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Interest rates and FDI in some selected African countries: The mediating roles of exchange rate and unemployment

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Abstract

Capital chases higher returns, and African countries continuously strive to implement effective policies to attract more Foreign Direct Investments (FDI). Against this backdrop, we explore the relationship between interest rates and FDI inflows in Africa and how exchange rates and unemployment distinctively affect that relationship. We employ panel data on six major FDI-hub economies in Africa for the period 1990-2017. The results of the study suggest that interest rates have a statistically significant positive impact on FDI inflows. Also, the results indicate 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. On the other hand, when unemployment interacts with interest rates the impact of the latter on FDI is more positive. We conclude that policies that stabilize exchange rate and increase labor development should be fortified if an African economy wants to achieve and sustain long term inflows of FDI.

Keywords: Foreign direct investment; Interest rate; Unemployment rate; Real exchange rate.

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1. Introduction

Over the years, academicians and policy-makers have recognized Foreign Direct Investment (FDI) as a key factor necessary for economic growth in developing countries (Frimpong and Abayie, 2006; Chowdhury and Mavrotas, 2003). FDI enhances resource allocation, promotes industrialization, and increases employment, which consequently leads to poverty alleviation. Again, FDI increases the productivity of the host country via skills acquisition, technological transfer, imitation of organization-managerial practices, market development, and competition (De Mello, 1999; Gorg and Greenaway, 2004). Moreover, the inflow of FDI increases the host country's revenues, strengthens the exchange rate of the country, and prompts the government to make policies that would attract more multinational companies and individual foreign investors (Sethi, 2003).

Africa has seen a significant increase in economic development partly due to the continuous rise of FDI inflows into the region over the past few decades. FDI flows as a percentage of GDP, and Gross Fixed Capital Formation (GFCF) in the region provide a distinct description of the level of impact of FDI in the economy. According to the 2014 Africa Economic Outlook, FDI inflows as a percentage of both GDP and GFCF since 1980 have risen significantly in the region, especially in Sub-Saharan Africa (SSA). In 1980, FDI contributed to only 0.09% of Africa's GDP; however, it rose to 1.94% in the year 2000 and then rose again to 3.29% in 2012. Similarly, the ratio of FDI in GFCF skyrocketed from 0.5% in 1980 to 11.54% in 2000 and then to 16.39% in the year 2012 (Africa Economic Outlook, 2014). A recent world investment report by the United Nations Conference on Trade and Development also shows a continuous growth in the contribution of FDI towards the continent's growth rate of both GDP and GFCF from 2015 to 2018 (UNCTAD, 2018). According to the report, the real growth rate of GDP as a percentage of FDI for developing and emerging economies increased from 4.3% in 2015 to 4.4 in 2016, then from 4.8% in 2017 to 4.9% in 2018. Likewise, GFCF growth rate increased from 2.9% in 2015 to 3.3% in 2016 and then from 3.9% in 2017 to 6.3% in the year 2018.

FDI inflows into Africa have been skewed towards the extractive sectors in the region such as the mining and petroleum sector until recently becoming more diversified. Almost all of the investment inflows into the region are centered in the few resource-rich countries such as South Africa, Angola, Nigeria, Egypt,

Ethiopia, and Ghana (UNCTAD, 2012). The resilient investment concentration in these areas is a result of the high prices of oil and gas, which tend to maximize investor's profitability according to the United Nations report of 2005. Recently, FDI into Africa is slowly shifting from extractive sectors to services and manufacturing sectors. FDI inflows into Africa is now spreading to the non-resource rich countries in the continent (Chen *et al.*, 2015). According to the 2016 *Africa Attractiveness* report, the extractive sector of the African continent accounted for only 6.2% of the total FDI that entered the region. The report further asserts that more than 20% of the FDI projects and more than 50% of the capital investment that came to Africa emanated from Asia-Pacific countries with China leading the way (Ernst and Young, 2016). This all-time record in 2016 was attributed to the current diversification of investors attracted to the continent. Foreign direct investment to Africa amounted to US$46 billion in 2018, an increase of 11% of the 2017 inflows despite the worldwide decline in FDI (UNCTAD, 2019).

Several factors have been identified in literature as essential drivers behind the recent aggravating flow of FDI into Africa. These factors are broadly economic, institutional, and political. For example, in the study of Jaiblai and Shenai (2019), Gross domestic product, infrastructure, income levels, trade openness, and exchange rate were found to be the key factors attracting FDI in the Sub-Sahara African economies. Also, Saini and Singhania (2018), identified GDP growth, trade openness, unemployment rate, gross fixed capital formulation, political stability, and trade openness as the catalysts for the flow of FDI into the region. Owusu-Antwi *et al.* (2013) add that trade openness, exchange rate, natural resource, inflation, and infrastructure are the primary drivers of FDI in Ghana. Bende-Nabende (2002) established that FDI liberalization is amongst the utmost leading long-run factors of FDI in Africa. The findings from the study of Asiedu (2003) also affirms the work of Bende-Nabende (2002) that a better investment system stimulates FDI to Africa. Ibrahim *et al.* (2019) also established information and telecommunication as a robust factor that spurs FDI in Africa. Okafor (2012) found the real gross domestic product, real exchange rate, and interest rate as the fundamental factors determining FDI in Nigeria but interest rate was found to be of no significant impact on the inflow of FDI in Zimbabwe (Anna *et al.*, 2012).

