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Original Article

The Role of Economic Infrastructure and Trade Openness in Attracting Foreign Direct Investment in Developing Countries

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ABSTRACT

This paper examined the role of economic infrastructure and trade openness in attracting foreign direct investment in developing countries. The study used secondary data from 1997 to 2019 to analyse 95 developing countries selected as per data availability. Pooled regression was performed on the panel data using E-views computer software. The method used was fixed effect model and the two-stage estimated generalized least squares estimation with cross-section weights and instrumental variables. The paper tested seven equations for robustness and results analysed after cointegrating regression Durbin-Watson test. The study tested the significance of economic infrastructure and the extent to which openness to trade encourages the attraction of foreign direct investment inflows among other variables. The study observed a positive and statistically significant relationship between foreign direct investment inflows and economic infrastructure. The paper also observed a positive and significant relationship between foreign direct investment inflows and the degree of trade openness. The study concluded that better economic infrastructure and increased trade openness individually results in increased foreign direct investment inflows. Unequivocally therefore, this paper showed that countries with good economic infrastructure will drastically reduce transport costs. With good infrastructure in place, increased degree of trade openness will lead to a greater marginal gain in foreign direct investment inflows. Consequently, the empirical results detailed in this study showed that, economic infrastructure and trade openness interact. This interaction makes a given developing country more attractive as a foreign direct investment destination. Unambiguously, this study found a negative interaction between economic infrastructure and the degree of trade openness, inferring that the most economically advanced developing countries tend to attract higher foreign direct investment inflows but at a decreasing rate compared to the least economically advanced developing countries.

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INTRODUCTION

In the second half of the century from 1901 to 2000, international trade and investment flows entered a buoyant phase of development globally. The establishment of global institutions like the World Trade Organization [WTO], 1995, International Monetary Fund [IMF], and the World Bank, 1994, coupled with a substantial elimination of barriers to trade and investment impelled this (Sharma and Bandara, 2010). Throughout this period, the world witnessed increased volume of global trade and international flow of capital. This was expedited by trade and investment openness coupled with improvements in transport and communication. However, World War I, Great Depression, and World War II interrupted this spectacular global phenomenon that was an extension of the development of globalization that had been going on since the second half of the century from 1801 to 1900. Indubitably, the period that marked the birth of the first era of trade openness can be traced circa 1870 to 1913 (Estevadeordal, *et al.,* 2003).

A reputable 20 percent of global domestic product and a prodigious 70 percent of global trade are generated by Multinational Corporations (MNCs), now some 54,000 parent firms and some 450,000 foreign subsidiaries increasingly influencing the size and nature of cross-border transactions (Owusu-Manu *et al.,* 2019). Overwhelmingly, MNCs participate in global trade. Evidently, a whopping third of global trade in goods arise because of intrafirm trade within an MNC's subsidiaries scattered globally (Frobel *et al.,* 1980). An additional third of global trade encompasses multinationals trading among themselves as exporters and importers at the same time. In the process, MNCs shape the nature of world economy.

The best noteworthy origin of the global capital flows between 1990 and 2019 emerged to be the foreign direct investment (FDI), soaring from US$3,699 billion in 1990 to US$1.54 trillion in 2019 rendering some economies as both hosts and sources of FDI. This impressive increase in FDI in the past few decades rationalizes unrelenting academic curiosity in studying location decision by MNCs. However, following devastating health, financial and economic crisis caused by COVID-19 that was initially reported to the WHO on 31st December 2019, global FDI plummeted starting in the early 2020. This plunge resulted in FDI dropping 42 percent or $859 billion from a towering figure of $1.54 trillion in 2019. The year 2020 ended grimly with FDI slightly more than 30 percent lower than the investment trough that trailed 2008 – 2009 global financial and economic crisis. Such a disheartening scanty FDI flows was only observed in the 1990s (UNCTAD, 2020).

Differences in decline of FDI flows throughout developing economies in 2020 was witnesses with a -37 percent in Latin America and the Caribbean, -18 percent in Africa and -4 percent in developing Asia. Of paramount importance is that East Asia was the leading host of FDI location, accommodating a commanding lead of one-third of the world FDI in 2020. UNCTAD (2021) kvetches that this trend is worrying seeing the mammoth investment needs linked to the sustainable development goals (SDG).

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Advancement on SDG necessitates additional investments in vial economic infrastructure, health, sanitation and water, suitable education, climate change alleviation coupled with investment in productive capacity to create jobs and consequently growth in incomes. FDI could be welfare improving and stands as the stupendous and perpetual external origin of finance for developing economies – contrast this with portfolio investments, remittance, and official development assistance (Germaschewski, 2016).

