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ORIGINAL ARTICLE

Geographical determinants of foreign direct investment: evidence from sub-Saharan Africa*

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ABSTRACT

This paper investigates time-invariant geographical determinants of FDI in Sub-Saharan African (SSA). To achieve this objective, a panel data model was estimated using the Hausman-Taylor estimation technique. The estimation results show that the coefficients of time-invariant geographical variables, such as geographical size, and area located within the tropics are positive and statistically significant while the coefficient of distance from the sea is negative and statistically significant. We further disaggregated the sample into sub-regions and found consistent evidence to buttress the claim. The study recommends that SSA countries should take advantage of their geographical factors to come out with common market opportunities to maximise the potential for growth in FDI.

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1. Introduction

With the advent of globalisation, the critical role of FDI in promoting growth and development agenda has become even more imperative in developing countries, especially in SSA. Hence, the need to use incentives to attract FDI to augment scant domestic resources. Consequently, many countries across the globe embarked on various reforms in the 1980s leading to significant inflows of FDI into almost every region of the world (Ozturk, 2007). Notwithstanding the rise in global FDI inflows, Africa remains the lowest recipient of FDI (see Figure 1).

Figure 1 shows that global FDI flows to Africa in 2016 are $53 billion dollars constituting only 2.8% of the global FDI inflows of $1868 billion dollars. In 2017, the inflow to Africa is $42 billion dollars which are only 2.9% of the global total of $1430 billion dollars. This indicates that the distribution of FDI by geography shows some skewness. Asiedu (2002) indicates that SSA countries have received less FDI by virtue of their geographical location. Geographical factors may affect economic growth and can influence policy and the convergence of incomes across countries. Geography may also affect the transportation cost and consequently the decision of foreign firms. For example, relative to other developing countries, such as the Caribbean and Latin America, Asia, and transition economies, FDI flows to Africa is the lowest. FDI in Africa is also relatively diverse with few countries attracting large shares of total global FDI inflows. According to UNCTAD (2018) report, the two major recipients of FDI in SSA are South Africa ($7.4 billion) and Angola ($1.6 billion). Nigeria received $1.3 billion with Morocco and Togo receiving $1.0 and $0.3 billion, respectively.

Despite the rising attention and scores of studies on the determinants of FDI into SSA, specific geographical factors affecting FDI have not been given the needed attention. Geographical factors are country-distinct features that act as an incentive to attract FDI inflows (Ogun, Salisu, Olowookere, Ogunlana, & Ofonyelu, 2018). The Eclectic theory suggests that FDI occurs due to ownership, location, and internalisation advantages (Dunning, 1993). However, empirical studies investigating the locational determinants of FDI in SSA have focussed on resource seeking, efficiency-seeking, market seeking, and assets seeking (Cleeve, 2012; Okafor, Piesse, & Webster, 2017) to the neglect of specific geographic factors, such as geographical size of a country, percentage of land located within the tropics and mean distance from the sea.

There are various channels through which transport cost and geographic friction can affect the decision of foreign firms. For instance, high transportation costs may encourage firms to duplicate production across countries

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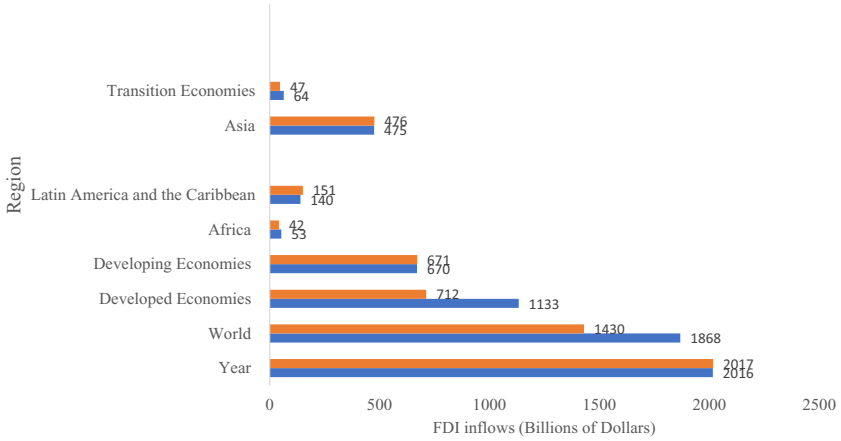

Figure 1. Current foreign direct investment trends by geography (2016–2017). Source: UNCTAD (2018).

known as horizontal FDI. In contrast, low transportation costs will encourage firms to take advantage of cross-country cost differentials to participate in vertical or complex FDI strategies where trade and FDI complement each other. The cost of transferring goods and information influences firms' decisions to geographically separate production tasks or located next to each other. Large-scale economies derived from the geographic proximity of individuals or firms in achieving product and factor market externalities and technology transfer could play a critical role in multinational production as foreign firms account for the majority of trade and technology flow. Foreign firms usually incur high transport costs in obtaining their intermediate inputs and reaching buyers. Thus, low transportation costs could aid foreign firms as they source for goods, tasks, and ideas from each other.

This study adds to existing literature (e.g. Cleeve, 2012; Okafor et al., 2017) by incorporating geographical factors in examining the determinants of FDI in SSA. Thus, the objective of this paper is to assess how geographical factors can affect FDI inflows into SSA. Gaining insight into how geographical factors affect FDI will help SSA policy makers to put in place appropriate measures that will help trigger FDI inflows into SSA. The remaining sections of the paper are organised as follows. Section 2 discusses pertinent literature on the topic and section 3 presents the methodology whiles section 4 focuses on results and discussion. Conclusion and policy recommendations are highlighted in section 5.

2. Literature review

The Eclectic theory suggests that FDI arises due to ownership advantages (O), location advantages (L), and internalisation advantages (I) known as the OLI paradigm (Dunning, 1993). The ownership theory suggests that foreign firms must have countervailing advantages to overcome competition from local firms. Thus, for foreign firms to be competitive abroad, they must possess ownership advantages, such as patent rights, managerial skills, and innovative products (Dunning, 1993). The location hypothesis postulates that the international immobility of certain factors, such as labour, markets, and natural resources necessitates the movement of capital across countries (Kumar, 1994). Finally, the internalisation theory postulates that FDI occurs when foreign firms are able to substitute or switch market transactions with internal transactions (Buckley & Casson, 1976). This reduces the firm's cost of doing business and technology imitation as well as retain status through supervision. In sum, the OLI (ownership, location, and internalisation) paradigm suggests that foreign firms initially build competitive advantage at home after which they relocate to specific countries abroad based on (L) advantages through FDI, which permits foreign firms to internalise (O) advantages.

