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Economic growth and foreign direct investment in Africa: the mediating role of state fragility and natural resources

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ABSTRACT

Using data from 43 African countries from 2000-2018, the study employed the Dynamic System GMM approach to examine the moderating effect of state fragility and natural resources on the FDI–economic growth nexus. The study found that FDI does not affect Africa's economic growth directly or indirectly after interacting with FDI with state fragility and natural resources. The insignificant impact of FDI on economic growth in Africa may be because for FDI to promote economic growth, some necessary factors, such as institutional development and the state of the economy, must be developed to a certain level high enough for the effect to be experienced. Given that African countries are fragile with low levels of institutional development, the FDI-Growth nexus is insignificant. The study recommends that African countries establish stable economies and develop their institutions to benefit from FDI inflows.

Keywords: Economic Growth, Foreign Direct Investment, State Fragility, Natural resources

Introduction

Foreign direct investment (FDI) is viewed as external financing that contributes to economic growth, stimulates innovation and entrepreneurship, enhances productivity and competitiveness, reduces unemployment, promotes export growth, improves the trade balance, increases per capita income, and reduces poverty rates (Abdelhadi, *et al.*, 2022). Hence FDI is essential in the development process of many developing countries. Given this fact, host countries are providing many incentives to foreign investors, e.g. tax holidays, subsidies and relaxed laws on the repatriation of property income to attract them. Moreover, Bissoon (2012) points out that competition for attracting FDI inflows has intensified recently. Generally, many scholars (Liang, Shah, & Bifei, 2021; Shittu *et al.*, 2020; Ozekhome, 2017; Ndambendia & Njoupouognigni, 2010; Borensztein, De Gregorio, & Lee, 1998) find that FDI promotes economic growth, especially in developing countries. On the other hand, scholars (Triki, *et al.*, 2022; Seyoum & Camargo, 2021; Dimitrova & Triki, 2018) find that state fragility hinders FDI inflows and other scholars (Dimitrova, Rogmans, & Triki, 2020; Siddiqui & Iqbal, 2018; Anyanwu, 2012; Asiedu, 2006) find that natural resource endowment attracts FDI inflows. However, these three areas of research (FDI-Economic growth, State fragility-FDI, Natural resource endowment- FDI) have lived apart, and there has not been any effort to bring these strands together. Specifically, the moderating role of state fragility and natural resource endowment in the FDI-Growth nexus has been

underexplored in the literature. This is worth investigating as these variables interact with each other.

Many researchers on the FDI- Economic growth nexus find a positive relationship between these two variables. For example, Borensztein, De Gregorio, & Lee (1998) examined the effect of FDI on growth in developing countries using a cross-country regression and found that FDI is essential for transferring technology and contributes relatively more to growth than domestic investment. Also, Abdelhadi, Bashayreh, & Alomari (2022) note that political stability, security and stability of the legal and regulatory environment are some of the key factors that multinational companies consider when making investment decisions. Dimitrova, Rogmans, & Triki (2020) studied the relationship between state fragility and FDI inflows in 17 countries from the Middle East and North Africa (NEMA) region from 2002-2018 using panel data analysis and found that state fragility negatively impacts FDI inflows. The authors state that fragile states are challenged by weak and unstable institutional environments, which makes business relations more complex and difficult for foreign companies to set up shop. Focusing on natural resources, Asiedu (2006) uses panel data for 22 African countries from 1984-2000 to examine the impact of natural resources on FDI and found that natural resources promote FDI.

Many developing countries, especially in Africa, have recorded high scores on the index of fragility, which may be attributed to weak economic fundamentals such as structural economic imbalances, uneven growth, excessive dependence on resources, and high levels of unemployment among young adults (Abdelhadi, Bashayreh, & Alomari, 2022). On the other hand, Africa is rich in natural resources ranging from arable land, water, oil, natural gas, minerals, forests and wildlife. Hence, it's relevant to study the moderating effects of state fragility and natural resource endowment in the FDI-economic growth nexus in Africa.

Though many economists have shown that FDI is associated with increased economic growth, especially in developing countries, the research has not yet considered whether there are conditions mediating the growth-FDI nexus. State fragility hinders FDI inflows in fragile economies, whereas the presence of natural resources tends to attract FDI inflows. If state fragility and natural resource endowment affect FDI inflow, these effects will also affect economic growth. Therefore, the main contribution of this study is to examine the mediating role of state fragility and natural resources in the FDI-Economic growth nexus in Africa. This is the first paper to examine how state fragility, natural resources and FDI jointly influence economic growth in the African context.