Multinationals in the host developing economies do not function in seclusion. Normally, there is the presence of other competing local companies that manufacture similar products. Additionally, multinationals compete aggressively with other corporations located in the global marketplace. Indeed, the degree of global rivalry hinges, *inter alia*, on the level of transport costs and on the magnitude in which multinationals participate in the global marketplace (Ng'ang'a, 2022). Recently, empirical and theoretical work has emerged. This latest literature endeavours to illustrate reasons as to why some multinationals export while others do not. In their empirical study, Greenaway and Kneller (2007), find that, the productivity of multinationals engaged in export is higher than that of non-exporting multinationals. Multinationals seek incentives from a selected list of alternative locations, and pick a precise location. Fixed costs that are indeed high induced this. Evidently, these costs are correlated with locating a physical firm in a foreign developing economy. Potential host developing economies compete belligerently with each other by offering incentives to entice multinationals. Beyond pursuing fiscal and other support from the host developing economies, multinationals also pursue other features from the competing host economies. Among them are good infrastructure, high local consumer demand, conducive market environment, domestic competition, and labour market conditions (Frobel *et al*., 1980; Lahiri & Ono, 1998).

Lemi and Asefa (2009) aver that both FDI flows and stocks of multinationals continue to be centralized predominantly in the globally most advanced economies and conspicuously more so in the Triad (European union, Japan and the United States), insofar as their origins and destinations are concerned. This global distribution of inward FDI stock reflects the size of market and trade openness. In all this, developing economies account for moderately between $1/5^{th}$ and $1/4^{th}$ of both global GDP and global inward FDI stock. In developing economies, the stock of FDI is exceedingly skewed and amazingly concentrated: the host 10 major developing economies account for the lion's share of approximately $2/3^{rd}$ of the total stock that all developing economies receive. Surprisingly, this is more than would be projected from their share in developing economies' output of trade (Hirsch, 1976; Sharma & Bandara, 2010; Ibrahim *et al.*, 2019).

Economic infrastructure (transport, telecommunication, power, water and sanitation) offers services that are essential to economic activities. Customarily, economists think of economic infrastructure as appropriate technology that significantly lowers costs in the manufacturing and distribution of intermediate inputs and consequently nurtures specialization. There exists an inverse correlation between these costs and the level of development of transport and telecommunication infrastructure. Germaschewski (2016) argues that variations in the cost of infrastructure across developing economies could unambiguously explain the disparity in their potentiality to contest in the global marketplace for FDI. Thus, variations in the volume and quality of economic infrastructure across developing economies might be liable for the differences in transport costs that sequentially elucidate the disparity in the competitiveness. Trading prospects could be improved through progress in economic infrastructure that lessens transport costs (Bougheas *et al.*, 1999; Dalal & Katz, 2003; Khadaroo & Seetanah, 2009).

Many developing economies have only managed to attract scanty amount of FDI inflows notwithstanding their determinations regarding economic deregulations in a progressively more internationalized global economy. Given the existence of colossal return on economic infrastructure investment, governments in developing economies are zealous to provide more infrastructure capital (Borros and Cabra, 2000). Debt financing are used, yet, the sporadic increase in interest payments of the government debts has resulted in progressively higher fiscal deficits that routinely trigger galloping inflation. The failure of governments to resolve infrastructure dearth has reticent FDI inflows in many developing economies due to growing

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production and transport costs that has occasionally lessened marginal productivity and effectiveness.

The main contributions of this paper are three folds. Firstly, there has been universal agreement surrounding governments across developing economies that trade openness is the single most effectual technique to encourage FDI inflows and stimulate private investments (Germaschewski, 2016). However, the conclusions from the prevailing literature review on the subject of the popularity of trade openness thus far, have been mixed and vary from affirmative to somewhat detrimental. The analysis in this paper provides a sturdy economic backing for trade openness. Secondly, growth and development literature on infrastructure provision has not yet examined macroeconomic outcome of interaction effect of the degree of trade openness and development level of infrastructure in a country insofar as the attraction of FDI is concerned. Thirdly, a synergic amalgamation of comprehensively collected data and econometric modelling have proven an elusive target for scholarly work, rendering policy and analysis weak (Owusu-Manu *et al.*, 2019). This paper seeks to fill these gaps.

The focus of this research was to ascertain the empirical links among economic infrastructure, trade openness, and FDI in the instance of 95 developing economies carefully chosen as per data obtainability. This study covered 1997 to 2019 and used pooled time series and cross-sectional observations. This research endeavoured to supplement the ever-increasing literature on the FDI discourse.

The following is a guide of how this study is arranged: section 2 examines the literature reviewed, both theoretical and empirical; section 3 analyses econometric modelling, methodology and explores the empirical approach and the data employed; section 4 furnishes the empirical findings and interprets the results; lastly, the closing section culminates this research and offers policy implications.

LITERATURE REVIEW

There was a slow growth of FDI globally in the entire of 1970s and at the beginning of 1980s. Nonetheless, the ever up surging of portfolio lending obscured this growth: the 1974 to 1982 ill-omened ascension of loan to developing economies.

Worldwide, FDI soared since mid-1980s. This was propelled by a surge of FDI emanating from developed economies: Japan in the late 1980s, U.S. and European multinationals located in South and East Asian economies in the 1990s. International movement of FDI climaxed to $1.54 trillion in 2019 before the 2020 slump (UNCTAD, 2021).

Historically, FDI has altered its course. In the 1970s and 1980s, it steered clear of developing economies due to hostility and expropriations that peaked in the 1980s. Astoundingly, this trend waned at the dawn of 1990 and FDI flows in these developing economies rose phenomenally (Estevadeordal *et al.,* 2003, Sharma *et al.,* 2010).