Scores of empirical studies have examined the determinants of FDI with divergent results. Most of these studies have used country-level data and have concentrated on the locational dimension of the OLI paradigm. For the purpose of this study, the literature on the locational determinants of FDI is grouped into geographical determinants, market determinants, resource determinants, and efficiency determinants.

2.1. Geographical determinants

Several studies have examined how geographical location affects FDI inflows (Bi, Ren, & Bao, 2020; Gallup, Sachs, & Mellinger, 1999; Ogun et al., 2018). For instance, Ogun et al. (2018) examined the effect of geography and policy factors on FDI in four regions in Africa from 1980 to 2010. By using the gravity model and threshold procedure, the authors showed that long geographic distance limits FDI inflows. Gallup et al. (1999) argued that most African countries by virtue of their geographical location are remote from core European markets which leads to high transport costs and cost of doing business which negatively impacts on exports.

In China, Bi et al. (2020) also revealed that long geographic distance represents high transportation costs for sending staff and shipping goods which adversely affect both vertical and horizontal. For vertical FDI, costly shipping is a hindrance, since vertical FDI needs to export its products back to the home country and not solely sell them in the host market. However, for horizontal FDI, long geographic distance gives MNEs more motivation to conduct FDI rather than export. Using country-level data from 2010 to 2019 for 20 sub-Saharan African countries, Nkansah-Dwamena and Yoon (2022) revealed that the availability of land is a critical determinant of land acquisition investment in sub-Saharan Africa.

2.2. Market determinants

Several recent studies have shown a positive significant relationship between market size and market growth with FDI (Bi et al., 2020; Ogun et al., 2018; Shan, Lin, Li, & Zeng, 2018). For instance, using the gravity model, Ogun et al. (2018) showed that market size is a major determinant of FDI in Africa. Ogbonna, Ogbuabor, Manasseh, and Ekeocha (2022) also revealed that market size is a robust determinant of FDI in 46 African countries from 2010 to 2019. In China, Bi et al. (2020) found that firms are more likely to choose a host region with a larger market size. In general, market size enhances FDI inflows, though inconclusive results have been observed in some studies (Botrić & Škuflić, 2006; Mohamed & Sidiropoulos, 2010).

2.3. Resource determinants

Scores of studies have also examined the effect of natural resources on FDI inflows (Nkansah-Dwamena & Yoon, 2022; Ogbonna et al., 2022; Ogun et al., 2018; Okafor et al., 2017). For instance, using the gravity model, Ogun et al. (2018) found that FDI flows to countries with an abundance of natural resources in Africa. Similar results have been obtained in recent studies. For example, using the GMM estimation technique, Ogbonna et al. (2022) revealed that the abundance of natural resources attracts FDI to 46 African countries from 2010 to 2019. Nkansah-Dwamena and Yoon (2022) also showed that natural resources are key in attracting FDI in sub-Saharan Africa.

In contrast, Okafor et al. (2017) explored the factors affecting FDI in 20 SSA and 11 MENA countries from 2000 to 2010. The authors revealed that resource endowments do not significantly influence FDI for this sample. They argued that for natural resources to attract FDI, minimum threshold requirements are necessary for terms of political stability and trade openness. Furthermore, the two regions were found to be structurally and behaviourally different with MENA countries attracting more FDI compared to countries in SSA. The differences in the effect of natural resources on FDI could be attributed to the type of natural resource in question, whether the sample of countries under study has an adequate number of countries endowed with natural resources, and the methodology employed in the study.

2.4. Infrastructure

The extent to which infrastructure is developed as well as its reliability and availability raises the efficiency of investment and thus attracts FDI (Makoni, 2018; Vijayakumar, Sridharan, & Rao, 2010). Several proxies, such as rail networks, constant water and power supply, the number of sea and international airports, and the availability of telephone main lines have been used to measure infrastructural development with divergent results (Makoni, 2018; Mohamed & Sidiropoulos, 2010). For instance, using time series data and multiple regression analysis, Wekesa, Wawire, and Kosimbei (2016) found that transport infrastructure, communication infrastructure, water, and waste infrastructure are key determinants of FDI in Kenya. Jaiblai and Shenai (2019) also investigated the

determinants of FDI in ten (10) sub-Saharan African countries from 1990 to 2017. The results showed that FDI flows to countries with better infrastructure. Similarly, Nguea (2020) explored the impact of infrastructure on FDI in Cameroon from 1984 to 2014. The authors showed that communication infrastructure exerts a positive and significant effect on FDI in both the long run and the short run.

Some studies (see Botrić & Škuflić, 2006; Kinda, 2018) have revealed that infrastructure exerts a negative effect on FDI. In the view of Kinda (2018), the negative relationship between infrastructure and FDI is the result of high transactions cost and operational challenges faced by MNEs operating abroad. Intuitively, it is not farfetched to also argue that FDI is sensitive to the infrastructure measure used.

2.5. Efficiency determinants

Several indicators, such as the rate of inflation, exchange rate, interest rate, and governance measures have been used in the literature to gauge the efficiency of foreign firms in the host country (Agyeman, Arthur, & Addai, 2021; Harms & Knaze, 2021; Ogun et al., 2018). Unstable inflation rates are indicators of macroeconomic instability and could deter FDI. Empirically, Ogun et al. (2018) examined geography and policy factors that drive FDI into four regions in Africa from 1980 to 2010. By using the gravity model and threshold procedure, the authors revealed that FDI gravitates to countries with low levels of inflation. Fiscal deficit ratio of $<$3.3% and the inflation rate of $<$10% maximised the geographical advantage. Furthermore, exchange rate depreciation exerts a positive effect on FDI. Harms and Knaze (2021) also found that exchange rate stability enhances bilateral FDI flows and countries that are linked by a non-floating exchange rate regime seem to attract significantly more FDI from each other.