Given the above, this study seeks to examine the mediating role of state fragility and natural resource endowment in the FDI-economic growth nexus using panel data from 43 African countries covering a period from 2000 to 2018 employing the system GMM estimator. Interaction terms between FDI and state fragility and FDI and natural resource endowment are included in the growth model to examine whether the moderating variables weaken or strengthen the effect of FDI on economic growth.

Moreover, state fragility is more than political risk given that it results not only in governance failure of the host country's political institutions but also economic, security, and social failures (Nay, 2013). Hence, this study used the state fragility index that encompasses all the aspects state of fragility, namely: security, political, economic and social risks, unlike most of the studies that mainly concentrate on the political risk as the only aspect of state fragility.

The remainder of the paper is outlined as follows: Section 2 presents a brief review of the relevant literature; Section 3 provides the research methodology; Section 4 presents the empirical results, while Section 5 gives the policy implications and conclusions.

Literature Review

Regarding the impact of FDI effect on economic growth, most studies (Acquah & Ibrahim, 2020; Shittu *et al.*, 2020; Opoku, Ibrahim, & Sare, 2019; Iamsiraroj, 2016; Gui-Diby, 2014; Adams, 2009; Borensztein, De Gregorio, & Lee, 1998) generally have found that FDI enhances economic growth. For example, Shittu et al. (2020) studied the impact of FDI and globalisation in West Africa while examining political governance's role using data from 1996-2016 employing the Autoregressive Distributed Lag (ARDL) approach. These authors found that FDI stimulates the growth of the subregion, and this effect is enhanced by political governance. Also, Acquah & Ibrahim (2020) studied the relationship between FDI, economic growth and financial sector development using annual panel data from 1980–2016 for 45 African countries employing the two-system generalised method of moments technique and found that higher FDI is associated with higher growth.

Further, Opoku, Ibrahim, & Sare (2019) re-examined the growth effect of FDI in Africa employing the generalised system method of moments approach and found that FDI positively and unconditionally enhances economic growth. Similarly, Iamsiraroj (2016) found that FDI positively affects growth. The author used the simultaneous system of equations approach of 124 cross-country data from 1971–2010. Moreover, Gui-Diby (2014) examined the impact of FDI on economic growth in 50 countries in African using data from 1980-2009, employing the System Generalised Method of Moment estimator and found that FDI inflows had a positive and significant impact on economic growth in the African region during 1995 to 2009. Also, Adams (2009) analysed FDI's growth effects in Sub-Saharan Africa from 1990–2003 using the OLS estimator and found FDI to be a positive and significant determinant of growth.

Almfraji & Almsafir (2014) conducted a literature review on FDI–economic growth nexus from 1994-2012. Their results revealed that the main finding of the FDI-economic growth relationship was most significantly positive, but in some cases, it was negative or even null. They also noted that the FDI-growth nexus was moderated by several factors like levels of human capital, financial markets development, the complementarity between domestic and foreign investment and trade openness.

However, Sarkar (2007), using a sample of 51 lesser developed countries from 1970- 2002 employing the OLS, fixed and random effects regressions and the Autoregressive distributive Lag approach, found that in the majority of cases, there is no long-term relation between FDI and economic growth. Also, Chowdhury & Mavrotas (2006), using data from Chile, Malaysia, and Thailand from 1969- 2000, employing the Lag-augmented vector autoregression approach, found no relationship between FDI and economic growth in Chile. Being specific to Africa, Awolusi, Adeyeye, & Pelser (2017) examined the FDI effect on economic growth in selected African economies from 1980 to 2014, using OLS and dynamic panel estimation techniques and found limited or negligible the impact of FDI on economic growth in Africa. Yeboua (2021) examined the FDI-Growth nexus in 27 African countries from 1990–2017 and found that the growth effects of FDI were conditional on the level of institutional development, with

countries that fall below the threshold of institutional development having either a negative or null effect of FDI on economic growth. Further, Yimer (2023) investigated the growth effects of FDI in Africa from 1990–2016 and employed a dynamically common correlated effect approach for an error-correction model. Their results revealed that FDI effects on economic growth are insignificant both in the short and long run in fragile countries. Further, M'baye (2023) examine the relationship between FDI and economic growth in the West African Economic and Monetary Union (WAEMU) using panel cointegration and Granger causality techniques using data from 1994-2018 and found no causality between the two variables. The author argues that the null causality between FDI and economic growth in WAEMU was due to the weakness in absorptive capacity factors (human capital, infrastructures, quality of institutions, business environment) and the fact that the sectors that attract the most FDI inflows are the ones that contribute the least to economic growth and job creation.