In the 1970, governments' heavy borrowing from commercial banks left several developing economies weighed down by ever growing debt-servicing commitment that were not tied to the performance of export. Given the debt catastrophe that occurred during the start of 1980s, advancing credit from the multilateral banks and the bankrolling by the international portfolio investors emaciated.

Whilst concerns regarding MNCs economic and political muscles hardly disappeared, policy debates commenced. This informed the static economic advances that would be realized from FDI inflows including the likelihood of technological and other valuable spillovers. Subsequently, MNCs were viewed propitiously noting that at the initial whiff of distress, FDI would not rush to depart (World Bank, 2001).

In 1970s, mining and extraction undertakings in the primary sector comprised about one-quarter of the global total FDI while services sector contributed another one-quarter. Manufacturing sector contributed a whopping one-half. After 1970s, the proportion of extraction and mining dwindled because developing economies nationalized their industries in a large scale. Actually, developing economies wielded enormous power over the extraction of their natural resources. By 2002, manufacturing sector's share had deteriorated to one-third wile services sectors share grew to 60 percent. The most active categories in manufacturing sector that participate in FDI are machinery, automobiles, electrical and electronic equipment

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and pharmaceuticals. Significant FDI in services sector are normally entrenched in banking and related financial services. Others are conspicuously found in business services viz. accounting, advertising, and consulting. In fact, retailing and wholesaling are also gaining traction (Ibrahim *et al.*, 2019).

Most governments in developing countries liberalized their economies beginning mid-1970s and embraced FDI inflows. From the early 1980s, developing economies approach on FDI altered determinedly. Obstacles to physical investment have dwindled and zealous promotion burgeoned. This kind of encouragement appears to be contrary to the domestic market promotion or the import substitution investment policies that were prevalent in the 1960s and 1970s. The ever thriving home markets, production costs that were relatively low, and serious restructuring of the economy allured FDI in few developing economies in South and East Asia and into Latin America. China gained tremendously, an effect of its openness to trade and FDI inflows in the late 1970s. (Barros & Cabral, 2000; Montero, 2008; Hakro & Ghuma, 2011; Bekana, 2016).

There was a wide-ranging transmission of physical capital, advanced skills and technology because of the blossoming in global trade and investment flows among countries in the 1980s. Developing economies crave for private capital in a world where the flows of official multilateral and bilateral sources of capital have declined (Kumari & Anil, 2017; Liargovas & Kontantinos, 2012). To tap into prospective external assistance like technological advances, managerial skills and foreign exchange, these economies require capital in form of FDI so as to plug their resource lacuna.

FDI originates from the decision by MNCs to relocate a limited or all of its productions to relatively inexpensive host destinations to retain competitiveness in the world market. According to Okafor (2015), if business condition is favourable for-profit maximization, the aspiration to realize benefits from their specific advantage like managerial capability, technological know-how and marketing expertise is reinforced. Ultimately, relative profitability triumphs the locational choice of FDI. From multinationals' point of view, once a given developing economy is selected, as the final destination for FDI, it must be profitable to produce in that country than in others given the locational choice of multinationals.

Business operations of the parent firms and their global subsidiaries generate profits for multinationals. Internationally, governments earn revenue from duties levied on business profits, which tend to be complex and contentious. Given varying tax rates among developing countries, multinationals attempt to bid for the lowest tax rates. MNCs establish their subsidiaries in jurisdictions of developing economies with the minimum tax rates. Most developing economies are intensively competing for FDI through increased trade openness. Consequently, there lately have been a substantial growth of theoretical and empirical literature on FDI. Tax instruments as a tool have been used widely in developing economies to attract FDI (Horst, 1971; Grosse, 1985; Lahiri & Ono, 1998; Ng'ang'a, 2022). Because lower taxes are a good guide for trade openness, MNCs locate in those developing economies with the lowest tax rates.

Assuming the lowest transport costs and the lowest trade barriers, FDI inflows could be utilized to lessen costs by establishing different phases of the total production in various developing economies. Economic historians have widely and intensively studied industrial revolution in the west. They have analysed the sources of economic growth. Remarkably, these economists sited substantial decline in both communication and transport costs that astoundingly supported the growth of investment and international trade (Harris, 1993; Estevadeordal *et al.*, 2003). FDI enables more trade and investment because multinational total production is spread throughout its subsidiaries in different developing economies. Clearly, this is contrasted with the state in which a multinational would undertake almost all its production in a single developing economy. Various parts of a commodity, manufactured by subsidiaries in one developing economy are transported to subsidiaries in other economies for assembly and then the assembled finished goods are finally transported to subsidiaries around the globe for sale to the ultimate consumer. Multinationals disperse production to various host-developing economies where consumers are located in order to lessen transport costs, circumvent obstacles to trade, and achieve domestic market benefits. Developing economies open to trade invest more in economic infrastructure. Moreover, the level of

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infrastructure under open economies receive increasingly higher FDI than the closed economies. A number of academic papers have examined the interaction between infrastructure and trade. Bougheas *et al.*, (1999) admit that infrastructure lowers transport costs leading to expansion in the volume of trade.

