One of the major issues we may face in examining factors that attract FDI both in Central and East Africa is the existence of potential endogeneity in some of the independent variables. Also, we are using macro panels with long time di-

mension, and according to Baltagi (2015) we may face cross-section dependence and serial correlation issues. Furthermore, since our study employs macro panels, that is, the panel with a large number of time (T) relative to the cross-section (N), there is a possibility that variables may exhibit a long-run relation. We cannot use the OLS estimation as it will produce inconsistent and biased results, which can lead to a provision of inefficient results for the small sample due to potential cross-section dependence, endogeneity, and serial correlation (Pedroni, 2001).

The suitable estimation method for such a panel setting is the Panel-ARDL model based on PMG. Pesaran et al., (1999), Loayza & Ranciere (2004), and Samargandi et al. (2015) suggested that dynamic heterogeneous panel can be incorporated into an error-correction-model based on ARDL (p, q) approach with p as lags of dependent variables and q as the regressors' lags. The regression is written as;

$$\begin{aligned}\Delta \ln Y_{i,t} = &\sum_{j=1}^{p-1} \beta_j^i \Delta \ln Y_{i,t-j} + \sum_{j=0}^{q-1} \rho_j^i \ln \Delta X_{i,t-j} \\ &+ \delta^i \left[\ln Y_{i,t-1} - \left\{ \theta_0^i + \theta_1^i X_{i,t-1} \right\} \right] + \mu_{it}\end{aligned} \tag{10}$$

Whereby, Y is the dependent variable, X is a vector set of all the independent variables in the model, β & ρ are short-run dynamic coefficients of the lagged dependent and independent variables, θ denotes long-run coefficients, δ is the adjustment speed of coefficient to the equilibrium in long-run, i and t respectively denote region and time index, while μ denotes error term.

The entire term in square bracket denotes long-run regression, which is derived from;

$$\ln Y_{i,t} = \theta_0^i + \theta_1^i X_{i,t} + \varepsilon_{i,t} \tag{11}$$

Whereby, $\varepsilon_{i,t} \sim \mathrm{I}(0)$.

Models to be estimated would use PMG estimator. It represents a version of an error-correction model for the cointegration test in ARDL presented by Pesaran & Smith (1995) and Pesaran (1997). The significant merit of the methodology is that the Panel-ARDL approach can be utilized with variables that have different integration orders, *i.e.*, I(0) and I(1), or mixed. Moreover, we can obtain short and long-run dynamics simultaneously with a Panel ARDL. Pesaran et al., (1999) stated that PMG estimator generates consistent estimates and address endogeneity by including the lags of the dependent variables and the independent variables in the model. Endogeneity might also be region, country or period specific. To address this potential endogeneity, we will also include fixed effects for region, country and period in our analysis as done by Ashraf et al., (2015).

4. Empirical Findings and Discussion

The estimation process started by the presentation of preliminary tests to verify the normality of the series and to make sure that there is no multicollinearity among the independent variables. **Table 1** contains the summary of the descriptive statistics of each variable to use in this study. Results indicate that overall, on

average, net FDI inflows contribute to approximately 2% to GDP, the proportion of natural resource rent to GDP is about 9.45%, while the ratio of trade openness to GDP is 48.77% and about 1 fixed telephone line is used per 100 people, while 612.2$ are earned per person per year both in Central and East Africa. On average, in Central Africa, net FDI inflows represent 2% of GDP while in East Africa they contribute about 2% to GDP. The proportion of natural resource rents to GDP is 12.45% in Central Africa while it is 6.44% in East Africa. The share of trade to GDP is 52.858% in Central Africa whereas it is 44.691% in East Africa on average. While on average 100 people use about 1 fixed telephone line in East Africa as well as in Central Africa. An individual in East Africa earns 563.14$ on average while in Central Africa, the person earns 661.26$ per year.

Results of the correlation test among the independent variables are presented in Table 2. Considering the range of the absolute values (0.054 - 0.597) in Table 2, we can conclude that multicollinearity is not a problem amongst the explanatory variables since these values are below the benchmark of 0.8 (Prodan, 2013).

Table 1. Descriptive statistics.