Contrary to the research that found a positive growth effect of FDI in Africa, Meniago & Lartey (2021) used 25 Sub-Saharan African countries to study the direct and indirect growth effects of FDI from 1980-2104 and found that FDI directly negatively influences economic growth in Sub-Saharan Africa. Concerning the impact of state fragility on FDI, Triki, Dimitrova, & Valentino (2022) analysed the impact of state fragility on FDI flow in the MENA region using panel data from 2002-2018 with fixed effects and pooled OLS estimators. They found that state fragility negatively impacts inward FDI. They used the appropriate measure of state fragility encompassing political risk, economic, security and social aspects. In addition, Dimitrova & Triki (2018) examined the effect of state fragility on FDI inflows in 7 Southern and Eastern Mediterranean countries and found that state fragility deters FDI inflows. In particular, they found that only the political dimension of state fragility negatively affects FDI inflows, whereas the social and economic aspects of state fragility were insignificant. Further, Seyoum & Camargo (2021) analysed data from 93 fragile states and found that state fragility deters FDI inflows and also leads to a deterioration of the state's economic situation.

According to Triki, Dimitrova, & Valentino (2022), state fragility could be associated with country risk (events and conditions that reduce or variance in expected returns specific to a country), which negatively influences firms' foreign investment. Further, Triki, Dimitrova, & Valentino (2022) point out that State fragility is diverse, focusing on not only political and economic institutions but security and social factors. According to these authors, security aspects may include terrorist attacks or violent conflicts, while social factors may include; lack of access to education, unemployment, inequalities in access to healthcare, and persistent poverty, among others. Since state fragility is negatively associated with FDI inflows, it is likely to reduce the spillover effects of FDI on economic growth.

Focusing on the role of natural resource endowment in attracting FDI, Siddiqui & Iqbal (2018) stressed the importance of natural resources (abundant oil and natural gas reserves) for attracting FDI inflows in MENA countries. Similar results are reported by (Ezeoha & Cattaneo, 2012; Sanfilippo 2010; Asiedu, 2006), who found that natural resource endowments promote FDI in sub-Saharan Africa. Likewise, Bokpin, Mensah, & Asamoah (2015) reported that natural resource endowment drives FDI inflows in Africa after allowing for trade effects. The authors used annual panel data from 1980-2011 from 49 African countries and employed the system GMM estimation technique.

However, Asiedu (2013) reported that natural resources adversely impact FDI and that the FDI-resource curse persists even after controlling for institutions' quality and other important determinants of FDI. However, good institutions can mitigate the adverse effect of natural resources on FDI. The study uses panel data from 99 developing countries from 1984-2011 and employs the system-GMM estimator. Moreover, De Soysa & Neumayer (2007) found that high resource rents increase the risk of civil war, which generates an unstable environment that is less favourable for foreign direct investment. The effect of natural resources on FDI is, therefore, mixed. Given that natural resources influence FDI inflows, natural resource endowment will likely moderate the FDI-growth nexus.

Even though some studies find null or adverse growth effects of FDI, generally, studies have found that FDI enhances growth, but only under certain conditions. However, no study has examined the moderating effects of state fragility and natural resource endowment on the FDI growth effect. Given that state fragility and natural resources endowment influence, FDI flows, it is essential to examine whether these factors weaken or strengthen the impact of FDI on Economic growth.

Research Methodology.

Econometric Methodology and Model Specification

The paper analyses the effect of State fragility and natural resources on the FDI-economic growth nexus by developing the research hypotheses to be addressed as listed below;

1) Does state fragility negatively affect FDI inflow in Africa?
2) Do natural resources promote FDI flow in Africa?
3) Does FDI promote economic growth in Africa?
4) Does State fragility significantly reduce the benefits of FDI on economic growth in Africa?
5) Do natural resources enhance the benefits of FDI on economic growth in Africa?

To empirically test the economic growth effect of FDI conditional on state fragility and natural resource endowment, this paper employs a dynamic panel with system GMM estimation. The empirical models are formulated as,

$$FDI_{it} = \beta_0 + \beta_1 SF_{it} + \beta_2 NR_{it} + \varepsilon_{it} \quad (1)$$

$$GDP_{it} = \beta_0 + \beta_1 GDP_{it-1} + \beta_2 FDI_{it} + \beta_3 SF_{it} + \beta_4 (FDI_{it} \times SF_{it}) + \boldsymbol{\delta\chi} + \varepsilon_{it} \quad (2)$$

$$GDP_{it} = \beta_0 + \beta_1 GDP_{it-1} + \beta_2 FDI_{it} + \beta_3 NR_{it} + \beta_4 (FDI_{it} \times NR_{it}) + \boldsymbol{\delta\chi} + \varepsilon_{it} \quad (3)$$

Where FDI_{it} represents the FDI inflows of country i at time t, whereas SF_{it} is the state fragility index, NR_{it} is the natural resource rents, a measure of natural resources endowment. GDP_{it} is the growth rate of real gross domestic product per capita of country i at time t, a measure of economic growth, whereas χ is a vector of all other variables affecting economic growth. These control variables include; investment measured as gross capital formation, government expenditure, inflation, population and life expectancy, which were selected following (Barro, 1996) and according to data availability.