Infrastructure investment could result to domestic firms that compete with multinationals thereby becoming more competitive in the export markets due to reduction in the production costs (Fiedorowicz & Rzepka, 1977). Establishment of good economic infrastructure increases productivity of the local firms supporting them to lower production costs, become competitive, and even steal market share from multinationals in both domestic and export markets. According to Chakravorty *et al.* (2008), this market-stealing effect motivates developing economies to invest more in economic infrastructure. Therefore, trade openness and infrastructure development interact insofar as the attraction of FDI is concerned (Donnenfeld & Weber, 2000; Greenaway & Kneller, 2007; Ng'ang'a, 2022).

Multinationals compare exporting and production in a given developing economy. In the chosen host economy, production conditions must exists and be attractive to enable FDI's profitability. Three economic conditions have contributed to globalization of market and production by MNCs: Firstly, for the duration of post-World War II era there was a radical decrease in trade and investment barriers. Secondly, developing economies grew speedily and increased in size, which, according to Harris, (1993) implies increased international specialization of production. Lastly, advancement in technologies involving transport and telecommunication (Estevadeordal *et al*., 2003; and Khadaroo & Seetanah, 2009). The first two reasons are important and have received the most attention from economists, but the third factor must be equally important and yet, has received relatively little attention. I emphasize that these are not the only explanatory economic factors, but I believe them to be the most significant.

MODEL SPECIFICATION AND METHODOLOGY

The empirical evidence from the panel data set in this study is based on the following fixed effect model (FEM) borrowed and modified from Ng'ang'a (2022):

$$ln(FDI_{it}) = \beta ln(VOLTRDE_{it}) \times ln(INFR_{it}) + \beta' CV_{it} + \lambda + \varepsilon_{it} \quad (1)$$

$$i = 1, 2, 3, \cdots, 95; \; t = 1997, 1998, \cdots, 2019$$

Where, ln in all equations stands for natural logarithm, i stands for the ith cross-sectional unit and t for the tth time period.

As a matter of convention, this research takes i to symbolize the cross-section identifier and t the time identifier.

Initially, this study assumes that the exogenous variables are non-stochastic and that the error term follow the classical assumptions, namely, $E(\varepsilon_{it}) \sim N(0, \sigma^2)$. The dependent variable, FDI_{it}, is the net FDI inflows expressed as a percentage of GDP. This indicates the extent to which physical foreign capital flows into a host country. Thus, FDI_{it} is a measure of foreign capital penetration. The explanatory variable $INFR_{it}$ is a measure of infrastructural development (economic infrastructure). This paper uses a proxy for communication infrastructure, viz., the number of telephones mainlines available per 1,000 people. Trade openness, $VOLTRDE_{it}$ measures the extent of a country's openness, or integration into the world-economy. It is a standard hypothesis that trade openness promotes FDI inflows. In the literature, the ratio of the volume of trade to, $[(\text{exports} + \text{imports})/GDP]$, is often used as a measure of openness of a country and it is also often interpreted as a measure of trade restrictions. Increase in the volume of trade indicates higher degree of trade openness. This proxy is also important for foreign direct investors who are motivated by the export market. The degree of trade openness also measures degree of liberalization of an economy. The product of $VOLTRDE_{it}$ and $INFR_{it}$ i.e., $(VOLTRDE_{it}) \times ln(INFR_{it})$ is thus referred to as the "interaction term". The, CV_{it} is a vector of control variables, i.e., a set of FDI determinants other than the interaction term.

One good way of taking into account the "individuality" of each country or each cross-sectional unit is to let the intercept vary for each country but still assume that the slope coefficients are constant across countries. Thus, although the intercept may differ across the 95 developing countries in the sample, each individual's

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intercept does not vary over time; that is, it is time invariant. To see this, I modify equation 1 and hence write equation 2 as:

$$ln(FDI_{it}) = \beta ln(VOLTRDE_{it}) \times ln(INFR_{it}) + \beta' CV_{it} + \lambda_i + \varepsilon_{it} \quad (2)$$

The λ in pooled regression equation (1) is a common fixed effect term. The λ_{it} in the fixed regression equation (2), differs from λ in equation (1) in that the individual effect λ, though constant across time, is now modelled in equation (2) as specific to the individual country i rather than being identical across countries as in equation (1). Equation (2) therefore is the fixed effects model (FEM), where differences between countries, being fixed across time, can be viewed as parametric shifts of the regression function. This study follows equation (2). The ε_{it} is a stochastic error tem.

I have put the subscript i on the intercept term to suggest that the intercepts of the 95 developing countries may be different; this difference may be due to special features of each country such as stage and level of economic development. In the economic literature, equation (2) is known as the fixed effects (regression) model (FEM). The level of development of economic infrastructure will greatly increase productivity and cut costs. With infrastructure in place, increased trade openness in the host country will lead to higher FDI inflows. The term, $VOLTRDE_{it} \times FDI_{it}$, will thus be referred to as interaction term. A vector of control variables (CV) indicates a set of FDI determinants other than the interaction term. These variables are GDP growth rate, $GDPGR_{it}$; secondary school male enrolment as a percent of gross total enrolment, SEC_{it}; consumer price inflation, as an annual percent, $INFL_{it}$; money and quasi money, $M2$ percent of GDP, $FINDTH_{it}$; gross capital formation as a percent of GDP, NV_{it}; and government expenditure, $GOVT_{it}$.