Capital chases higher returns; it moves from region of low-interest rate to high-interest rate (Pholphirul, 2002). This financial-economic phenomenon behind capital mobility has received much attention from several authors and

researchers and some have confirmed the theory (Dunning, 2001; Hymer, 1976; Anna *et al.,* 2012). Interest rate is the gain or return on investment. Thus, it is very rational for any investor to channel their investments from low-interest rate areas to high-interest rate areas purposely to attained the golden goal of profit maximization. Hence, it is mostly established in literature that high-interest rates can lead to increased foreign direct investment since it provides the first and immediate answers to profit-seeking investors (Anna *et al.*, 2012; Singhania, 2011). The magnetic power of high interest rate in attracting FDI into developing economies has been confirmed in prior studies (Chakrabarti, 2001; Lanyi and Saracoglu, 1983; Khan and Zahra 2016). Profit maximization is the golden goal of most businesses, and therefore, investment moving to supposed high places of returns is not overboard. Africa is noted for high-interest rates commonly above 20% per year, especially in sub-Saharan Africa countries (Shum, 2015; Jalloh and Guevera, 2017); therefore, an investigation into the effect of interest rate on FDI in the region and the mediating effects of exchange rate and unemployment becomes worthwhile.

This study contributes to the existing knowledge in three main ways. First, this study adds to the ongoing inconclusive discourse on the effect of interest rate on FDI by using current data on six major FDI hub economies in Africa. Despite numerous studies depicting a positive link between the nexus of interest rate-FDI inflows, some studies hold a contradictory view to the former. For instance, Khan and Zahra (2016), Singhania (2011), among other researchers, reinforce the stylized fact that high-interest rates may lead to an upsurge in foreign direct investment and real interest rate adjusted for inflation is a crucial determinant of FDI inflows. In contrast, Benson *et al.* (2019) found a negative and insignificant relationship between interest rate and FDI in Nigeria although other studies found a positive link between the variables. Similarly, an insignificant link was found between the interest rate and FDI in a study conducted by Faroh and Shen (2015) in Sierra Leone. The inconsistencies in the findings open up for further discussion on the nexus. Thus, this study seeks to give more evidence on the nexus by assessing the impact of domestic interest rate on foreign direct investment in six major FDI hub economies in Africa.

Second, most researchers considered the individual impact of the various determinants on FDI without considering the moderating effect of other factors such as unemployment and real exchange rates in the relationship between interest rates and FDI. Conferring to the fact that investment mainly moves to areas that offer good cum secured returns, it is of high importance to assess the

moderating effect of other essential variables on the link between the interest rate and FDI. Exchange rate, which is the value of a country's currency relative to that of another's, can shield or shrink the returns inherent in a given foreign direct investment in a particular host country. As such, appreciation of the host country's currency (decrease in the exchange rate) may lead to an increment in foreign direct investment (Wafure and Nurudeen 2010; Chris-Ejiogu *et al.* 2019; Khandare 2016). Depreciation of the host currency increases the comparative wealth of foreign investors and, therefore, lowers the relative cost of capital for the foreign investor. Accordingly, when exchange rates interact with interest rates, the effect of the interest on FDI will be less favorable, particularly in economies where exchange rates are appreciating. However, the impact of the interest rate will be more favorable for economies where the exchange rates are depreciating.

Also, the mediating effect of unemployment in the interest rate-FDI nexus has not been considered by researchers on FDI. The rate of unemployment in a host country stands to boost or decrease the value of returns inherent in investment as far as the cost of production (labor) is concerned. The internalization theory asserts that investors will only invest in an economy when the value of the investment is less than the returns on the investment. Therefore, a given economy with a low cost of labor is likely to have more foreign direct investment than an economy with a high price of labor (Apana and Yeboah 2018). A study conducted by Krugell (2005) over some selected nations in Africa, established that cheap and quality labor have a significant impact on FDI inflows. As such, when unemployment interacts with interest rates, the effect of the interest rate on FDI will be more positive, particularly in an economy with a high percentage of unemployment. The inverse of this will be valid for economies with a very low unemployment rate. Hence, this study contributes further to literature by examining how other equally important factors in the host country, specifically unemployment and exchange rates, interact with the interest rate to influence FDI.