Overall					
Variable	**Obs**	Mean	**Std. Dev.**	**Min**	**Max**
FDI	174	2.023	4.2	−4.659	40.882
NRE	174	9.447	6.532	2.475	38.039
MarketSize	174	612.2	374.638	126.955	1710.51
InfrastQual	174	0.559	0.839	0.018	5.098
TradeOpen	174	48.775	15.913	19.684	126.351
Central Africa					
FDI	87	2.322	5.716	−4.659	40.882
NRE	87	12.453	7.708	5.248	38.039
MarketSize	87	661.262	391.208	165.763	1540.568
InfrastQual	87	0.66	1.135	0.018	5.098
TradeOpen	87	52.858	17.74	26.453	126.351
East Africa					
FDI	87	1.724	1.625	0	5.725
NRE	87	6.441	2.851	2.475	16.235
MarketSize	87	563.137	352.739	126.955	1710.51
InfrastQual	87	0.458	0.327	0.103	1.624
TradeOpen	87	44.691	12.686	19.684	72.858

Table 2. Correlation matrix.

Variables	(1)	(2)	(3)	(4)
(1) NaturalResEndow	1.000			
(2) MarketSize	−0.054	1.000		
	(0.479)			
(3) InfrastQuality	−0.184	0.544	1.000	
	(0.015)	(0.000)		
(4) TradeOpenness	0.597	0.091	0.064	1.000
	(0.000)	(0.230)	(0.405)	

4.1. Result of Cross-Sectional Dependency (LM_{adj}) Test

From the Table 3, we can observe that since probability values of the series and the cointegration equation are inferior to 0.05, the null hypothesis of cross-section independence is rejected because there is cross-sectional dependence among countries of these two regions. This showcases that a significant shift in the series in one of the countries affects the other countries. Therefore, when policy-makers in these countries are setting their policies, they should consider other countries' policies as external factors. Moreover, since cross-sectional dependence is determined when choosing unit-root and the cointegration test methods, this situation should be considered.

4.2. Panel Unit Root Test

Since we have identified cross-sectional dependence presence amongst the countries in the panel for FDI, lnInfrastQual, lnNRE, lnMktSize, and lnTradeOpen, the stationarity of the series was examined by Pesaran's (2006) CADF test. In consideration of the long time covered by this study, it is essential to run cointegration and unit root tests in order to assess the order integration of the variables and the existence of long-run relationship amongst variables. Results of CADF panel unit-root test are presented in Table 4 and indicate that FDI is stationary at the level; whereas, Infrastructure quality, natural resource endowment, GDP per capita (measuring market size), and trade openness, are stationary at the first difference. Since the order of integration of our variables is a mixture of I(0) and I(1), that fits the application of the panel-ARDL estimator. In this case, we can test for cointegration between the series.

4.3. Cointegration Analysis

The long-run relationship amongst variables is tested by employing Pedroni cointegration test, and the outcome is presented in Table 5. We report two types of residual test as suggested by Pedroni (1999). The first panel in table has the first type, which entails the statistics of 4 sub-tests, namely panel-rho, panel PP, panel-v, and panel ADF. The tests are based on the pooling residuals of regression within-dimension of the panel. In the table, the second panel contains the

second type, which comprises of three sub-tests statistics, namely group ADF, group PP, and group rho. The tests are based on pooling the residuals of the regression along the dimension of the panel. In Table 5, out of the seven sub-tests from both of the two types, six have the same null hypothesis of no cointegration. Narayan et al. (2007) and Lee & Chang (2008) stated that if at least 4 statistics are significant, the H_0 of no cointegration can be rejected; hence that indicates that cointegration exists. Pedroni (1999) also stated that in order for cointegration to exist, group ADF and panel ADF are to be considered because they have better properties for small samples. Therefore, they provide reliable estimates. Hence, we can deduce that long-run relation exists amongst the variables in this study because out of the seven statistics, six of them are statistically significant.

Table 3. LM adj test for Cross-sectional dependence.

Variables	Test Statistics	P-value
FDI	13.100	0.000
lnInfrastQuality	58.160	0.000
lnNaturalResEnd	19.530	0.000
lnMarketSize	69.010	0.000
lnTradeOpenness	23.160	0.000

Table 4. Results of the CADF Panel unit-root test.

Variables	Levels	First difference	Critical Value
FDI	−2.670	-	−2.570
lnInfrastQuality	−0.951	−3.932	−2.570
lnNaturalResEnd	−2.129	−5.143	−2.570
lnMarketSize	−1.473	−4.716	−2.570
lnTradeOpenness	−1.568	−5.150	−2.570

Note: Model with constant and trend for series FDI, lnInfrastQual, lnNRE, lnMktSize, and lnTradeOpen at 1% level of significance has been selected as the test model.