Infrastructure and volume of trade of goods and services are used to assess the effects of the interaction of infrastructure development and the degree of trade openness on FDI inflows. Since the purpose of this paper is to examine if the degree of trade openness and the level of Infrastructure development in a country interact insofar as the attraction of inward FDI is concerned, the study focuses on these.

These variables are specified in an economic model as;

$$FDI_{it} = f(GDPGR_{it,}, INFR_{it}, VOLTRDE_{it}, (VOLTRDE_{it}) \times (INFR_{it}),\ SEC_{it},\ INFL_{it}\ , FINDTH_{it}\ , INV_{it,}, GOVT_{it}) \quad (3)$$

This study then considers a model of the following form:

$$FDI_{it} = \lambda_i (GDPGR_{it})^{\beta_2} (INFR_{it})^{\beta_3} (VOLTRDE_{it})^{\beta_4} (VOLTRDE_{it} \times INFR_{it})^{\beta_5} (SEC_{it})^{\beta_6} (INFL_{it})^{\beta_7} (FINDTH_{it})^{\beta_8} (INV_{it})^{\beta_9}\ (GOVT_{it})^{\beta_{10}} (e)^{\epsilon_{it}} \quad (4)$$

The following economic model (equation 5), which has been guided by the empirical literature is specified. Taking the natural logarithm on equation 4, I get the following log-linear fixed effect model (FEM):

$$\ln(FDI_{it}) = \beta_{1i} + \beta_2 ln(GDPGR_{it}) + \beta_3 ln(INFR_{it}) + \beta_4 ln(VOLTRDE_{it}) + \beta_5 ln(VOLTRDE_{it}) * ln(INFR_{it}) + \beta_6 ln(SEC_{it}) + \beta_7 ln(INFL_{it}) + \beta_8 \ln(FINDTH_{it}) + \beta_9 ln(INV_{it}) + \beta_{10} ln(GOVT_{it}) + \epsilon_{it} \quad (5)$$

Where; $\beta_{1i} = ln(\lambda_i)$ and i represents 1…,95 developing countries, and t represents 23 years from 1997…,2019. In the above multiple log-linear FEM, each partial slope coefficient measures the partial elasticity of the dependent variable with respect to the explanatory variable, FDI_{it}, holding all other variables constant. This paper seeks to estimates the partial regression coefficients β_{1i}, β_2, β_3, β_4, β_5, β_6, β_7, β_8, β_9, and β_{10}. These are the partial elasticity coefficients. For instance, β_3, measures the elasticity of FDI with respect to $INFR_{it}$, holding $GDPGR_{it}$, $VOLTRDE_{it}$, $(VOLTRDE_{it} \times INFR_{it})$, SEC_{it}, $INFL_{it}$ $FINDTH_{it}$, INV_{it}, and $GOVT_{it}$ constant: thus, β_3 measures the percentage change in FDI_{it} for a percentage change in $INFR_{it}$ *ceteris paribus*. As these results show, β_3, suggesting that if $INFR_{it}$ increases by 1 percent, FDI_{it} on the average increases by approximately β_3 percent plus β_5 multiplied by the effects of trade openness.

$$\frac{\partial ln(FDI_{it})}{\partial \ln (INFR_{it})} = \beta_3 + \beta_5 \ln(VOLTRDE_{it}) \quad (6)$$

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In equation (6), β_3 measures the percentage change in FDI_{it} for a given (small) percentage change in infrastructure, added to the effects of trade openness that have been multiplied by a constant β_4. Therefore, β_3 is the economic infrastructure elasticity of FDI_{it}.

Under the assumption of symmetry, β_4 in equation (7) below, measures the percentage change in FDI_{it} for a percentage change in trade openness, $VOLTRDE_{it}$.

$$\frac{\partial ln(FDI_{it})}{\partial \ln (VOLTRDE_{it})} = \beta_4 + \beta_5 \ln(INFR_{it}) \qquad (7)$$

Note that the full change in FDI_{it} is also influenced by β_5 multiplied by the volume and quality of economic infrastructure.

The product of infrastructure ($INFR_{it}$) and trade openness ($VOLTRDE_{it}$) gives the interaction term in equation (8). It gives the joint or simultaneous effect of the two quantitative variables.

Thus,

$$\frac{\partial^2 ln(FDI_{it})}{\partial ln(VOLTRDE_{it}) \partial \ln (INFR_{it})} = \beta_5 \qquad (8)$$

This economic model postulates that when an economy's infrastructure deteriorates, there is a greater effect of high infrastructural cost on FDI. When such an economy becomes more closed to trade, there will be a bigger drop-off in FDI inflows of the magnitude β_5. Conversely, a country with good economic infrastructure will receive more FDI inflows as trade openness increases nonetheless at a decreasing rate (Ng'ang'a, 2022).

EMPIRICAL RESULTS

Table 1, below reports the econometrics results.