Precisely, this study contributes to the existing literature in three main ways: first, we inject fresh insight into the ongoing academic discourse on the impact of interest rate on FDI with recent data. Second, we show the mediating effect of exchange rate in the interest rate-FDI nexus and lastly, we demonstrate the mediating effect of unemployment rate in the interest rate-FDI nexus. The results of the study suggest that interest rates have a statistically significant positive impact on FDI inflows. Also, the results indicate 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. On the other hand,

when unemployment interacts with interest rates the impact of the latter on FDI is more positive. The next section is dedicated to the underpinning theoretical framework and review of relevant literature. Section 3 discusses the research methodology, including the empirical model, data sampling, and data sources. Section 4 contains the analysis of empirical results, while Section 5 covers the conclusion and the recommendation.

2. Literature review

Foreign direct investment continues to be one of the hottest economic issues discussed on most economical platforms across the globe and, as a result, has generated a lot of knowledge into the pool of scholarly wisdom of FDI as far as its theories, determinants, and benefits are concerned. In this section, we present some of the theories relevant to our study and the research hypotheses.

2.1. Theoretical review

There are several intertwined theories on FDI including the product life cycle theory, the theory of exchange market or imperfect capital, the internalization theory, and eclectic paradigm theory. This study adopts the internationalization and the eclectic paradigm theories as the main theoretical underpinnings.

The Internationalization Theory

This theory is quite similar to the production cycle theory (Hymer, 1972). It elucidates the fact that multinational companies undertake foreign direct investment to widen their market share globally. However, these firms will only invest abroad when the cost of financing is comparatively low to the associated benefits of investing abroad. This decision is not solely dependent on the returns on investment in the foreign country but also factors such as demand for the product, cost of capital, economies of scale, cost of labor, barriers to entry, and political stability. With these in check, Hymer (1976) records that these firms can attain two chief substantial advantages: they can remove emerging local competition with their global expertise. Firms can also further their expertise by acquiring local resources and management practices. In a nutshell, Hymer remarks that firms can achieve foreign direct investment because market imperfection exists. This Internationalization theory was invented by Buckley and Casson (1976), added on by Hennart (1982), and finally advanced by Casson (1983). Buckley and Casson (1976) posit that multinational corporations organize their internal activities to develop specific advantages which they can exploit. Firms aspire to build their internal markets whenever transactions can

be made at a lower cost within the firm and increase gains. Albeit this theory is more applicable to production and licensing, in terms of real estate, it could be deduced through investor's intention to maintain the position and establish quality standards on the foreign market (Casson, 1983).

The Eclectic Paradigm

The eclectic paradigm is possibly the most famous theory of FDI. It is a hybrid of diverse theories of FDI. Dunning created it in an attempt to overcome the various limitations associated with some of the opinions of foreign direct investment (Boddewyn, 1983). Dunning (2001) proclaims that for a firm to effectively and efficiently engage in foreign direct investment, it must concurrently satisfy three main conditions: location, ownership, and internationalization. To Dunning, firms should have a better competitive edge over its competitors serving the same market by possessing personalized intangible but transferrable assets such as trademarks and patents right. With this ownership advantage, firms will be able to reduce their cost of production or increase their income upon transferring to companies at an expense.

Location benefits points on finding the most suitable economy to host the activities of the multinational company by comparing the strength, threats, opportunities, and weakness that exists among economies. Denisia (2010). Here, key factors such as cost of transportations, proximity to natural resources, market size, trade policies, and easy access to market influence the decision on location. Upon attainment of this location advantage, multinational firms are now able to engage in full exploitation of its ownership advantages, which consequently leads to the engagement of foreign direct investment because the location and the ownership advantages work together.

Internalization benefits offer a framework for assessing different ways in which the company will exploit its powers from the sale of goods and services to various agreements that might be signed between the companies. Upon fulfillment of the ownership and location conditions, it is profitable for the company to use these advantages in collaboration with at least some factors outside the country of origin (Dunning, 1988).

Boddewyn (1985) affirms that internalization benefits are higher when firms engage in the cross-border markets by way of establishing businesses in each of the economies it sells its products or services rather than offering business right under license and franchise. Dunning (2005) adds to this by also signifying that a corporation is more likely to get higher returns if it engages in foreign

production as opposed to the extension of its production rights to other countries. In conclusion, the eclectic paradigm emphasizes that there is a high probability of firms engaging in FDI when they acquire more ownership advantages which empowers them internally to make more profit externally via exploitations of these advantages outside their home country. Therefore, for FDI to occur, these three interrelated conditions must co-occur (Boddewyn 1985).

2.2. The research hypothesis

The Internationalization theory illustrates that since every rational investor seeks to maximize the profit, they seek credit from low-interest economies and then invest in economies that offer high returns on investment. As a result, investment moves to economies that offer high-interest rates coupled with better security in the form of a better business environment (Pholphirul, 2002). According to Singhania (2011), a high-interest rate may lead to an increase in foreign direct investment, and the real interest rate adjusted for inflation is a crucial determinant of FDI inflows.