In a recent study, Agyeman et al. (2021) investigated the link between interest rates and FDI inflows in Africa and how exchange rates and unemployment uniquely affect that relationship. By using panel data on six major FDI destinations in Africa from 1990 to 2017, the study showed that when exchange rates interact with interest rates the effect of the latter on FDI is less positive, especially in economies where exchange rates are high.

Theoretically, the depreciation of the host country's currency renders the assets of the host country relatively cheaper enabling foreign firms to acquire more assets in the host country and reduces the cost of production of export-oriented foreign firms (Froot & Stein, 1991). However, where investment is for sale in the host country, depreciation of the host country's currency might erode the purchasing power of consumers and decrease their return on investment overtime. Campa (1993) contends that the expected future returns on investment dominate the decision of foreign firms. Thus, the appreciation of the host country's currency might increase the expected future returns on investment and increase FDI inflows.

2.6. Corruption and political instability

Some studies have examined the effect of institutional factors, such as corruption, political instability, rule of law and voice, and accountability on FDI with divergent results (Aromasodun, 2022; Lacroix, Méon, & Sekkat, 2021; Shan et al., 2018).

Empirically, Shan et al. (2018) explored the factors that drive Chinese FDI in 22 African countries from 2008 to 2014. The authors found that Voice and accountability enhance Chinese FDI flow while rule of law and corruption have no influence on FDI. However, political stability and regulatory quality deter Chinese FDI. Lacroix et al. (2021) examined the effect of democratic transitions on FDI for a panel of 115 developing countries spanning the period 1970–2014. Using a difference-in-differences method, the study showed that democratic transitions do not affect foreign direct investment (FDI) inflows, on average. However, transitions that do not go into reverse for at least 5 years, increase FDI inflows. Ogbonna et al. (2022) examined the impacts of global uncertainty and economic governance institutions on FDI inflow to 46 African countries from 2010 to 2019. Using the GMM estimation technique, the study revealed that global uncertainty limits FDI flow to Africa, and economic governance institutions aggravate this effect. Aromasodun (2022) also investigated the determinants of FDI flow to West Africa using pooled OLS estimation method. The results showed that institutional composite index and control of corruption have positive effects on FDI and hence increase globalisation tendency. In a recent study, Nkansah-Dwamena and Yoon (2022) showed that government effectiveness and political stability are drivers of land acquisition investment in sub-Saharan Africa.

Some studies have found that higher levels of corruption and weak institutions attract FDI, particularly into SSA due to the resource-seeking motives of MNCs (Carike, Elsabé, & Henri, 2012; Okafor, 2015). For instance, Cheung, De Haan, Qian, and Yu (2012) and Fung and Garcia-Herrero (2012) revealed that in Africa, Chinese FDI is not affected by corruption, human right records, political crisis, and risk largely driven by the abundance of natural resources. Egger and Winner (2005) argued that corruption circumvents administrative and regulatory procedures and hence the positive effect on FDI.

3. Methodology

3.1. Theoretical model

The classical theory of comparative advantage has been traditionally used to explain the location decision of firms. The motive to reduce production and supply costs lead to firms moving their activities across international boundaries. Thus, Driffield and Taylor (2002), Naudé and Krugell (2007) hypothesise that the chances of a foreign firm penetrating or increasing production in the host country are contingent on the expected profits (Π^e).

Suppose the lifespan of the investment is given as *N*-periods, *j* is the initial period of investment, the discount rate is *r*, *t* is the period for which the expected profit will last after the investment ends, and φ is a functional notation. Following Driffield and Taylor (2002), and Naudé and Krugell (2007), the probability of profitability of FDI can be written as:

$$Prob(FDI) = \varphi_1 \left(\sum_{j=0}^{N} \left(\frac{1}{1+r} \right)^j \prod_{t+j}^{e} \right) \tag{1}$$

Since this probability is not observable in practice, we present Equation (1) as a function of the FDI motives by incorporating geographical factors into the model. According to Dunning (1993), motivations explaining the internationalisation of firms distill into resource seeking aimed at accessing labour force, physical infrastructure, and raw materials; market seeking with the prime aim of getting access and control of foreign market; efficiency seeking which is mainly to benefit from cheap labour or lower cost of production and strategic seeking to enjoy the benefit of research and development as well as sophisticated technology and innovation (Cleeve, 2008).

$$\text{Thus, } \sum_{j=0}^{N} \left(\frac{1}{1+r} \right)^j \prod_{t+j}^{e} = \varphi_2(G_{1i}; M_{2j,}; E_{3i,}; R_{4i,} A_{5i,} I_{6i}) \tag{2}$$

Where **G** is a vector of geographical variables which include the geographical size of the country in square kilometres (km^2), mean distance to the coast or river in kilometres (km), and proportion of land in geographic tropics calculated in equal land projections. Geographical variables are mainly to exploit the advantages of land size, access to sea due to cheaper ocean costs (Hausmann, 2001; Venables, 2001).

M is a vector of market-seeking determinants of FDI usually captured by market size. Large markets or markets with a high growth potential may generate high revenue and economies of large-scale production. Market-seeking factors are usually to maintain existing markets or take advantage of new markets (Majeed & Ahmad, 2009; Carike et al., 2012).

E is a vector of efficiency-seeking determinants, such as exchange rate, the rate of inflation and financial market development, etc. Efficiency-seeking determinants are usually to generate new sources of competitiveness for firms and seek an abundance of factors of production, mainly labour with low production costs in relation to their productivity (Vijayakumar et al., 2010)

R is a vector of resource-seeking variables which include natural resource rent (measured as the difference between the revenue generated and the cost of extraction of natural resources; infrastructure (measured by fixed telephone subscription); and human resource development (measured by school enrolment, secondary (percentage gross). Generally, resource-seeking determinants are to seek natural resources, labour force, and physical infrastructure (Dadzie, Owusu, Amoako, & Aklamanu, 2018; Makoni, 2018).

A is a vector that consists of asset-seeking determinants to access research and development, raw materials, innovation, and technology (Okafor, 2015). Asset-seeking is mainly to gain "synergistic" knowledge and innovative ideas.

I is a vector of institutional factors, such as political stability and rule of law (Cleeve, 2008; Hagan & Amoah, 2020; Kwablah & Amoah, 2022; Shan et al., 2018).