Table 5. Results for the Pedroni cointegration test.

Test Statistics	Panel	Group
V	0.6979	.
Rho	−0.4013	0.4637
T	−2.245	−2.171
Adf	−1.952	−3.088

Note: All the test statistics are distributed N (0, 1), and are under the H_0: no cointegration, and they diverge to ∞ (save for the panel v).

4.4. Presentation and Interpretation of Results

The estimates of Panel ARDL model based on PMG estimation for which FDI is the dependent variable are presented in Table 6. The interpretation is based on the magnitude and signs of the coefficients.

Overall, the PMG estimator results reveal that infrastructure quality, market size and trade openness significantly affected FDI positively in long-run in Central and East Africa. The infrastructure quality increases the attractiveness of a country or region and affects FDI's climate at the local level. For instance, a percentage enhancement in infrastructure quality increases FDI by 0.88% in long-run. Moreover, a percentage change in the levels of trade increases FDI inflows by 1.27%. The market size measures income distribution in the host country. Results indicate that a percentage change in market size increases inflows of FDI by 2.32%. These results agree with the existing literature (see, for example, Jaiblai & Shenai, 2019; Faroh & Shen, 2015; Mottaleb & Kalirajan, 2010; Petrović-Ranđelović et al., 2017) in the case of Sub-Saharan African region, Sierra Leone, in and low-income countries and Balkan countries). Thus, infrastructure quality, market size, and trade openness determines FDI attraction in the two regions. The error-correction term that estimates the adjustment speed is −0.715 (71.5%). That means long-run convergence amongst variables in this study will be sped at 71.5%.

Table 6. Results for Panel ARDL (PMG estimates): determinants of FDI.

	Overall		Central Africa		East Africa	
Variables	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
			Long-run coefficients			
lnInfrastQual	0.884***	(0.19)	0.454	(0.33)	0.934***	(0.20)
lnNRE	−0.591	(0.54)	−2.097***	(0.76)	−0.428	(0.57)
lnMktSize	2.321***	(0.41)	−1.227	(0.76)	2.850***	(0.45)
lnTradeOpen	1.273*	(0.72)	2.585**	(1.21)	1.25	(0.76)
Error-correction Coeff.	−0.715***	(0.13)	−0.708*	(0.40)	−0.974***	(0.07)
			Short-run coefficients			
ΔlnInfrastQual	−0.767**	(0.34)	−1.414***	(0.37)	−0.277	(0.34)
ΔlnNRE	−1.034	(2.15)	−1.829	(4.46)	0.515	(0.89)
ΔlnMktSize	0.0291	(1.16)	1.957	(1.40)	−0.0784	(1.90)
ΔlnTradeOpen	3.645	(4.23)	6.076	(8.78)	0.681	(1.82)
Intercept	39.38	(50.19)	−26.09	(61.13)	84.74	(59.39)
Country	6		3		3	
Observation	168		84		84	

Notes: 1) FDI is the dependent variable; 2) Standard errors are in parentheses; 3) ***denotes $p < 0.01$, ** denotes $p < 0.05$, while * denotes $p < 0.1$; 4) Coefficients for time fixed effects are not reported; 5) Δ is first difference operator.

Furthermore, it confirms long-run relationship amongst the variables that were established earlier. However, in the short-run, infrastructure quality has a significantly negative impact on FDI inflows attraction. This means that the quality of infrastructure do not play a major role in FDI attraction in the short-run in the two regions, implying that for countries of one region to attract more FDI, they should improve the quality of their infrastructures.

Comparing these factors in the two regions, results indicate that: 1) In Central Africa, natural resource endowment has a statistical negative and significant impact on FDI. For instance, a percentage change in the natural resource endowment decreases FDI inflows by about 2.1%. These results agree with the "resource curse argument" and studies by Kekic (2005), and Aseidu & Lien (2011), who showcases that while the abundance of natural resources is considered as a factor of FDI attraction, it lowers FDI inflows levels in the non-resource sector of the economy, leading to a fall in the FDI inflows aggregate. Also in the line of Poelhekke & Van der Ploeg (2013) and Mouanda Makonda & Akylangongo Ngakala (2021) who revealed that the abundance of natural resource alters a country's position on FDI inflows in favor of resource sector and reduces FDI inflows in non-resource sector, leading to more significant capital accumulation and an increment in resource exports in resource sector. The increase of activities in resource sector is due to FDI accumulation in this sector, which makes firms that are operating in non-resource sector uncompetitive (Sachs & Warner, 2001). 2) Trade openness is positive and significantly related to FDI inflows attraction. A percentage change in the volume of trade increases FDI inflows by 2.6%. But in the short run, infrastructure quality has a significant but negative impact on the FDI attraction. This means that the quality of infrastructure does not play a critical role in FDI attraction in Central Africa. This result is plausible in that infrastructures (roads, communication, railways) are deteriorated. Thus, in Central Africa, trade openness and natural resource endowment are determinants of FDI attraction.