Table 1: The dependent variable is FDI net inflows as a percentage of gross domestic product

	Fixed Effect Model (FEM)/ 2SEGLS estimation (cross-section weights)						
Regressors	**Eq. (1)**	**Eq. (2)**	**Eq. (3)**	**Eq. (4)**	**Eq. (5)**	**Eq. (6)**	**Eq. (7)**
Intercept	-6.87[a] (-10668)	-9.235[a] (-10.58)	-12.767[a] (-10.187)	-15.091[a] (-9.063)	-16.674[a] (-11.4)	-16.757[a] (-10.07)	-16.652[a] (-9.792)
$\ln(GDPGR_{it})$	0.0542[b] (2.517)	0.0506[b] (2.3)	0.1211[a] (2.801)	0.1067[b] (2.190)	0.1302[b] (2.575)	0.112[b] (2.129)	0.1111[a] (2.17)
$\ln(INFR_{it})$	0.618[a] (11.524)	1.795[a] (6.967)	1.9318[a] (4.0655)	2.208[a] (5.091)	2.23[a] (5.213)	2.006[a] (4.155)	2.078[a] (4.381)
$\ln(VOLTRDE_{it})$	1.2166[a] (8.5636)	1.7696[a] (8.9337)	2.139[a] (8.647)	2.5405[a] (10.171)	2.611[a] (9.093)	2.244[a] (6.355)	2.321[a] (6.623)
$\ln(VOLTRDE_{it})$* $\ln(INFR_{it})$		-0.2785[a] (-4.7695)	-0.382[a] (-3.371)	-0.476[a] (-5.103)	-0.5228[a] (-5.558)	-0.4612[a] (-4.311)	-0.485[a] (-4.617)
$\ln(SEC_{it})$			0.7738[b] (2.415)	0.8604[a] (2.7103)	0.9138[a] (3.2401)	0.909[a] (3.219)	0.946[a] (3.534)
$\ln(INFL_{it})$				-0.133[a] (-2.745)	-0.11[c] (-1.852)	-0.1144[b] (-1.897)	-0.1113[c] (-1.743)
$\ln(FINDTH_{it})$					0.7419[a] (2.666)	0.6976[b] (2.555)	0.7452[a] (2.6)
$\ln(INV_{it})$						0.5459[a] (2.7458)	0.529[b] (2.531)
$\ln(GOVT_{it})$							-0.236 (-1.24)
Cross-section included	95	95	90	89	89	89	89
Adjusted R^2	0.629	0.634	0.62	0.6396	0.6426	0.6444	0.645
Standard Error (S.E) of Regression	0.996	0.98695	1.002	0.97225	0.96369	0.96427	0.9643

Notes: Superscripts indicate levels of significance as follows: [a]1%, [b]5%, [c]10%. The t-Statistics are reported in parentheses.

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The two-stage estimated generalized least squares (2SEGLS) estimation with Cross-section weights used the following Instrumental Variables (IV); $\ln(GDPGR_{it})$, $\ln(INFR_{it})$, $ln(VOLTRE_{it})$, $\ln(VOLTRDE_{it}) \times ln(INFR_{it})$, $ln(SEC_{it})$, $ln(INFL_{it})$, $\ln(FINDTH_{it})$, $\ln(INV_{it})$, $\ln(GOVT_{it})$.

I find that it is most appropriate to report the constants from the fixed effect model (FEM) for the last equation (equation (7)) only to avoid sloppiness. For the constant coding, see *Appendix 1* in the appendix.

Equation 7 produces the following constant from the FEM and 2SEGLS:

1-C =-5.048588; 2-C = 3.254013; 3-C = 0.017924; 4-C = -1.395036; 5-C = -1.734182; 6-C = 0.310322; 7-C = 0.690114; 8-C = 0.991859; 9-C = 0.122867; 10-C = 0.126536; 11-C = 1.532536; 12-C = 1.000650; 13-C = 2.245734; 14-C = 0.382713; 15-C = -0.887464. 16-C = 0.958561; 17-C = 2.905846; 18-C = 0.011893; 19-C = -0.093382; 20-C = 0.631376; 22-C = 0.773762; 23-C = -2.543584; 24-C = 0.760674; 25-C = 0.638665; 27-C = 0.590572; 28-C = 0.542660; 29-C = -1.213181; 30-C = -0.718494. 31-C = -0.033570; 32-C = 1.240752; 33-C = 0.007105; 34-C = 0.902083; 35-C = 0.604165; 36-C = 0.656184; 38-C = 0.608410; 39-C = 0.508857; 40-C = 0.899409; 41-C = 0.688641; 42-C = -0.325221; 43-C = 0.168520; 44-C = -0.978181; 45-C = -0.344230. 46-C = -4.749055; 47-C = 0.368338; 48-C = -2.363146; 49-C = -1.286314; 50-C = -2.655721; 51-C = 2.076637; 52-C = -2.537958; 53-C = 0.440814; 54-C = 1.298482; 55-C = 1.381844; 56-C = -0.085886; 57-C = 1.225756; 58-C = -0.910019; 59-C = -1.703301. 60-C = 0.106004; 61-C = -2.975682; 62-C = 2.605170; 63-C = -2.001635; 64-C = 0.677245; 65-C = 2.904060; 66-C = 1.921781; 67-C = 0.268779; 68-C = -0.456479; 69-C = 1.138904; 70-C =-0.120353; 71-C = -0.110175; 72-C = -0.677453; 73-C = 2.426898; 74-C = 0.749178; 76-C = 2.751114; 77-C = -2.095639; 78-C = -1.067642; 80-C = 1.044595; 82-C = 0.540203. 83-C = -1.427453; 84-C = 2.885849; 85-C = -1.033903; 86-C = 0.326596; 87-C = 0.719715; 88-C = -0.604900; 89-C = 3.032500; 90-C = -1.556035; 92-C = 1.504457; 92-C = 1.504457; 93-C = 2.327919; 94-C = 2.234632; 95-C = -0.973935.