The study conducted by Singhania (2011) confirms the research of Gross and Trevino (1996) that a relatively high-interest rate positively impacts FDI inflow. They further submit that the impact could be negative if the foreign investor funds its investment with the host country capital. Also, in the work of Chakrabarti (2001), a positive relationship between the interest rate and FDI in India was found. Similarly, a study was undertaken by Lanyi and Saracoglu (1983), on 21 developing economies to evaluate the relationship that exists between the interest rate and investment also proved a positive relationship between investment and interest rate. The discount factor method for uncertainty was used in this study to discount the capital inflow to the present. Numerous studies have found positive and significant relationships exist between high-interest rates and FDI. Khan and Zahra (2016) and Fornah & Yuehua (2017) all have their empirical results backing this hypothesis.

H1: There is a positive relationship between the interest rate and FDI

The exchange rate is the value of a country's currency comparably to the value of another country's currency. The capital imperfection theory expounds that foreign direct investment arose as a result of the difference in the value of currencies and the rate at which a country currency depreciates relative to that of other countries (Cushman, 1985). In this light, the impact of the exchange rate on foreign direct investment can be viewed from two different angles. The first is the variations in the level of the exchange rate among countries. The second is

the frequency of instability of the exchange rate in a particular country.

In the study conducted by Froot and Stein (1991), on the advanced world or the developed economies, the empirical evidence showed a significant and negative relationship between exchange rate and foreign direct investment in the host countries. They stated that a percentage decrease in the value of the local currency led to more FDI inflows. Also, the empirical results from the research of Rosengren (1994) confirmed the fact that depreciation in the exchange rate of a developed economy leads to an increment in foreign direct investment.

H2: When interest rate interact with the exchange rate the effect on FDI will be less positive

According to Apana and Yeboah (2018), there is a large pool of adaptable and educated labor force without jobs in Ghana. As a result, the minimum wage for employing both skilled and unskilled labor is not expensive, and foreign investors pay the same wages and salary as local employers. The internalization theory asserts that investors will only invest in an economy when the cost of investment is less than the returns on the investment. Therefore, a given economy with a low cost of labor is likely to have more foreign direct investment than an economy with a high cost of labor. In the research of Krugell (2005), over some selected countries in Africa, it was confirmed that cheap and quality labor have a significant impact on FDI.

According to Khan and Zahra (2016), unemployment is positively and significantly related to foreign direct investment. That is an increase in the unemployment rate, which is parallel to the low cost of labor results in an increase in foreign direct investment inflow to the nation. Thus, they concluded that unemployment is a significant determinant of FDI. Also, in the study of Pigato (2001), unemployment was confirmed to have a substantial direct impact on FDI. Also, a study undertaken to explore the determinants of foreign direct investment in Africa countries established unemployment as a significant factor (Krugell, (2005).

Similarly, Blanchard (2011) reiterates that unemployment is one of the critical determinants behind foreign direct investment inflows to a host country. He construed that nations with higher unemployment rates offer two significant advantages to foreign investors, all things being equal. That is, high unemployment provides enough ready labor force and a top prospect of the cheap but good workforce.

H3: The effect of interest rate on FDI will be more positive when there is a high unemployment rate

3. Research methodology

In this section, we present the main methodological approach adopted in this study. This includes the variables used in the study, how the variables were measured, the data used and sources of the data.

3.1. Data and study variables

For this study, we utilize a panel data on the six major FDI inflow countries in Africa over 28 years (1990–2017). This study is limited to the selected countries for 28 years due to the non-availability of data, especially for the interest rate variable. The countries included in this study are Angola, Egypt, Ghana, Morocco, Nigeria, and South Africa. Annual data were collected on the following variables: interest rates (INT) using lending rates in the respective countries, foreign direct investment inflows (FDI) measured by FDI as a percentage of GDP, GDP per capita (GDP) adjusted by purchasing power parity (PPP) at current international US Dollars, unemployment rate (UNE), real exchange rate (RER), and Trade openness (OPEN), which is measured as the total of a country's imports and exports expressed as a percentage of GDP. The choice of the study variables and their measurements are based on prior studies on the relationship between interest rate and investment by Beccarini (2007), Singhania (2011), and Suyuan *et al.* (2015). Data for all the variables used in the study were obtained from the World bank country indicators apart from the proxy for interest rate, the lending rate, which we sourced from the Economic Intelligent Unit (EIU) database.

3.2. The empirical strategy

Our main aim is to investigate the effect of interest rate (INT) on foreign direct investment (FDI) and the mediating effects of real exchange rates and unemployment rates in the interest rate – FDI nexus. We first estimate an equation to analyze the effect of interest rate on FDI. The empirical method used in this study is based on related prior studies on FDI by Faroh and Shen (2015), Kruggel (2005), and Anna *et al*. (2012). We control for countries' investment environment for international trade and the differences in market size of the economies by including openness to trade (OPEN) and GDP per capita (GDP) respectively in the model. We specify a baseline random effect model justified by the Hausman test later presented in the empirical results section in Table 3. The baseline model for the effect of interest rate (INT) on foreign direct investment (FDI) is specified as follows;

$$FDI_{it} = \beta_0 + \beta_1 INT_{it} + \beta_2 RER_{it} + \beta_3 UNE_{it} + \beta_4 CONT_{it} + u_{it} \quad (1)$$

$$\text{and } u_{it} = u_i + v_{it}$$

Where FDI_{it} is the foreign direct investment as a percentage of GDP of country *i* at time *t*; INT_{it} is the interest rates of country *i* at time *t*; RER_{it} is the real exchange rate and UNE_{it} is the unemployment rate; $CONT_{it}$ is a vector of control variables; u_{it} is the error term and β_0, β_1,β_2,v_3, and β_4 are the parameters to be determined. Equation one was estimated to test hypothesis one, which examines the effect of interest rate on foreign direct investment.