However, in East Africa: 1) Infrastructure quality and 2) market size have a significant positive impact on the attraction of FDI inflows in the long-run. The results showcase that a percentage enhancement in the quality of infrastructure increases FDI inflows by 0.9%. Also, a percentage change in the market size increases the attraction of FDI inflows by 2.9%. The results are in agreement with studies highlighted above. In short-run, coefficients of the variables are insignificant. Thus, infrastructure quality and market size are factors that determines the attraction of FDI inflows in East Africa. The error-correction term that estimates the adjustment speed is −0.708 (70.8%) in Central Africa and −0.974 (97.4%) in East Africa, meaning that the long-run convergence amongst the variables will be sped at 70.8% in Central Africa and 97.4% in East Africa. This confirms the existence of long-run relation amongst the variables. Following these results, we can therefore conclude that factors that attract FDI inflows differ across Central and East African regions and that the East Africa is more at-

tractive than Central Africa due to its more favorable climate of investment.

5. Conclusion and Recommendations

This study investigated factors that determine the attraction of FDI in six countries of Central and East African regions over the period 1990-2018. The Panel ARDL model based on PMG estimator was applied to achieve the objective of the study. Focusing on the results from PMG estimation, it indicated that overall trade openness, infrastructure quality and market size have a significant and positive impact on FDI attraction in the regions. This reveals that they are determinants of FDI attraction in Central as well as in East Africa. Specifically, trade openness determines the attraction of FDI in CA, while natural resource rents decrease inflows of FDI, confirming the natural resource curse argument in Central Africa. In East Africa, infrastructure quality and market size are factors that contribute to attracting FDI inflows. Following these results, the study concludes that factors that attract FDI differ across the two regions. Also, since infrastructure quality and market size measure the attractiveness, the investment's climate, and the income distribution in the host country, we can conclude that East Africa has a more favorable environment of investment and is more attractive than Central Africa. This can explain why in the recent decades East African region has been attracting more FDI inflows compared to Central African region. Finally, we can conclude that the outcome of this research supports the outcomes of other empirical research on significant effect of trade openness, market size, infrastructure quality, and natural resource endowment on FDI inflows.

Based on these results, the study makes the following policy recommendations:

1) Because the hypothesis of natural resource curse has been found in Central Africa, governments should strengthen policies regarding natural resources because most of areas with natural resource abundance are controlled by militia and they do not follow rules and law enforcement. Given that investors are risk averse, they will hardly invest in such environment. That is why governments should increase their foot-hold and control those areas so that they can bring peace and security, maintain law and order and promote dialogue and peace among communities.

2) Most of countries endowed in natural resources export their resources in the raw form to developed countries where the cost of labour is higher than in developing countries, meaning that investors incur high cost of production to process these raw materials. Central African countries should invest in infrastructures to reduce cost of doing business and build human capacity (health care and education) in order to gain value addition in terms of having skill-sets to reduce the cost of production and facilitate that raw materials are locally processed because of low labour cost.

3) In regards to trade, Governments of the Central African countries should promote the exports of processed goods that fetch higher prices in international market and promote importation of capital goods that will be used in produc-

tion such as tractors and fertilizers. These countries should implement policies that suppress trade barriers in order to promote trade with each other.

4) In East African countries, governments should build and improve infrastructures in areas that have high transport and communication costs in order to lower the cost of production.

5) Policy makers in East Africa should implement policies that increase economic growth, health care and quality education since they enhance human capital stock; hence increase in FDI and market size. They should implement policies that promote Micro, Small and Medium Enterprises (promoting entrepreneurship activities) because they create formal employment which increases income and consumption, leading to the improvement in people's purchasing power.

6) Countries should remove barriers to trade with others in order to boost their markets so that businesses are able to easily expand their activities.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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