A country-specific fixed effect is assumed for the error term.

$$\varepsilon_{it} = \mu_i + \nu_{it} \quad (4)$$

where ε_{it} represents the error term. It contains $\mu_{i,}$ which represents country-specific effects fixed which are time-invariant, e.g. climate, geographical location, and prior colonial status, among others. Whereas ν_{it} is assumed to be independent and identically distributed with mean 0 and variance δ_v^2 over time and across countries.

To shed light on the fourth and fifth hypotheses, we include interaction terms in equations (2) and (3), i.e. the interaction term between FDI and State fragility and FDI and natural resources. Hence, this paper focuses on examining how state fragility and natural resource endowment affect the marginal effect of FDI on economic growth. The fourth and fifth hypotheses require calculating the partial derivative of FDI at various levels of state fragility and natural resources endowment within the sample, i.e.

$$\frac{\partial GDP_{it}}{\partial FDI_{it}} = \beta_2 + \beta_4 SF_{it} \quad (5)$$

$$\frac{\partial GDP_{it}}{\partial FDI_{it}} = \beta_2 + \beta_4 NR_{it} \quad (6)$$

Most studies that use interactions consider β_2 and β_4 in equations (2) and (3), focusing on their sign and significance. However, the approach does not account for the covariance between β_2 and β_4, which may lead to misleading results in terms of significance. This study takes into account the covariance between β_2 and β_4 by following (Jaccard & Turrisi, 2003) which is an advatage. This allows for the correct calculation of standard errors surrounding the overall marginal effect of FDI on economic growth conditional on state fragility and natural resource endowment.

The standard error bands concerning equations (5) and (6) are derived from;

$$\hat{\sigma}\left(\frac{\partial GDP_{it}}{\partial FDI_{it}}\right) = \sqrt[2]{\left(var\beta_2 + SF_{it}^2 var\beta_4 + 2SF_{it} cov(\beta_2\beta_4)\right)} \quad (7)$$

$$\hat{\sigma}\left(\frac{\partial GDP_{it}}{\partial FDI_{it}}\right) = \sqrt[2]{\left(var\beta_2 + NR_{it}^2 var\beta_4 + 2NR_{it} cov(\beta_2\beta_4)\right)} \quad (8)$$

Since the study employs a dynamic panel approach, we include lagged dependent variable as a regressor on the right-hand side in equations (2) and (3). However, there is a correlation between the lagged dependent variable and the error term since GDP_{it-1} depends on ε_{it-1}, which consists of μ_i. To eliminate the possible autocorrelation (Arellano & Bond, 1991) suggested differencing equations (2) and (3) to get rid of the country-specific effects. The transformed error is correlated with ΔGDP_{it-1} since both include v_{it-1}. To get rid of the endogeneity of ΔGDP_{it-1} and any other endogenous variable, Arellano and Bond (1991) suggested using their lags in levels as instruments (lag starting from lag two and beyond are valid instruments). I.e. $E(GDP_{it-s}\, \Delta v_{it})=0$ for all $s\geq 2; t=3.....T$. In the case of persistent explanatory variables over time, lagged levels of these variables are weak instruments for the regression in difference. Blundell & Bond (1998) and Arellano & Bover (1995) developed the system-GMM estimator as a way of increasing efficiency. The Syetem-GMM estimation combines regression in differences with regression in level. The instrument for the differenced equation remains the same as mentioned above. Regarding the levels equation, instead of differencing equations (2) and (3) to remove the fixed effect, it differences the instruments to make them exogenous to the fixed effect.

The assumption is that $E(\Delta\omega_{it}\ \mu_i)=0$ for all i and t, where $\Delta\omega_{it}$ represents the differenced instruments. If this holds, then $\Delta\omega_{it-1}$ is a valid instrument for the variables in levels since $E(\Delta\omega_{it-1}\ \varepsilon_{it})=0$

The paper uses the Hansen (1982) test of over-identifying restrictions to test the validity of instrumental variables. The null hypothesis is that the over-identifying instrumental variables are uncorrelated with the error term. The consistency of the GMM estimator depends on $E(\Delta v_{it}\Delta v_{it-2})=0$; the study conducted a serial correlation test of the error term. The differenced error term is first-order serially correlated even if the original error term is not by construction. However, the second-order serial correlation should be absent.