Some empirical studies on the effect of interest rate on investment and the economy (such as Beccarini, 2007; Mushtaq and Siddiqui, 2016) go further to utilize the Generalized Method of Moment (GMM), however, this study does not employ the GMM because the study sample defies the assumptions underpinning the validity of the GMM. That is, the GMM requires sample with lager N (number of cross-sections) but smaller T (time-span) but in this current study, the sample contains smaller N but Larger T due to non-availability of data.

From equation (1), we introduce the respective interaction terms (exchange rates and unemployment rates) to estimate how those variables mediate the effect of interest rates on FDI to test hypotheses 2 and 3. To estimate the respective role of exchange rates and unemployment on the effect of interest rates on FDI, we introduce the cross term (INT×RER) into equation (1) to obtain equation (2) as follows:

$$FDI_{it}=\beta_0+\beta_1 INT_{it} + \beta_2 RER_{it} +\beta_3 CONT_{it}+\psi(INT_{it}\times RER_{it})+u_{it} \quad (2)$$

Also, we introduce the cross term (INT×UNE) into equation (1) to estimate the role of unemployment in the relationship between interest rates and FDI. The resulting equation after introducing (INT×UNE) into the equation is as follows:

$$FDI_{it}= \alpha_0+ \alpha_1 INT_{it} + \alpha_2 UNE_{it}+ \alpha_3 CONT_{it} + \phi(INT_{it}\times UNE_{it})+ u_{it} \quad (3)$$

We included the interaction terms to examine whether the effect of interest rate on FDI will be complemented or substituted by real exchange rate and unemployment separately. ($INT_{it}\times RER_{it}$) and ($INT_{it}\times UNE_{it}$) are the interaction terms in equations 2 and 3 respectively. It could be observed from equation (2) that β_1 and β_2 measure the direct effects of interest rate and real exchange rate, respectively, while ψ determines the simultaneous variation in both interest rate and real exchange rate on FDI. From equation (2), we can obtain equations (4) and (5) by taking the partial derivative with respect to interest rate and real exchange stated as follows:

$$\frac{\partial FDI_{it}}{INT_{it}} = \beta_1 + \psi RER_{it} \quad (4)$$

$$\frac{\partial FDI_{it}}{RER_{it}} = \beta_2 + \psi INT_{it} \quad (5)$$

From equations (6) and (7), it is important to note that increase in both interest rate and exchange rate will dwindle foreign investment, especially when foreign investors do not have a channel to finance their operations from within the host country but they have to finance from outside the host country. This is because when the host country's currency depreciates the cost of production increases relative to the international market especially when production inputs are imported into the host country. In many parts of Africa, labor cost is already low so the fall in wages resulting from currency depreciation may not be enough to compensate for the increase in production cost on the international market due to the fall in the value of the host country's currency relative to those of other countries. Besides, most of the machineries used by these foreign investors are sourced from outside the continent. Thus, a rise in exchange rate or depreciation in the host country's currency will reduce the positive effect of interest rate on FDI.

Similarly, α_1 and α_2 in equation (3) measure the direct effects of interest rate and unemployment, respectively, while ϕ examines the concurrent variation in both interest rate and unemployment on FDI. By taking the partial derivative of equation (3), we can derive equations (6) and (7) as follows:

$$\frac{\partial FDI_{it}}{INT_{it}} = \alpha_1 + \phi UNE_{it} \quad (6)$$

$$\frac{\partial FDI_{it}}{UNE_{it}} = \alpha_2 + \phi INT_{it} \quad (7)$$

It is expedient to note that, increases in both interest rate and unemployment increases FDI, thus, if their partial derivatives are positive. If that is the case, In such a case, β_1, β_2 and ϕ are all non-negative. That is, a slight increase in either interest rate or unemployment rate implies more FDI inflows. On the other hand, if the coefficients of interest rate and unemployment have different signs, we assess the derivatives at different levels of interest rate and unemployment.

4. Results and discussion

All the statistical results including descriptive statistics and the model estimations are presented in this section.

4.1. Descriptive statistics

Table 1 shows the descriptive statistics of the study variables for the whole pane, as well as the individual countries incorporated into our study. The table also includes the correlation among the study variables.