Suppose x_{it} denotes all the variables of interest that could potentially affect the expected profitability of FDI, we re-write Equation (2) as follows:

$$\sum_{j=0}^{N}\left(\frac{1}{1+r}\right)^{j}\prod_{t+j}^{e}=\varphi_3(x_{it}) \tag{3}$$

Where x_{it} include geographical, market, efficiency, and asset-seeking variables which are hypothesised to affect expected profit positively or negatively. From the literature, human capital, trade, market size, abundance of natural resources, availability and reliability of infrastructure, fiscal and monetary policy, and financial market development attract FDI. In contrast, high inflation rate, high domestic investment, and long mean distance from the sea may negatively affect FDI. Collinearity between these variables would not permit the simultaneous inclusion of all in the regression equation. The choice of variables was informed by data availability.

3.2. Empirical model

This paper uses panel data techniques (Random effect and Hausman-Taylor estimator) on 40 SSA countries (see Table A2 in Appendix) from 2002 to 2022. The year 2002 was the starting period to allow the inclusion of political stability and rule of law into the model to capture the strength of institutions. Following the discussion on Equations (1)–(3), the econometric model for estimating the determinants of FDI into SSA can be presented as:

$$y_{it}=x_{it}\beta+\upsilon_{it} \tag{4}$$

Where $x_{it}=$ vector of explanatory variables; $y_{\mathrm{it}}=$ FDI net inflow ($US); The β's denote the unknown parameters of the explanatory variables and $\upsilon_{it}=\mu_{it}+\xi_{it}$, μ_{it} is an idiosyncratic country-specific effect and ξ_{it} is the error; $i=1, 2, 3, \ldots, N.$ denotes an index for the individual countries used in the study and $t=1, 2, 3.$ T represents an index for time-invariant periods. There is no interdependence between the unobservable country-specific effect μ_{it} and the error term ξ_{it}. We estimate Equation (4) using Hausman-Taylor (H-T) estimation technique. The H-T model is an instrumental variable approach that allows the inclusion of time-invariant variables, such as measures of geography which are wiped out by the fixed effects estimator. Moreover, it provides a way out of the correlation that might exist between the time-invariant variables and the unit effects. Further, the random effect model is used for robustness checks.

It is important to acknowledge that unit root test, cross dependence and cointegration tests are all relevant tests in timeseries estimations. This is because they help in testing for the effect of the external shocks overtime that might throw equilibrium value out of its prior path, thus, generating spurious estimates. However, using the instrumental variable approach simply suggests that you are introducing controls for such noise emanating from external shocks hence such tests may not add much to the causal estimates. In fact, it may provide results that are not so useful for the causal effect investigation of time-invariant variables within the context of a short-span panel cross-sectional data. To this end, we proceed with our estimation without a panel unit root test or a cointegration test. It is important to add that some IV studies are without the panel unit root test (see e.g. Amoah, Asiama, Korle, & Kwablah, 2022; Delgado, McCloud, & Kumbhakar, 2014; Hagan & Amoah, 2020; McArthur & McCord, 2017) whiles a few also present it anyways (see e.g. Amoah, Tetteh, Korle, & Quartey, 2021).

3.3. Sources of data and description of variables

4. Results and discussion

The regression results are presented in this section. Before the estimation of the regression equation, we present the description of the variables in Table 1 and investigate the possible correlation among the independent variables. Appendix Tables A1 and A2 present the correlation analysis and the list of countries, respectively. Following the absence of severe serial correlation problems, the long-run relationship between the variables was estimated. The results are presented in Table 2. Column (1) of Table 2 presents the results of the entire sample using the

Table 1. Variable description, measurement, expected signs, and sources.

Variable	Expected sign	Description/source
Dependent variable FDI net inflows ($US)		FDI net inflows comprises total equity capital as well as reinvestment of profits and both short-term and long-term capital to obtain management interest in the long run usually in an enterprise producing abroad and not at home. Source: The World Bank, World Development Indicators (WDI, 2022)
Independent variables		
Time invariant geographical variables		
Geographic size of the country (km^2)	Positive	Surface area of country in kilometres squared in equal area projection. Source: Portland State University College of Urban and Public Affairs (2022)
Mean distance to nearest coastline or sea navigable river (km)	Negative	Average distance from ice-free coastline and sea-navigable rivers in plate care projection. Source: Portland State University College of Urban and Public Affairs (2022)
Percentage of land in geographic tropics	Positive	Proportion of the land area situated in the tropics in equal area projection. Source: Portland State University College of Urban and Public Affairs (2022).
Market seeking variable		
Gross domestic product per capita (constant 2010 US$)	Positive	GDP per capita refers to the summation of gross value added by all producers in the economy plus net indirect taxes. GDP per capita is obtained by Gross Domestic Product divided by the population. Source: WDI (2022)
Resource seeking variables		
Natural resource rent	Positive	Rents from natural resources measure the difference between the revenue generated and the cost of extraction of natural resources. Source: WDI (2022)
Fixed telephone subscription (infrastructure)	Positive	It comprises fixed public pay phones, the number of analogue fixed telephone lines, fixed wireless loop subscriptions, voice over—IP subscription and ISDN voice channel equivalent. International Telecommunication Union, World Telecommunication/ICT Development Report and database. Source: WDI (2022)
Efficiency seeking variable		
Official exchange rate (LCU per US$, period average)	Positive/negative	It denotes the exchange rate set by the authorities in the country or the rate established in an exchange market backed by law. It is computed as a yearly average using averages from monthly values (Local currency units relative to the U.S. dollars). Source: WDI (2022)
Institutional variables		
Rule of law	Positive	Denotes the opinions of people regarding their trust and the degree to which they abide by the rule of law governing society, especially in areas, such as property rights, contract enforcement, the police, and other courts and the occurrence of violence and crime. Source: World Governance Indicators (WGI, 2022)
Political stability and absence of violence/terrorism	Negative	It portrays the views regarding the chances of political instability or politically-induced terrorism or violence. Source: WGI (2022)

random effect model and column (2) presents the results using Hausman-Taylor (H-T) estimation technique. Columns (3) and (4) present the H-T results for resource rich and resource-poor countries, respectively.

In this study, we limit our discussion to H-T model because it addresses possible problems of serial correlation and endogeneity. In addition, it accounts for both time and country-specific effects.