Too many moment conditions may introduce bias while enhancing efficiency; hence (Baltagi, 2005) suggests using a subset of moment conditions to balance the reduction in bias and the loss in efficiency. Given the trade-off between efficiency and bias, the instrument set was restricted to the first available lagged values in the differenced equation and the six lagged first differences in the level equation. The instrument set was collapsed.

In the presence of heteroskedasticity, the Two-step system GMM uses a consistent estimate of the weighting matrix, taking the residuals from the one-step estimate. However, Two-step GMM produces standard errors that are downward biased; thus, in this paper, we used Windmeijer (2005) robust finite sample corrected standard errors to solve this problem.

Instruments need to be relevant, i.e., correlated with the endogenous variables. Nevertheless, according to Bound, Jaeger, & Baker (1995), if the instruments are weak, the IV/GMM estimates are biased towards the same direction as OLS, and their estimates may be inconsistent. Generally, many researchers consider system GMM as being more robust to the weak instrument problem than difference GMM. However, Bun & Windmeijer (2010) showed that system GMM could also suffer from weak instrument biases. Despite the above shortcomings, Bond, Hoeffler, & Temple (2001) provided helpful insight into the GMM estimation of dynamic growth models. The authors argue that the coefficient of the lagged dependent variable from a good estimator should lie between the within-group estimator (lower bound) and the pooled OLS estimator (Upper bound). An estimator with a coefficient of the lagged dependent variable close to or lower than that of the within-group estimator is a likely sign that the estimator is downward biased may be due to the weak instrument problem. Hence the study also estimates the dynamic panel with these two measures (pooled OLS and within-group estimators) as checkpoints on whether the preferred system GMM is a good estimator.

Data

The study uses cross-country dynamic panel data from 43 African countries covering a period from 2000 to 2018. We obtained the data mainly from World Bank development indicators, except for the state fragility index data which was obtained from the Center for Systemic Peace. The sample choice depended on data availability.

It is universally acknowledged that a variety of factors drive economic growth. Among these variables is FDI, considered one of the factors influencing economic growth, especially in developing countries. The study includes interaction terms between FDI and state fragility and FDI and natural resource

endowment to study the moderating effect of state fragility and natural resource endowment on the FDI-economic growth nexus. We included control variables in the model, particularly investment, government expenditure, inflation, life expectancy and population since they are considered major economic growth determinants, especially in Africa. Further, the control variables were selected based on (Barro, 1996) and according to data availability.

- Economic growth is measured as the percentage change in real GDP per capita.
- FDI is measured as foreign direct investment inflows as a ratio to GDP. We expect a positive coefficient since FDI will likely stimulate innovation and entrepreneurship and enhance productivity and competitiveness.
- State fragility. It is an index that measures state fragility according to four factors: political, economic, security and social. Each factor is assessed against two criteria, legitimacy and efficiency. The security factor looks at Political Violence vulnerability and the level of state repression; the political factor looks at governance stability and governance representation. The economic factor looks at economic stability as indicated by GDP and trade openness, whereas the social factor looks at social efficiency as indicated by the human development index (HDI) and social legitimacy as indicated by the infant mortality rate. The state fragility index ranges from 0=no fragility to 25=extreme fragility. We expect state fragility to hinder FDI inflow, thereby reducing the effect of FDI on economic growth. Thus we expect a negative coefficient of the interaction term between FDI and state fragility. The data on the state fragility index was obtained from the Center for Systemic Peace (2019).
- Natural resources endowment is measured as rents from natural resources as a ratio to GDP. Natural resource endowment is likely to attract FDI inflow, thereby enhancing the effect of FDI on economic growth. Thus we expect a positive coefficient of the interaction term between FDI and natural resource endowment.
- Investment is measured as a ratio of gross fixed capital formation to GDP used as a proxy for capital accumulation. A positive coefficient is expected.
- Government expenditure is measured as the ratio of general government consumption to GDP. Government consumption is measured as a ratio of general government consumption to GDP. According to Barro (1995), the ratio of government consumption to GDP is intended to measure a set of public outlays that do not directly enhance an economy's productivity. Hence a negative effect of government expenditure on economic growth is expected.
- Inflation is measured as the percentage change in the annual consumer price index. Inflation negatively affects GDP since it makes economic planning hard. Thus, a negative coefficient is expected.
- Population is measured as the logarithm of the total population. Since labour is a factor of production, a large labour force due to a high population size leads to an increase in GDP. Hence a positive coefficient is expected.
- Life expectancy. This measures the health of human capital; hence a positive coefficient is expected.