TABLE 1: DESCRIPTIVE STATISTICS FOR THE WHOLE PANEL AND THE COUNTRIES

Country	Statistics	FDI	INT	RER	UNE	OPEN	GDP
Whole Panel	Mean	2.763	22.334	108.399	12.411	61.072	5,367.173
	Std. dev.	4.683	27.169	39.561	7.646	24.003	3,014.356
	Min	-6.057	5.600	48.924	2.154	20.723	1,237.363
	Max	40.167	67.900	276.000	27.330	152.547	12,703.420
Angola	Mean	5.352	28.000	149.760	17.735	99.962	4,835.163
	Std. dev.	10.205	19.064	62.221	7.235	27.616	1,940.265
	Min	-6.057	12.500	55.300	7.281	52.257	2,316.544
	Max	40.167	67.900	276.000	23.954	152.547	8,179.296
Egypt	Mean	2.313	14.179	89.700	10.478	48.781	7,227.292
	Std. dev.	2.400	2.733	16.993	1.660	10.445	2,705.173
	Min	-0.205	11.000	63.100	7.950	30.247	3,713.489
	Max	9.344	20.300	118.300	13.150	71.681	11,512.400
Ghana	Mean	3.889	23.321	107.119	5.450	75.665	2,602.602
	Std. dev.	2.903	8.503	25.616	2.411	19.223	1,362.402
	Min	0.251	10.300	68.314	2.154	42.488	1,237.363
	Max	9.517	39.600	161.701	10.360	116.048	5,454.144
Morocco	Mean	1.735	9.233	102.146	12.710	65.162	4,737.196
	Std. dev.	1.307	3.326	4.455	4.048	13.665	1,654.640
	Min	0.006	5.600	95.190	8.910	47.096	2,549.080
	Max	4.442	13.800	111.415	22.900	85.673	7,314.154
Nigeria	Mean	2.069	19.593	107.019	4.530	37.542	3,426.327
	Std. dev.	1.132	3.633	52.141	0.810	8.800	1,301.961
	Min	0.634	15.100	48.924	3.700	20.723	2,059.135
	Max	5.791	31.600	268.964	7.060	53.278	5,507.170
South Africa	Mean	1.219	14.175	99.079	23.565	53.206	9,374.458
	Std. dev.	1.321	4.244	17.334	2.578	9.261	2,459.747
	Min	-0.066	8.500	72.014	16.900	37.488	6,258.189
	Max	5.979	21.800	130.286	27.330	72.865	12,703.420

Correlations

	FDI	INT	RER	UNE	OPEN	GDP
FDI	1.000					
INT	0.579	1.000				
RER	-0.310	-0.067	1.000			
UNE	0.004	0.151	-0.126	1.000		
OPEN	0.345	0.472	0.106	0.147	1.000	
GDP	0.164	-0.309	-0.059	0.567	-0.101	1.000

Notes: Std. dev. = Standard deviation; Min=Minimum; Max=Maximum; FDI= Foreign direct investment; INT=Interest rate; RER=Real Exchange rate; UNE=Unemployment rate; OPEN=Trade openness; GDP=GDP per capita.

The average annual FDI inflow as a percentage of GDP for the whole sample is 2.449%, with -6.057% and 40.167 as the minimum and the maximum respectively. For the countries in the sample, Angola has the highest average, the minimum and the maximum FDI inflow as a percentage of FDI. The value of the lending rates for these countries ranges from 5.600% (for Morocco) to 67.900% (for Angola) with an average of 19.161% during the period of study. The mean annual real exchange rate for the entire sample is 109.121 with a minimum value of 48.924 (for Nigeria) to 276.000 (for Angola). The unemployment rate for the entire sample ranges from 2.154% (from Ghana) to 27.330% (for South Africa) with an average of 11.649%. The annual average trade openness of the countries during the period of study is 61.072% with a range of 20.723% (for Nigeria) to 152.547% (for Angola). For GDP per capita, PPP current international US Dollar, the average for the sample is $ 5,367.173 within a range of $ 1,237.363 (for Ghana) and $ 12,703.420 (for South Africa). The GDP per capita values signify that Ghana has the lowest income status among the countries in the sample while South Africa has the highest. The correlation matrix depicts that INT, UNE, OPEN, and GDP all have positive correlation with FDI while RER is the only variable that has a negative correlation with FDI. Also, the levels of correlation that exist among the variables are less than 60 percent. Table 3 indicates that multicollinearity doesn't exist among the independent variables. Hence, the null hypothesis which says multicollinearity exists among the dependent variables is rejected and as such we can conclude our data does not suffer from multicollinearity.

4.2. The effect of interest rates on FDI

Table 2 shows the results for the effect of interest rate on FDI in Equation (1) which test hypothesis one. The random effect model as justified by the Hausman test (see Table 3) is used for the estimations. The first and second columns show the random effect and the random effect with robust standard errors respectively while the third column shows the fixed-effect model for comparison purposes.