These results are robust given that adjusted R^2 are convincingly high; they range from 62.9 percent in equation (1) to 64.5 percent in equation (7). The standard errors (S.E) of regression also decrease from 1.002 to 0.96427 in equation (6). Nonetheless, when government expenditures are included, the S.E of regression increases a little bit to 0.9643. This paper also conducted Cointegrating Regression Durbin-Watson (CRDW) Test. The purpose was to find out whether endogenous variable, FDI_{it}, and exogenous variables, $GDPGR_{it}$, $INFR_{it}$, $VOLTRDE_{it}$, $(VOLTRDE_{it} \times INFR_{it})$, SEC_{it}, $INFL_{it}$, $FINDTH_{it}$, INV_{it}, and $GOVT_{it}$ in this study were cointegrated. The critical values were first provided by Sargean and Bhargava (1983). In CRDW the Durbin-Watson d obtained from the cointegrating regression is used. The null hypothesis is that $d = 0$. On the basis of 10,000 simulations each, the one percent, five percent, and ten percent critical values to test the hypothesis that the true $d = 0$ are statistically provided as 0.511, 0.368, and 0.322, respectively. In this case consequently, the inference is that, if the computed d value is smaller than, for instance 0.511, the null hypothesis of co-integration is rejected at the 1 percent level.

In this study, the values of Durbin-Watson statistic (d) are 0.909, 0.925, 0.912, 0.93, 0.95, 0.959, 0.96 for equations (1), (2), (3), (4), (5), (6) and (7) respectively and are all above these critical values. This suggests that FDI_{it}, $GDPGR_{it}$, $INFR_{it}$, $VOLTRDE_{it}$, $(VOLTRDE_{it} \times INFR_{it})$, SEC_{it}, $INFL_{it}$, $FINDTH_{it}$, INV_{it}, and $GOVT_{it}$ are cointegrated, and as a consequence strengthening the finding on the foundation of the Engel-Granger (*EG*). This study's conclusion, based on both the *EG* and *CRDW* tests, is that, the variables in this study are cointegrated. Although they independently seem to display random walks, there seem to be a steady long-run association among them; undoubtedly, these variables will not wander away from each other. This study also applies the two-stage estimated generalized least squares (2SEGLS) estimation with cross-section weights and instrumental variables (IV) to "purify" the stochastic explanatory variables of the influence of the stochastic disturbance, ε_{it}. The estimates thus obtained in this study are consistent.

Table 2 in the appendix provides a list of all 95 developing countries in this study. The Serial numbers used corresponds to the constant obtained in the FEM. Subsequently, and in line

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with the custom, the empirical work on the causes of FDI in this paper employs multiple regression analysis: fixed effect model (FEM) in lieu of the gravity model. The variables contained in the analysis are dictated by theoretical literature examination and the empirical work conversed above. The model in this study is estimated by applying the technique of pooled least squares (i.e., pooled cross-sectional and time series data) for 95 developing countries for the period 1997 to 2019. The White Heteroscedasticity procedure was used to correct for heteroscedasticity.

Using equation (7) in Table I, results from the pooled least square regression are as in equation (8) below:

$$ln(FDI_{it}) = -16.652 + 0.111\ln(GDPGR_{it}) + 2.078\ln(INFR_{it}) + 2.32ln(VOLTRE_{it}) - 0.485ln(VOLTRDE_{it}) \times ln(INFR_{it}) + 0.946ln(SEC_{it}) - 0.1113ln(INFL_{it}) + 0.745\ln(FINDTH_{it}) + 0.529\ln(INV_{it}) - 0.236\ln(GOVT_{it}) \quad (8)$$

t-statistics in parenthesis: $R^2 = 0.645$

The pooled least square regression results, set out in the Table I, relate to the entire set of 95 developing countries in the sample. Considering regressions (1) to (7), one can see that all slope coefficients of the control variables are correctly signed as expected and significantly different from zero. However, the coefficient for government expenditure ($GOVT_{it}$) is not only negative but statistically insignificant. Concerning the variables of interest, trade openness is more important (with a coefficient of 2.32) than economic infrastructure (with a coefficient of 2.078). Nevertheless, the difference between these two coefficients is only very small. Regarding all the variable in this study both economic infrastructure and trade openness are the major factors in attracting FDI in developing countries.