In column (2) of Table 2, the H-T regression results show that a 1% increase in the square kilometres (km^2) of a geographical area enhances FDI inflow into SSA by ∼0.6%. Similarly, a 1% increase in an area located within the tropics also promotes the flow of FDI by ∼0.4%. This result is plausible in that the greater the land area and a country's location within the tropics, the greater would be the variety and abundance of natural resources which could attract FDI. For both resource-rich and resource-poor countries, geographical size is important in attracting FDI (Columns 3 and 4). Studies, such as Coughlin, Terza, and Arromdee (1991) and List (2001) find that the greater the land size, the more FDI it attracts.

Consistent with a priori expectation, distance from the sea is negative and statistically significant for the aggregate sample and resource-rich countries. That is, a 1% increase in distance from the sea reduces FDI inflow into the region by ∼0.2% in the aggregate sample and 0.6% in resource-rich countries. This could be attributed to the fact that the greater the distance from the sea the higher the transaction cost (e.g. transportation cost) reducing FDI inflows. This result corroborates with the findings of Head and Mayer (2004) who find that geographic proximity could affect the decision of foreign firms particularly export-oriented foreign firms. Chen and Moore (2010) also reveal that distance between host and headquarter countries decreases affiliate sales and the number of multinational affiliates. In Africa, bulk commodities, such as coal, iron ore, oil, and petroleum products as well as agricultural products are shipped almost exclusively via ocean cargo. Many African countries, are far away from central markets in Europe which contribute to high transport cost and the cost of doing business which negatively impact on exports (Gallup et al., 1999). High transportation cost often renders the shipping of such

Table 2. Regression results of the full sample.

	(1)	(2)	(3)	(4)
			H-T model	
Variables	Random effect model	H-T model	Resource rich	Resource poor
Land area km^2 (ln)	2.038***	0.642***	0.664***	0.123***
	(0.265)	(0.110)	(0.242)	(0.035)
Mean distance (ln)	−1.320***	−0.178**	−0.557*	−0.031
	(0.183)	(0.067)	(0.335)	(0.047)
Tropical areas (%)	1.829***	0.354**	1.662	0.011
	(0.200)	(0.145)	(1.574)	(0.188)
GDP per capita (ln)	0.084	0.083	0.073	0.368***
	(0.184)	(0.184)	(0.111)	(0.084)
Exchange rate (ln)	−0.004	−0.005	−0.004	−0.003
	(0.006)	(0.005)	(0.005)	(0.004)
Fixed telephone subscription	0.321***	0.320***	0.476	0.770
	(0.068)	(0.070)	(0.211)	(0.685)
Natural resource rent (ln)	−0.028	−0.004	0.031	0.110*
	(0.071)	(0.062)	(0.071)	(0.043)
Political stability	0.054	0.053	0.132	−0.078*
	(0.064)	(0.064)	(0.095)	(0.054)
Rule of law	−0.025	−0.024	−0.265	0.201**
	(0.116)	(0.115)	(0.222)	(0.081)
Constant	−0.144	13.931***	12.963***	0.001
	(2.271)	(0.332)	(2.781)	(0.001)
Observations	697	697	330	298
Number of countries	40	40	21	19

Dependent variable = FDI, Robust standard errors in parentheses.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

goods to distant locations entirely unprofitable. Hausmann (2001) and Venables (2001) reveal that the cost of transporting goods over one extra kilometre of land is equivalent to shipping them over seven additional kilometres on sea. Thus, a long distance from the sea and ports in developing countries may diminish their attractiveness for efficiency-seeking FDI and render them less attractive for export-oriented FDI.

Furthermore, the market size proxied by GDP per capita was used to test for the market-seeking hypothesis. The results indicate that market size exerts no effect on FDI. This could be attributed to the small and fragmented markets in the region. Small market size does not allow the full exploitation of the factors of production by foreign firms and may lead to inefficient use of imported technology which increases the production cost and decreases the profitability of foreign firms.

Natural resource rent and investment in infrastructure were also employed to examine the resource-seeking hypothesis. The estimation results indicate that natural resource exerts no effect on FDI. The result corroborates the findings of Okafor et al. (2017). The authors indicate that for natural resources to attract FDI, minimum threshold requirements, such as the existence of political stability and trade openness are necessary. Political stability creates the right investment climate and boost investor confidence which attracts FDI. According to Onyeiwu and Shrestha (2004) host countries with greater openness to trade attract FDI. In theory, the extent to which a country is opened to external trade indicates its level of comparative advantage and guarantees higher profitability on investment via lower transactions cost. It is more likely that countries with greater openness would attract export-oriented FDI due to the reduction in the cost of transaction mostly associated with market imperfections. In contrast, close economies make it difficult for foreign firms to import factors of production from home for production as well as repatriation of profits accrued from production and this may limit FDI inflows. Moreover, FDI usually goes into extractive industries which have limited space and is a highly regulated sector. Hence, FDI into the sector is highly controlled and inflows into the sector are limited.

In line with a priori expectation, infrastructure measured by fixed telephone subscription is positive and significant indicating that it attracts FDI. Specifically, a 1% increase in infrastructure induces FDI inflows by 0.3%. This corroborates the findings of Asiedu (2006) and Makoni (2018). This can be attributed to the existence of quality, reliable and available infrastructure which raises productivity and thus attract FDI. In contrast, Kinda (2018) finds that infrastructure exerts a negative effect on FDI. High transaction costs and operational challenges faced by foreign firms could possibly be the reasons why infrastructure exerts a negative effect on FDI.

The efficiency-seeking variable measured by the exchange rate exerts no effect on FDI. The finding is consistent with Dewenter (1995) in the United States and Naudé and Krugell (2007) for Africa. In addition, institutional

Table 3. Regression results for West and Central and South and East SSA countries.