Empirical Results and Discussion

Summary statistics and the countries included in the sample are presented in Table 1. Table 1 shows that all variables display considerable variation between and within countries, justifying the use of the panel estimation approach. The average growth rate is 1.918%, with an overall standard deviation of 6.202%. The average net FDI inflow as a percentage of GDP is 3.797%, with a standard deviation of

5.7%. The average natural resources rents as a ratio to GDP is 12.943%. The average state fragility index is 13.799, and this is an indication that more countries in Africa are fragile states. Table 1 also presents the summary statistics for the control variables.

Table 1: Descriptive Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP growth	817	1.918	6.202	-50.734	85.688
Investment	788	22.816	9.812	1.097	79.401
Government Expenditure	772	14.598	6.375	.952	50.836
Inflation	774	7.836	26.722	-9.798	513.907
Population	817	19974915	27913762	428178	1.959e+08
Life Expectancy	817	58.733	8.136	39.441	76.693
FDI inflow	817	3.797	5.7	-10.725	64.384
Natural Resources	814	12.943	12.758	.001	67.89
State fragility index	817	13.799	5.103	0	24

All variables are expressed in percentages except Population, Life expectancy and state fragility index Countries (N=43) Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cape Verde, Cameroon, Central African Republic, Chad, Comoros, Congo Dem. Rep., Congo Rep., Cote d'Ivoire, Egypt, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Libya, Madagascar, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.

Table 2: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) GDP growth	1.000								
(2) Investment	0.074	1.000							
(3) Government Expenditure	-0.111	0.177	1.000						
(4) Inflation	-0.072	-0.049	-0.095	1.000					
(5) Population	0.087	-0.022	-0.231	0.126	1.000				
(6) Life Expectancy	-0.003	0.265	0.120	-0.119	-0.001	1.000			
(7) FDI inflows	0.058	0.492	0.046	0.035	-0.077	-0.034	1.000		
(8) Natural Resources	0.031	0.191	-0.078	0.034	-0.097	-0.022	0.132	1.000	
(9) State fragility index	-0.023	-0.253	-0.361	0.154	0.291	-0.606	-0.003	0.249	1.000

Table 2 shows that government expenditure, inflation, life expectancy and state fragility are negatively correlated with GDP growth. The negative association between life expectancy and economic growth may be because, in Africa, increasing life expectancy has a small effect on GDP growth with a larger impact on population growth, leading to a significant reduction in GDP per capita growth rate. We also see from Table 2 that investment, population, FDI inflows and natural resources are positively correlated with economic growth.

The model in Table 3 was estimated to examine the effect of state fragility and natural resource endowment on FDI inflows. The model was estimated using the fixed effect estimators. The results in Table 3 indicate that a unit increase in the state fragility index reduces FDI inflows by about 0.3%. The variable of state fragility is significant at a 1% significance level. This leads to the conclusion that fragile states are less likely to attract FDI inflows. The results support the finds of (Triki, Dimitrova, &

Valentino, 2022; Seyoum & Camargo, 2021; Dimitrova & Triki, 2018) that state fragility negatively impacts FDI inflows. Focusing on natural resources, though positively signed as expected, the variable is insignificant. This implies that natural resources endowment does not influence FDI inflows in Africa. The results do not support the findings of a positive effect of natural resources on FDI as found by (Siddiqui & Iqbal, 2018; Bokpin., Mensah, & Asamoah, 2015; Ezeoha & Cattaneo, 2012). Nor do the results support the negative effect of natural resources found by (Asiedu, 2013; De Soysa & Neumayer, 2007). This may indicate that natural resources' positive and negative effects on FDI neutralise each, resulting in an insignificant effect of natural resources on FDI inflows in Africa.

Table 3: Effect of state fragility and Natural Resources on FDI Inflows.

	(1)
	FDI inflow
State fragility index	-0.2979***
	(0.0916)
Natural resources	0.0073
	(0.0284)
Constant	7.7224***
	(1.3324)
N	814
R-sq: within	0.0137
F-stat	5.34
Prob > F	(0.0050)

Figures in parentheses stand for standard errors, ***, **,* stand for statistical significance at 1 per cent, 5 per cent and 10 per cent levels, respectively.