Table 2: Results for the Effect of Interest Rates on FDI

Variables	Random effect (RE)	RE Robust	Fixed effect (FE)
INT	0.123***	0.123***	0.166***
	(0.0175)	(0.0178)	(0.0248)
RER	-0.0277***	-0.0277**	-0.0103
	(0.00568)	(0.0134)	(0.00874)
UNE	0.104**	0.104***	0.0958
	(0.0404)	(0.0356)	(0.0821)
OPEN	0.0235**	0.0235**	0.0325*
	(0.0105)	(0.0109)	(0.0166)
GDP	0.000149	0.000149*	0.000310**
	(0.000101)	(7.89e-05)	(0.000129)
Constant	2.030**	2.030	-2.254
	(0.985)	(1.707)	(2.183)
Observations	150	150	150
R-squared	0.450	0.450	0.444

*Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

From the result, INT (interest rate) has a statistically significant positive effect on foreign direct investment at a 99% confidence level. This outcome is consistent with previous studies that suggest that high interest rate may lead to an increase in FDI especially if the funds and investments are provided from outside the host country (Khan and Zahra, 2016; Fornah & Yuehua, 2017; Singhania 2011). This result also affirms the economic investment theory of the eclectic paradigm which emphasizes that there is a high probability of firms engaging in FDI when they acquire more ownership advantages which empowers them internally to make more profit externally outside their home country. Hence, investors borrow from a low interest rate country and then invest in a high interest rate country such as the major FDI countries in Africa under study.

As a rule of thumb, the Hausman test was conducted to justify our choice between the random and the fixed effect panel models, and the result of the Hausman test is presented in Table 3.

Table 3: Hausman Test Result

Variables	b Fixed	(B) Random	(b-B) Difference	sqrt(diag(V_b – V_B S.E
INT	0.16632	0.12308	0.04324	0.01750
RER	-0.01034	-0.02770	0.01736	0.00665
UNE	0.09577	0.10403	0.00826	0.07146
OPEN	0.03249	0.02352	0.00897	0.01280
GDP	0.00031	0.00015	0.00016	0.00008
	Chi2 (5) = (b–B)′ [(V_b – V_B)^(-1)] (b–B) = 8.54			
	Prob>chi2 = 0.2843			

*Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*

The value of Prob>Chi is 0.2843 which indicates that the difference in coefficients is not systematic. This shows that the random-effect model is appropriate. Therefore the random effect model was prioritized as the estimation method for the models presented in equations (1) to (3). We provide the results of the random model with the robust version for all the regression equations.

4.3. The mediation effect of exchange rate and interest rate in the interest rate–FDI nexus

Table 4: The mediation Effects of RER and UNE in the Interest Rate–FDI Nexus

Model #	(1)	(2)	(3)
INT	0.123*** (0.0178)	0.291*** (0.0743)	0.0219 (0.0567)
RER	-0.0277** (0.0134)	-0.00471 (0.00918)	-0.0292** (0.0131)
UNE	0.104*** (0.0356)	0.0962*** (0.0403)	0.143*** (0.0612)
OPEN	0.0235** (0.0109)	0.0199* (0.0138)	0.0191* (0.0110)
GDP	0.000149* (7.89e-05)	0.000148* (8.15e-05)	0.000130* (7.63e-05)
INT×RER	–	-0.00176** (0.000643)	–
INT×UNE	–	–	0.16095*** (0.00280)
Constant	2.030 (1.707)	-0.988 (0.973)	5.298* (2.728)
Observations	150	150	150
R-squared	0.444	0.4675	0.4784

*Notes: Robust errors in parentheses *** p< 0.01, **p <0.05, *p <0.1*

Columns (2) and (3) of Table 4 presents the results after including the interaction terms (INT×RER) and (INT×UNE) in the baseline model and the results correspond to Equations (2) and (3), respectively. We also provide the estimations for Equation (1) in the first column for comparison purposes.

The results as illustrated in column (2) shows that the coefficient of the interactive term (INT×RER) is negative as expected at 5% significant level. The results suggest that the impact of INT on the Host country FDI inflows will reduce when the host country's exchange rate increases. A closer look at the table reveals that the coefficient of interest rate, 0.123 in model (1) without the interaction term reduces to a negative value of -0.00176 when it interacts with real exchange rate. This is consistent with Froot and Stein (1991) and Rosengren (1994) works which opine that depreciation of a countries currency leads to less FDI inflows even when interest rate is significantly positive. Hence, interest rate and exchange rate are unlikely to complement each other in attracting foreign direct investment to a host country.

The results shown in column (3) depicts that the effect of the interaction term (INT × UNE) on foreign direct investment is positive at 5% significant level. Table 4 also shows that the coefficient of interest rate, 0.123 in model (1) without the interaction term increases to 0.16095 when it interacts with unemployment rate. This suggests that interest rate and unemployment rate are likely to complement each other in promoting the foreign direct investment of a host country. This is consistent with the studies that assert that unemployment plays a very critical role in enhancing FDI inflows in the host countries (these studies include Khan and Zahra, 2016; Pigato, 2001; Blanchard, 2011). The result of the current study is also consistent with the internalization theory which asserts that investors will only invest in an economy when the cost of investment is less than returns on the investment.