Variables	(1) H-T model West and Central	(2) H-T model South and East	(3) H-T model West	(4) H-T model Central	(5) H-T model South	(6) H-T model East
Land area km^2 (ln)	1.335***	0.168***	0.060	1.715***	0.069***	0.135
	(0.137)	(0.024)	(0.100)	(0.185)	(0.017)	(0.171)
Mean distance (ln)	−1.333**	−0.031	−0.024	−2.488***	−0.740***	0.075
	(0.544)	(0.117)	(0.075)	(0.758)	(0.157)	(0.091)
Tropical areas (%)	0.068	0.267*	0.087	−0.543	0.576***	0.392
	(0.243)	(0.148)	(0.394)	(0.424)	(0.105)	(0.444)
GDP per capita (ln)	−0.008	0.003	−0.009	−0.030	−0.014	−0.002
	(0.007)	(0.004)	(0.007)	(0.024)	(0.007)	(0.004)
Exchange rate (ln)	0.323***	0.323	0.294*	0.234	0.462	0.232
	(0.098)	(0.088)	(0.156)	(0.123)	(0.005)	(0.145)
Fixed telephone subscription	−0.088	0.121*	−0.042	−0.274	0.082	0.100
	(0.087)	(0.073)	(0.163)	(0.171)	(0.122)	(0.133)
Natural resource rent (ln)	0.075	−0.066	0.001	0.664***	0.064	0.114
	(0.083)	(0.132)	(0.097)	(0.212)	(0.142)	(0.120)
Political stability	−0.050	−0.126	0.046	−0.697	−0.076	−0.124
	(0.201)	(0.158)	(0.264)	(0.507)	(0.414)	(0.215)
Constant	12.245***	16.765***	19.300***	19.521***	20.000***	16.200***
	(3.240)	(1.045)	(1.580)	(5.664)	(1.100)	(0.632)
Observations	343	258	278	116	102	136
Number of countries	22	18	16	7	7	9

Dependent variable = FDI.
Robust standard errors in parentheses.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

variables measured by political stability and rule of law exert no significant effect on FDI. This corroborates the findings of Shan et al. (2018) for a panel of 22 countries in Africa from 2008 to 2014. Onyeiwu and Shrestha (2004) and Okafor (2015) argued that lack of economic freedom, macroeconomic, and political instability limits the flow of FDI in SSA.

Furthering the analysis, the study disaggregates the sample into West and Central, and South and East due to proximity as well as regional and resource-rich and non-resource-rich countries to check for robustness. Table 3 presents the results for West and Central (column 1) and South and East (column 2). Columns (3), (4), (5), and (6) present the results for West, Central, South, and East African countries, respectively. The results indicate that geographical size enhances FDI inflows in the subgroups. In addition, the mean distance from the sea exerts a negative effect in both samples but is significant only in the west and central SSA category. For the West and Central subgroup, the result is driven by countries in Central Africa and for the South and East subgroup, the result is determined by Southern African countries as shown in columns (4) and (5). With regard to distance, countries located in the central part of SSA are far away from the sea and this may discourage FDI inflows. The percentage of land located in the tropics was dropped due to collinearity.

Unlike the full sample and West and Central SSA countries, the coefficient of market size measured by GDP per capita exerts a positive and significant effect on FDI in the South and East SSA subgroup validating the market-seeking hypothesis. However, the result is driven by Southern African countries. This is plausible in that countries in Southern Africa are relatively developed than countries in other regions and may have larger markets to attract FDI compared to other regions. This finding is consistent with recent studies, such as Aman and Kaplan (2017), Okafor (2015), and Shan et al. (2018). Interestingly, Botrić and Škuflić (2006) employed total population to measure the market size and find a negative effect due to the small sample of countries. Hence, the sample size and the variable used in gauging market size could possibly affect its influence on FDI.

The size of the market has become more important because of the relative labour immobility across countries despite the emphasis on trade liberalisation. With large markets, foreign firms can make optimal use of imported raw materials and technology thereby reducing their operational cost and increasing returns on their investments. Hence, the expansion in the market size is regarded as an avenue for market-seeking FDI to enter domestic markets (Asiedu, 2002).

The coefficient of natural resource rent is positive and significant in the South and East SSA subgroups but negative and insignificant in West and Central SSA countries. Large quantities of natural resources remain untapped especially in Africa as a result of misplaced priorities and conflicts associated with resource rents between interest groups. For example, Liberia, Nigeria, Angola, DRC Congo, and the Republic of Congo have been characterised by militancy and conflicts which have limited the extraction of natural resources in these

countries (Okafor, 2015). With the exception of Angola, all the countries cited above are in West Africa. This could partly explain why natural resources exert no effect in the West and Central Africa since most of the resource-rich countries within the sub-region have experienced conflicts.

Infrastructure exerts a positive effect on FDI in West and Central SSA subgroup but insignificant effect in East and South SSA subgroup. In general, most countries in Africa have poor road networks, weak communications systems, and depend on private generators for production as the electricity supply is unreliable. These factors are likely to increase production cost and deter FDI. In addition, it is likely that the small sample size of countries in East and South SSA possess similar characteristics (Cleeve, 2008).

5. Conclusions and policy implications

The study examines the geographical determinants of FDI for 40 SSA countries over the period 2002–2016 using Hausman-Taylor estimation technique. The study reveals that the geographical size of the country in km^2 and the percentage area of land in the tropics attract FDI but the greater distance from the sea limits FDI inflows in the full sample. Furthering the analysis, the sample is disaggregated into South and East, and West and Central, and further into regional as well as resource-rich and resource-poor countries to check for robustness. For West and Central, and South and East subgroups, geographical size was found to be an important determinant of FDI. Market size and natural resource rent attract FDI in the South and East subgroup. Infrastructure attracts FDI in the West and Central subgroup. The results in the West and Central subgroup are largely determined by countries in Central Africa while Southern African countries drive results in the South and East subgroup. Geographical size also attracts FDI in both resource-rich and resource-poor countries but the greater distance from the sea limits FDI flow in resource-rich countries but has no effect on FDI in resource-poor countries.

The study recommends that SSA should take advantage of its greater geographical size in coming out with common market opportunities to maximise the potential embedded in FDI. This would reduce transaction costs and break the barrier of long-distance transport. The formation of a common market would help in collective bargaining and contract deals as investors would regard them as part of a bigger group rather than small individual markets and this would go a long way to attract FDI into the region. In addition, emphasis must be placed on the distance from markets rather than the distance to sea or port to benefit land-locked countries.

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References

Agyeman, A.S., Arthur, B., & Addai, B. (2021). Interest rates and FDI in some selected African countries: The mediating roles of exchange rate and unemployment.

Aman, A.W., & Kaplan, Z. (2017). The distribution and determinants of Turkey's FDI positions in Africa. *Turkish Economic Review*, *4*, 400–413.