The partial slope coefficient of 2.34 measures the elasticity of FDI inflows with respect to trade openness. Specifically, this number states that, holding all other variables in the regression equation constant, if trade openness increases by only one percent, on the average, FDI inflows would go up by roughly 2.34 percent in developing countries. The interaction term displays a coefficient of -0.485. This coefficient indicates that, with good economic infrastructure in place, trade openness increases FDI at a decreasing rate of 0.485 percent. Meaning that more economically advanced developing countries tend to attract higher FDI inflows but at a decreasing rate compared to the least economically advanced developing countries.

Unequivocally, countries with good economic infrastructure will drastically reduce transportation cost. With good infrastructure, increased trade openness will lead to a greater marginal gain in FDI inflows. Consequently, empirical results show that economic infrastructure and trade openness interact. This makes a given developing country more attractive as an FDI destination. This study strongly shows that, besides some other variables that are arbitrarily given, important determinants for increasing FDI inflows by the MNCs are trade openness and economics infrastructure. This shows that the lesser the barriers among countries, the higher would be the expected FDI inflows. Hence, to increase FDI inflows in developing countries, priority should be: (a) quality of economic infrastructure, and (b) degree of trade openness.

CONCLUSIONS AND POLICY IMPLICATIONS

This paper scrutinized the role of economic infrastructure and trade openness in increasing the attractiveness of FDI inflows by recipient developing economies. A sample of 95 developing economies was chosen based on data availability over the period of 23 years: 1997–2019. Amongst other classical variables, this study tested the significance of trade openness and economic infrastructure in charming FDI inflows with a focus on developing economies. The research found a positive and statistically significant correlation between FDI inflows and economic infrastructure. The research also obtained a positive and statistically significant correlation between FDI inflows and trade openness. The empirical test also acquired an unambiguously negative and statistically significant correlation between FDI inflows and the interaction term: economic infrastructure and trade openness. Except government expenditure, the other classical control variables included in this study produced the predicted signs and results as discussed in the literature.

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These results have significant policy implications for developing economies. These economies view FDI as a method of encouraging exports, generating employment and ameliorating productivity due to access of advanced technology. The inferences points to the significance of policy enhancements intended at improving the quality of infrastructure and opening up the economy for attracting foreign investment and trade. This could reduce income inequality through trade and increase tradability in the very poor countries.

This study could be extended in numerous ways. Measures of trade openness are essentially tools that measure trade dependence. In future, studies could go beyond their use and include as an alternative, measures that could directly be linked to trade barriers like tariffs. The ratio of custom duties collected to the value of imports for instance. This offers a rational proxy for change in import barriers over time.

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APPENDIX

The constants (C) in *Appendix 1* below corresponds to equation (7) FEM results.

Appendix 1: All Developing Countries in the Sample: (95 COUNTRIES)

Constant	Countries	Constant	Countries	Constant	Countries	Constant	Countries
C-1	Algeria	C-25	Cote d'Ivoire	C-49	Kenya	C-73	Rwanda
C-2	Angola	C-26	Dominica	C-50	Korea, Republic of	C-74	Senegal
C-3	Argentina	C-27	Dominican Republic	C-51	Lao, People's Republic	C-75	Seychelles
C-4	Bangladesh	C-28	Ecuador	C-52	Lebanon	C-76	Sierra Leon
C-5	Barbados	C-29	Egypt, Arab Republic	C-53	Lesotho	C-77	South Africa
C-6	Belize	C-30	El Salvador	C-54	Madagascar	C-78	Sri Lanka

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C-7	Benin	C-31	Equatorial Guinea	C-55	Malawi	C-79	St. Kitts and Nevis
C-8	Bolivia	C-32	Ethiopia	C-56	Malaysia	C-80	St. Lucia
C-9	Botswana	C-33	Fiji	C-57	Mali	C-81	St. Vincent and the Grenadines
C-10	Brazil	C-34	Gabon	C-58	Mauritania	C-82	Swaziland
C-11	Burkina Faso	C-35	Gambia	C-59	Mauritius	C-83	Syria, Arab Republic
C-12	Burundi	C-36	Ghana	C-60	Mexico	C-84	Tanzania
C-13	Cambodia	C-37	Grenada	C-61	Morocco	C-85	Thailand
C-14	Cameroon	C-38	Guatemala	C-62	Mozambique	C-86	Togo
C-15	Cape Verde	C-39	Guinea	C-63	Nepal	C-87	Trinidad and Tobago
C-16	Central African Republic	C-40	Guinea-Bissau	C-64	Nicaragua	C-88	Tunisia
C-17	Chad	C-41	Guyana	C-65	Niger	C-89	Uganda
C-18	Chile	C-42	Haiti	C-66	Nigeria	C-90	Uruguay
C-19	China	C-43	Honduras	C-67	Pakistan	C-91	Venezuela
C-20	Colombia	C-44	India	C-68	Panama	C-92	Vietnam
C-21	Comoros	C-45	Indonesia	C-69	Papua New Guinea	C-93	Yemen Republic
C-22	Congo, Democratic Republic	C-46	Iran, Arab Republic	C-70	Paraguay	C-94	Zambia
C-23	Congo, Republic	C-47	Jordan	C-71	Peru	C-95	Zimbabwe
C-24	Costa Rica	C-48	Jamaica	C-72	Philippines		