Focusing on Table 4 below, models 1 and 2 were estimates using the Pooled OLS estimator and within-group estimator, respectively. Whereas Model 3, Model 4 and Model 5 were estimated using the dynamic system GMM estimator. It is well known that pooled OLS estimator will give an estimate of β_1 in equations (2) and (3) that is biased upwards in the presence of individual-specific effects, and the Within-group estimator will give an estimate of β_1 that is biased downwards (Bond et al., 2001). Thus a consistent estimate of β_1 can be expected to lie between the Within Groups estimates (lower bound) and the pooled OLS estimates (upper bound). From Table 4, the estimates for the lagged dependent variable using the System GMM estimator in models 3, 4 and 5 lie comfortably above the corresponding Within group estimator and below the corresponding pooled OLS estimates. Therefore we can conclude that the system GMM estimator is the more appropriate and consistent estimator and that the model does not suffer from the problem of weak instruments. As such, all the rest of the regressions (model 3, model 4 and model 5) in Table 4 were estimated using the system GMM estimator.

Table 4, models 1, 2 and 3 report the results using the dynamic system GMM estimator. We report the robust (Windmeijer, 2005) finite sample corrected standard errors in all Models. The serial correlation test does not reject the absence of 2nd order serial correlation. Using the Hansen test of over-identifying restriction, the present study finds that the over-identifying instruments are valid. This study finds that the lagged dependent variable is negative, significant and below unity in all the Models, ruling out explosive behaviour. Given that the lagged dependent variable is negative and significant, it confirms the

convergence theory of economic growth, implying that poor countries tend to grow faster than richer countries. In addition, the data confirms the choice of dynamic GMM as a preferred panel estimator, suggesting that the results have good statistical properties.

Table 4: Effect of FDI inflow on economic growth considering the moderating effect of state fragility and natural resources.

	Pooled OLS	Within-group	System-GMM		
	(1)	(2)	(3)	(4)	(5)
	Gdp growth	Gdp growth	Gdp growth	Gdp growth	Gdp growth
L.GDP growth	-0.1203***	-0.2439***	-0.2158**	-0.2139**	-0.2137***
	(0.0369)	(0.0360)	(0.0891)	(0.0871)	(0.0816)
Investment	0.0367	0.1117***	0.0803**	0.0788**	0.0770**
	(0.0273)	(0.0377)	(0.0354)	(0.0359)	(0.0386)
Government expenditure	-0.1415***	-0.4221***	-0.2361**	-0.2341**	-0.2440*
	(0.0387)	(0.0727)	(0.1151)	(0.1129)	(0.1258)
Inflation	-0.0195	-0.0338**	-0.0236***	-0.0237***	-0.0235***
	(0.0132)	(0.0134)	(0.0072)	(0.0071)	(0.0076)
Population	0.5651***	-2.6808	0.6447**	0.6400**	0.6443**
	(0.1776)	(3.0595)	(0.2732)	(0.2716)	(0.2694)
Life expectancy	-0.0991***	-0.1368	-0.1473**	-0.1482**	-0.1444**
	(0.0373)	(0.1246)	(0.0690)	(0.0696)	(0.0685)
FDI	0.0369	0.0636	0.0032	-0.0592	0.0555
	(0.0456)	(0.0507)	(0.0300)	(0.1354)	(0.0885)
Natural resources	0.0281	0.2013***	0.0359	0.0365	0.0495
	(0.0184)	(0.0386)	(0.0376)	(0.0381)	(0.0461)
State fragility index	-0.1970***	-0.0008	-0.3334**	-0.3485**	-0.3399**
	(0.0638)	(0.1536)	(0.1358)	(0.1553)	(0.1406)
(FDI × State fragility index)				0.0042	
				(0.0081)	
(FDI ×Natural resources)					-0.0027
					(0.0038)
Constant	2.4080	54.5459	6.3089	6.6619	6.1911
	(3.4960)	(43.9816)	(4.5569)	(4.8266)	(4.4967)
N	698	698	698	698	698
Resid AR(2)			0.3185	0.3179	0.3230
Resid AR(2) p-value			0.7501	0.7505	0.7467
Hansen test			5.0794	4.9858	5.0143
Hansen test p-value			0.5337	0.5456	0.5420

Figures in parentheses stand for standard errors, and ***, **,* stand for statistical significance at 1 per cent, 5 per cent and 10 per cent levels, respectively.