Amoah, A., Asiama, R.K., Korle, K., & Kwablah, E. (2022). Corruption: Is it a bane to renewable energy consumption in Africa? *Energy Policy*, *163*, 112854. doi:10.1016/j.enpol.2022.112854

Amoah, A., Tetteh, C., Korle, K., & Quartey, S.H. (2021). Human development and net migration: The Ghanaian experience. *Journal of International Migration and Integration*, 23, 1147–1172. https://doi.org/10.1007/s12134-021-00874-6.

Aromasodun, O.M. (2022). Determinants of FDI inflows to West Africa: Prospects for regional development and globalization. *BRICS Journal of Economics*, *3*, 27–51. doi:10.3897/brics-econ.3.e83129

Asiedu, E. (2002). On the determinants of foreign direct investment to developing countries: Is Africa different? *World Development*, *30*, 107–119. doi:10.1016/S0305-750X(01)00100-0

Asiedu, E. (2006). Foreign direct investment in Africa: The role of natural resources, market size, government policy, institutions and political instability. *World economy, 29*(1), 63–77.

Bi, Y., Ren, Z., & Bao, K. (2020). Does distance matter in foreign direct investment sub-national location choice? Evidence from China. *Frontiers of Business Research in China*, *14*, 1–19. doi:10.1186/s11782-020-00080-8

Botrić, V., & Škuflić, L. (2006). Main determinants of foreign direct investment in the southeast European countries. *Transition Studies Review*, *13*, 359–377. doi:10.1007/s11300-006-0110-3

Buckley, P.J., & Casson, M. (1976). *The future of the multinational enterprises*. London: Macmillan.
Campa, J.M. (1993). Entry by foreign firms in the United States under exchange rate uncertainty. *The Review of Economics and Statistics*, *75*, 614–622. doi:10.2307/2110014
Carike, C., Elsabé, L., & Henri, B. (2012). Chinese foreign direct investment in Africa: Making sense of a new economic reality. *African Journal of Business Management*, *6*, 11583–11597.
Chen, M. X., & Moore, M. O. (2010). Location decision of heterogeneous multinational firms. *Journal of International Economics*, *80*(2), 188–199.
Cheung, Y.W., De Haan, J., Qian, X., & Yu, S. (2012). China's outward direct investment in Africa. *Review of International Economics*, *20*, 201–220. doi:10.1111/j.1467-9396.2012.01017.x
Cleeve, E. (2008). How effective are fiscal incentives to attract FDI to Sub-Saharan Africa? *The Journal of Developing Areas*, 135–153. doi:10.1353/jda.0.0015
Cleeve, E. (2012). Political and institutional impediments to foreign direct investment inflows to sub-Saharan Africa. *Thunderbird International Business Review*, *54*, 469–477. doi:10.1002/tie.21477
Coughlin, C.C., Terza, J.V., & Arromdee, V. (1991). State characteristics and the location of foreign direct investment within the United States. *The Review of Economics and Statistics*, *73*, 675–683. doi:10.2307/2109406
Dadzie, S.A., Owusu, R.A., Amoako, K., & Aklamanu, A. (2018). Do strategic motives affect ownership mode of foreign direct investments (FDIs) in emerging African markets? Evidence from Ghana. *Thunderbird International Business Review*, *60*, 279–294. doi:10.1002/tie.21852
Delgado, M.S., McCloud, N., & Kumbhakar, S.C. (2014). A generalized empirical model of corruption, foreign direct investment, and growth. *Journal of Macroeconomics*, *42*, 298–316. doi:10.1016/j.jmacro.2014.09.007
Dewenter, K.L. (1995). Do exchange rate changes drive foreign direct investment? *The Journal of Business*, *68*, 405–433. doi:10.1086/296670
Driffield, N., & Taylor, K.B. (2002). Spillovers from FDI and skill structures of host-country firms.
Dunning, J.H. (1993). Internationalizing Porter's diamond. *Management International Review*, 7–15.
Egger, P., & Winner, H. (2005). Evidence on corruption as an incentive for foreign direct investment. *European Journal of Political Economy*, *21*, 932–952. doi:10.1016/j.ejpoleco.2005.01.002
Froot, K.A., & Stein, J.C. (1991). Exchange rates and foreign direct investment: An imperfect capital markets approach. *The Quarterly Journal of Economics*, *106*, 1191–1217. doi:10.2307/2937961
Fung, K.C., & Garcia-Herrero, A. (2012). Foreign direct investment outflows from China and India. *China Economic Policy Review*, *1*, 1250003. doi:10.1142/S1793969012500033
Gallup, J.L., Sachs, J.D., & Mellinger, A.D. (1999). Geography and economic development. *International Regional Science Review*, *22*, 179–232. doi:10.1177/016001799761012334
Hagan, E., & Amoah, A. (2020). Foreign direct investment and economic growth nexus in Africa: New evidence from the new financial fragility measure. *African Journal of Economic and Management Studies*, *11*, 1–17. doi:10.1108/AJEMS-05-2019-0180
Harms, P., & Knaze, J. (2021). Bilateral de-jure exchange rate regimes and foreign direct investment: A gravity analysis. *Journal of International Money and Finance*, *117*, 102438. doi:10.1016/j.jimonfin.2021.102438
Hausmann, R. (2001). Prisoners of geography. *Foreign Policy*, 44–53. doi:10.2307/3183225
Head, K., & Mayer, T. (2004). Market potential and the location of Japanese investment in the European Union. *Review of Economics and Statistics*, *86*, 959–972. doi:10.1162/0034653043125257
Jaiblai, P., & Shenai, V. (2019). The determinants of FDI in sub-Saharan economies: A study of data from 1990–2017. *International Journal of Financial Studies*, *7*, 43. doi:10.3390/ijfs7030043
Kinda, T. (2018). The quest for non-resource-based FDI: Do taxes matter? *Macroeconomics and Finance in Emerging Market Economies*, *11*, 1–18. doi:10.1080/17520843.2016.1244095
Kumar, N. (1994). Determinants of export orientation of foreign production by US multinationals: An inter-country analysis. *Journal of International Business Studies*, *25*, 141–156. doi:10.1057/palgrave.jibs.8490196
Kwablah, E., & Amoah, A. (2022). Foreign direct investment and economic growth in sub-Saharan Africa: The complementary role of economic freedom and financial market fragility. *Transnational Corporations Review*, *14*, 127–139. doi:10.1080/19186444.2022.2041159
Lacroix, J., Méon, P.G., & Sekkat, K. (2021). Democratic transitions can attract foreign direct investment: Effect, trajectories, and the role of political risk. *Journal of Comparative Economics*, *49*, 340–357. doi:10.1016/j.jce.2020.09.003
List, J.A. (2001). US county-level determinants of inbound FDI: Evidence from a two-step modified count data model. *International Journal of Industrial Organization*, *19*, 953–973. doi:10.1016/S0167-7187(99)00051-X
Majeed, M.T., & Ahmad, E. (2009). An analysis of host country characteristics that determine FDI in developing countries: Recent panel data evidence. *The Lahore Journal of Economics*, *14*, 71–96. doi:10.35536/lje.2009.v14.i2.a3
Makoni, P.L. (2018). FDI and FPI determinants in developing African countries. *Journal of Economics and Behavioral Studies*, *9*, 252–263. doi:10.22610/jebs.v9i6(J).2021
McArthur, J.W., & McCord, G.C. (2017). Fertilizing growth: Agricultural inputs and their effects in economic development. *Journal of Development Economics*, *127*, 133–152. doi:10.1016/j.jdeveco.2017.02.007
Mohamed, S.E., & Sidiropoulos, M.G. (2010). Another look at the determinants of foreign direct investment in MENA countries: An empirical investigation. *Journal of Economic Development*, *35*, 75–95. doi:10.35866/caujed.2010.35.2.005
Naudé, W.A., & Krugell, W.F. (2007). Investigating geography and institutions as determinants of foreign direct investment in Africa using panel data. *Applied Economics*, *39*, 1223–1233. doi:10.1080/00036840600567686