We go further to examine the marginal effects of the percentage change in interest rate (exchange rate) on FDI when interest rate (exchange rate) is at its mean, minimum and maximum. Similarly, we investigate the marginal effect of interest rate (unemployment rate) on FDI when interest rate (unemployment rate) is at its mean, minimum, and maximum. The marginal effects are presented in Tables 5 and 6. Table 5 shows the results of the partial derivatives with respect to interest rate and exchange rate.

Table 5: Marginal Effects of Interest Rate, Exchange Rate and their Interactions

Indicators	**Interest rate**	**Exchange rate**
Zero	0.291	-0.00471
Mean	0.1005534	-0.034624
Minimum	0.2052893	-0.005155
Maximum	-0.1945972	-0.113282
Coefficient, means, minimum (Min) and Maximum (Max)	β_1= 0.291	β_2= -0.00471
	ψ = -0.00176	ψ = -0.00176
	$\overline{RER}$ = 108.3985	$\overline{INT}$ = 22.334
	RER (Min)= 48.92413	INT (Min) = 5.600
	RER (Max)= 276.000	INT (Max) = 67.900

From Table 5, it could be seen that when exchange rate is evaluated at zero, the marginal effect of interest rate is 0.291 and at zero interest rate, the marginal effect of exchange rate is -0.00471. Nevertheless, if we interact interest rate with exchange rate, the marginal effect of interest rate reduces to 0.1005534 when exchange rate is 108.3985. At the minimum exchange rate of 48.92413, the conditional effect of interest rate increase to 0.2052893 while at the maximum exchange rate of 276.000 the conditional effect of interest rate reduces to -0.1945972. Similarly, the marginal effect of the conditional impact of exchange rate reduces to -0.034624 when interest rate is 22.334%. At the minimum interest rate of 5.600%, the conditional effect of exchange rate increases to -0.005155 while at the maximum interest rate of 67.900% the conditional effect of exchange rate reduces to -0.113282. The conditional marginal effects of both interest rate and exchange rate show that the two variables substitute each other and increasing or decreasing the two at the same time dwindles FDI. This is because when the host country's currency depreciates the cost of production (apart from labor cost) increases relative to the international market. In the case of Africa where most of the machineries used by foreign investors are sourced from outside the continent, depreciation of the local currency can reduce the positive effect of interest rate on FDI.

Likewise, the result of the partial derivatives with respect to interest rate and unemployment rate is presented in Table 6.

Table 6: Marginal Effects of Interest Rate, Unemployment and their Interactions

Indicators	**Interest rate**	**Unemployment**
Zero	0.0219	0.143
Mean	0.0643807	0.1876893
Minimum	-0.0069585	-0.2040725
Maximum	0.1681379	0.2855519
Coefficient, means, minimum (Min) and Maximum (Max)	α_1= 0.0219	α_2= 0.143
	ϕ = 0.16095	ϕ = 0.16095
	$\overline{UNE}$ = 12.41141	$\overline{INT}$ = 22.334
	UNE (Min)= 2.154	INT (Min) = 5.600
	UNE (Max)= 27.330	INT (Max) = 67.900

It could be observed from Table 6 that the marginal effect of interest rate is 0.0219% when unemployment rate is evaluated at zero while the marginal effect of unemployment is 0.143% whan interest rate is zero. However, after interacting interest rate with unemployment rate, the conditional effect of interest rate increases to 0.0643807% when unemployment rate is 12.41%. At the minimum unemployment rate of 2.154%, the conditonal effect of interest rate reduces to -0.0069585% while at the maximum unemployment rate of 27.330% the conditional effect of interest rate increase to 0.1681379%. Also, the conditional impact of unemployment rate increases to 0.1876893% when interest rate is 22.334%. At the minimum interest rate of 5.600%, the conditional effect of unemployment reduces to -.2040725 while at the maximum interest rate of 67.900% the conditional effect of unemployment rate increases to .2855519. The conditional marginal effects of both interest rate and unemployment rate reveal that the two variables complement each other, so high interest rates given an average unemployment rate can simultaneously enhance FDI inflows.

5. Conclusion and recommendations

This study explored the effect of interest rate on FDI inflows into six major hub economies in Africa by using the panel data from 1990 to 2017. The empirical analysis of the data discloses that interest rate positively influences FDI inflows. This implies that high interest rates increase FDI inflows into the selected African economies. The study also reveals 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. This means that the predictive power of interest rate in a host country is reduced when the host country's currency

depreciates. Thus, interest rates and exchange rates do not complement each other in promoting FDI in the selected African economies. Furthermore, when unemployment interacts with interest rates the impact of the latter on FDI is more positive. This means that interest rate and unemployment rate complement each other in promoting FDI inflows especially when there is more skilled labor in the ratio of unemployment population of the host country. Consequently, if African economies want to achieve and sustain long-term FDI inflows, they should prioritize the following: implement policies that will enhance labor development, implement monetary policies that will boost a well-balanced interest rate, and control the depreciation of their local currencies.

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