Focusing on models 3, 4 and 5 in Table 4, the study finds that FDI, though positively signed as expected, does not affect economic growth in Africa since the variable is insignificant. The results in this study concur with (M'baye, 2023; Yimer, 2023; Yeboua, 2021; Awolusi, Adeyeye, & Pelser, 2017; Sarkar, 2007),

who found insignificant effects of FDI on economic growth in developing countries, most especially in Africa. Our results do not find evidence of a positive FDI effect on growth in Africa, as found by (Acquah & Ibrahim, 2020; Shittu, Yusuf, El Houssein, & Hassan, 2020; Opoku, Ibrahim, & Sare, 2019; Iamsiraroj, 2016; Adams, 2009). Nor do we find evidence for the negative relationship between FDI and economic growth, as evidenced by (Meniago & Lartey, 2021). The insignificant effect of FDI on economic growth found in this study may be explained by the fact that conditions such as development institutions and stable economies are necessary or should be in place to reap the benefits of FDI on economic growth. Hence without those necessary conditions, FDI will not affect economic growth. Given that most African countries have low levels of institutional development and are fragile economies, the impact of FDI on economic growth is insignificant. This argument is based on the findings of (M'baye, 2023; Yimer, 2023; Yeboua, 2021), whose results empirically revealed that the FDI effect on economic growth is conditional on institutions development and the state of the economy, with countries having low levels of institutional development and fragile receiving no benefit from FDI inflows.

Considering the state fragility index, as evidenced in Table 4, models 3, 4, and 5, this study finds that the variable is negative and statistically significant at a 5% significance level. A unit increase in the state fragility index reduces economic growth in Africa by about 0.33%. Concerning natural resource rents, the variable has an insignificant effect on economic growth.

Focusing on model 4, the interaction term between FDI and state fragility is insignificant. This indicates FDI effect on economic growth is not conditional on state fragility. Also, looking at model 5, the interaction term between FDI and natural resources is insignificant, implying it is not dependent on natural resource endowment.

Concerning the results of the control variables reported in Table 4; models 3, 4 and 5, we find that investment promotes economic growth in Africa, and the variable is statistically significant at a 5% significance level. Also, population, a proxy for the labour force, increased economic growth and the variable is statistically significant at a 5% significance level. Government expenditure and inflation negatively affect economic growth, and the variables are statistically significant and 5% and 1% significance levels, respectively.

Surprisingly, life expectancy, a measure of human capital's health, is negatively signed and statistically significant at a 5% significance level. This indicates that as life expectancy increases in Africa, economic growth reduces. The possible explanation for this result is that increasing life expectancy could have a negligible effect on growth in aggregate incomes, but it could significantly impact population growth, which requires more public spending on social protection services and pensions for ageing people from limited budgets. Hence a reduction in the growth rate of GDP per capita. Moreover, an increase in life expectancy leads to a high dependency ratio where the ageing population highly depends on the younger generation, yet Fayissa & Gutema (2010) empirically found that a high dependency ratio adversely impacts economic growth in Sub-Saharan Africa.

Table 5: Total Marginal Effect of FDI on Economic Growth at Various Levels of State Fragility.

	Evaluated at		
Gdpgrowth	SDVB	Mean	SDVA
FDI	-0.0226	-0.0012	-0.0202
	(0.0929)	(0.0943)	(0.1198)

Figures in parentheses stand for standard errors, ***, **,* stand for statistical significance at 1 per cent, 5 per cent and 10 per cent levels, respectively. SDVB is one standard deviation below the mean, and SDVA is one standard deviation above the mean.

Table 6: Total Marginal Effect of FDI on Economic Growth at Various Levels of Natural Resource Rents

	Evaluated at		
Gdpgrowth	SDVB	Mean	SDVA
FDI	0.0550	0.0180	-0.0190
	(0.0957)	(0.0479)	(0.0442)

Figures in parentheses stand for standard errors, and ***, **,* stand for statistical significance at 1 per cent, 5 per cent and 10 per cent levels, respectively. SDVB is one standard deviation below the mean, and SDVA is one standard deviation above the mean.

The results in Tables 5 and 6 show the total effect of FDI conditional on state fragility and natural resources based on models 4 and 5 in Table 4, respectively. All the results in Tables 5 and 6 show that FDI is insignificant in all cases, i.e. when evaluated at various levels of state fragility or natural resources. This leads to the conclusion that FDI does not affect Africa's economic growth even after interacting with FDI with state fragility and natural resources. This implies that FDI does not impact economic growth, whether directly or conditioned on state fragility or natural resources.

Conclusion and Policy Implications

This study examined the moderating effect of state fragility and natural resource endowment on the FDI–economic growth nexus using a dynamic panel approach with system GMM estimators. The study employed data from 43 African countries from 2000-2018. The study found that FDI inflow has insignificant effects on Africa's economic growth, whether directly or after interacting with FDI with state fragility and natural resources. The study argues that the insignificant effect of FDI on economic growth in Africa may be because for FDI to promote economic growth, some necessary factors, such as institutional development and the state of the economy, must be developed to a certain level high enough for effect to be experienced. Given that African countries are fragile with low levels of institutional development, the FDI-Growth nexus is insignificant. The study recommends that African countries establish stable economies and develop their institutions in order to benefit from FDI inflows.

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