Nguea, S.M. (2020). The impact of infrastructure development on foreign direct investment in Cameroon.
Nkansah-Dwamena, E., & Yoon, H. (2022). Why is sub-Saharan Africa an attractive destination to foreign land grabbers? Evidence from country characteristics. *African Development Review*, *34*, 280–292. doi:10.1111/1467-8268.12632
Ogbonna, O.E., Ogbuabor, J.E., Manasseh, C.O., & Ekeocha, D.O. (2022). Global uncertainty, economic governance institutions and foreign direct investment inflow in Africa. *Economic Change and Restructuring*, 1–26.
Ogun, O., Salisu, A., Olowookere, A., Ogunlana, F., & Ofonyelu, C. (2018). Geographical and policy factors in foreign direct investment inflows to Africa.
Okafor, G. (2015). Locational determinants of US outward FDI into Sub-Saharan Africa. *The Journal of Developing Areas*, *49*, 187–205. doi:10.1353/jda.2015.0000
Okafor, G., Piesse, J., & Webster, A. (2017). FDI determinants in least recipient regions: The case of sub-Saharan Africa and MENA. *African Development Review*, *29*, 589–600. doi:10.1111/1467-8268.12298
Onyeiwu, S., & Shrestha, H. (2004). Determinants of foreign direct investment in Africa. *Journal of Developing Societies*, *20*, 89–106. doi:10.1177/0169796X04048305
Ozturk, I. (2007). Foreign direct investmentgrowth nexus: a review of the recent literature. *International Journal of Applied Econometrics and Quantitative Studies, 4*(2).
Portland State University College of Urban and Public Affairs (2022). Available at database https://guides.library.pdx.edu/az.php
Shan, S., Lin, Z., Li, Y., & Zeng, Y. (2018). Attracting Chinese FDI in Africa: The role of natural resources, market size and institutional quality. *Critical Perspectives on International Business*, *14*, 139–153. doi:10.1108/cpoib-11-2016-0055
UNCTAD (2018). *World investment report: Investment and new industrial policies*. New York, NY: UNCTAD.
Venables, A.J. (2001). Geography and international inequalities: The impact of new technologies. *Journal of Industry, Competition and Trade*, *1*, 135–159. doi:10.1023/A:1012830529827
Vijayakumar, N., Sridharan, P., & Rao, K.C.S. (2010). Determinants of FDI in BRICS countries: A panel analysis. *International Journal of Business Science & Applied Management*, *5*, 1–13.
WDI, The World Bank (2022). DataBank. Available at https://databank.worldbank.org/. Accessed 01/01/2022
Wekesa, C.T., Wawire, N.H., & Kosimbei, G. (2016). Effects of infrastructure development on foreign direct investment in Kenya. *Journal of Infrastructure Development*, *8*, 93–110. doi:10.1177/0974930616667875

Appendix

Table A1. Pairwise correlation analysis.

	1	2	3	4	5	6	7	8	9	10
1. Foreign direct investment	1									
2. Land area km^2 (ln)	0.4031	1								
3. Mean distance (ln)	0.1443	0.5247	1							
4. Tropical areas (%)	−0.11	−0.0185	0.0316	1						
5. GDP per capita (ln)	0.3499	0.1644	−0.0347	−0.3215	1					
6. Exchange rate (ln)	0.0232	0.0803	0.117	−0.0487	0.1129	1				
7. Fixed telephone subscription	0.0842	0.1453	0.1945	−0.049	0.0346	−0.0328	1			
8. Natural resource rent (ln)	0.1716	0.003	0.0598	0.3187	−0.0091	−0.0271	−0.0833	1		
9. Political stability	−0.0153	−0.2123	−0.1598	−0.2954	0.358	0.0423	0.0223	−0.3021	1	
10. Rule of law	0.0614	−0.0011	0.1236	−0.4341	0.2255	0.0774	0.1377	−0.497	0.3677	1

Table A2. List of SSA countries used.

West and Central African countries	South and East African countries
Benin	Botswana
Burkina Faso	Lesotho
Côte D'Ivoire	Madagascar
Gambia	Mauritius
Ghana	Namibia
Guinea	South Africa
Guinea-Bissau	Zambia
Liberia	Zimbabwe
Mali	Burundi
Mauritania	Eritrea
Niger	Ethiopia
Nigeria	Kenya
Senegal	Malawi
Sierra Leone	Rwanda
Togo.	Somalia
Angola	Sudan
Cameroon	Tanzania
Central African Republic	Uganda
Chad	
Congo Republic	
Equatorial Guinea	
Gabon	