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The Differential impact of Foreign Direct Investment on Economic Growth between Landlocked and Coastal African countries

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ABSTRACT

The main motivation for this study is to determine why foreign direct investment does not produce the same level of growth in African countries. Specifically, it investigates whether being landlocked or having coastline access fundamentally changes how inflows of FDI translates into short and long run growth, a critical question for designing effective continental investment policy. The relationship between foreign direct investment and economic growth is a topic that sparks debate and needs further exploration. This study explains the differential impact of foreign direct investments on growth of landlocked versus coastal African countries during 1996 to 2023. We utilized a Panel Autoregressive Distributed Lag model alongside Pool Mean Group estimation, complemented by Pedroni and Kao co-integration methods and panel causality tests. The results show a stable long-run relationship between net foreign investment inflow and growth in both groups of countries. Specifically, a 1% increase in FDI results in a 1.44% rise in real GDP for coastal nations, compared to a mere 0.26% increase for landlocked countries, leading to a growth disparity of 1.18%. This analysis emphasizes the importance of considering geographical factors when exploring the relationship between foreign direct investment and economic growth. It also highlights the necessity for targeted economic policies to address the distinct challenges and opportunities that landlocked and coastal African nations encounter. Hence Landlocked African countries must compensate for geographic constraints through infrastructure, strong institutions, regional cooperation, and human capital development.

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1. INTRODUCTION

International monetary fund (IMF) defined foreign direct investment (FDI) as ''*a type of investment that happens when a person or company from one country buys a lasting interest in a business in another country*''. This is typically defined as owning 10% or more of voting shares or an equivalent stake (IMF, 1993). Over the past thirty years, global FDI inflows and economic growth have greatly improved, FDI inflows rose from 205 billion in 1990 to 1.33 trillion in 2023 (UNCTAD, 2024). During this time, the world economy expanded from 23 trillion in 1990 to 106 trillion in 2023 (World Bank, 2024). FDI inflows to Africa also have shown significant growth over these three decades. The latest UNCTAD (2024) report shows that FDI inflows to Africa jumped from $2.8 billion in 1990 to $52.6 billion in 2023, peaking at $83 billion in 2021, driven by strong interest from investors in the mining, energy, and infrastructure sectors. Despite overall growth in global FDI and the economy, there are variations among regions and countries. For instance, in 2022, Egypt made up 21% of FDI inflows, followed by South Africa with 17%. Nigeria only accounted for 1.6%. Additionally, between 1990 and 2023, there were notable differences in FDI inflows across Africa. Regional variations in FDI inflows are also noteworthy, for instance eastern African's FDI increased from 389 million in 1990 to 15.2 billion, while western Africa's inflows grew from $1.553 billion to $13 billion over the same period, Northern Africa saw an increased from $1.155 billion in 1990 to $14.917 billion, the southern African region increase from $92 million to $13.5 billion and to sub-Saharan African countries grew from $1.7 billion in 1990 to 39.16 billion in 2023 (UNCTAD, 2024).

The significant rise in FDI has been augmented by economic growth, with GDP growing from $558.8 billion in 1990 to $2.87 trillion in 2024. However, economic growth differs by region. Sub-Saharan Africa's GDP grew from $372 billion in 1990 to $2 trillion, while northern Africa's GDP increased from $186.8 billion to $858 billion in 2024 (UNCTAD, 2025).

We have contrasting theoretical explanations on the relationship between FDI and economic growth. Neoclassical growth theory focuses on capital accumulation, labor growth, and technological progress. This theory contends FDI as an important source of capital that boosts productive capacity and drives economic growth (Solow, 1956) and (Swan, 1956). Endogenous growth theory suggests a two-way causal relationship between FDI and economic growth. That is, increased FDI inflow improves human capital innovations by introducing new technologies and facilitating knowledge transfer, which leads to better productivity and export capabilities (Romer, 1990) attracting more FDI, creating a positive feedback loop that stimulates economic growth. On the other hand, ''Crowding-out theory'' argues that increased FDI inflows can reduce domestic investment, export performance and overall growth (Caballero & Lyons, 1992; Agosin & Machado, 2005). This theory argues that foreign investors may compete with domestic companies for crucial resources like land, labour and capital. This competition can crowd out domestic firms, hindering their growth and market share, which ultimately slows down economic progress (Caballero & Lyons, 1992).

Empirical studies also shows controversial relationship between FDI and economic growth. According to studies by Almalik et al. (2024), Emmanuel Obiora Nwakeze et al. (2023), Sokang (2018) and Mmasi et al. (2025) suggest that FDI drives economic growth. In contrast, researchers like Ghazalian (2024), Alharthi et al. (2024), Khan et al. (2023) argues that higher GDP growth attracts more FDI. Furthermore, studies by Chebli & Saidi (2024), Nupehewa et al. (2022), Rahman & Alam (2021), Otieno & Aduba (2022), Acquah & Ibrahim (2020), Sunde (2023), Bouchrika & Bardi (2025) and Wang et al. (2022), found a two way relationship between FDI and growth. There are also cases where there is no relationship between FDI inflows and growth Arthur & Addai (2022), Yimer (2023), and Ali & Mingque (2018), reported a lack of causal relationships. On the otherhand, FDI inflows reduces growth in studies by (Derbal et al., 2025; Magbondé et al., 2025) due to weak institutions and profit repatriation. These inconsistencies suggest that FDI's impact is context-specific, with geography playing a key role. Landlocked African countries, facing higher transport costs and limited market access, may benefit less from FDI than coastal countries with better connectivity and trade opportunities. This underscores the need for a geography-sensitive analysis comparing landlocked and coastal African economies to understand FDI's differential impact on growth.

In addition to the theoretical and empirical debates, many developing countries, particularly in Africa, depend on foreign capital to address their savings-investment and import-export gaps and achieve sustainable economic growth. However, these nations often face capital shortages, as evidenced by significant savings-investment gaps, indicating that they lack sufficient savings and/or foreign exchange to meet their investment requirements. For example, Botswana's gap was -4.74% of GDP in 2024, Burkina Faso, Burundi, Central African Republic and Uganda were -6.4%, -13.6%, -8.9% and -7.3% respectively, similarly Tanzania, South Africa, Namibia, Kenya and Benin were -3.1, -0.6, -15.3, -3.7 and -6.4 % of GDP (IMF, 2025). These figures highlight the financial challenges faced by different regions within Africa, particularly landlocked countries.

Additionally, many African countries have faced significant debt overhang problems that discourage investment. The number of countries experienced debt distress or identified as being at high risk of debt distress increased to 23 in 2022, up from 16 in 2019 (World Bank, 2023). Furthermore, many African countries are receiving lower official development assistance compared to previous years. For instance, net official development assistance from landlocked Africa to Burundi declined from 18.1% of GNI in 2020 to 17.2% in 2022, while Uganda's dropped from 8.4% to 4.7%, Central Africa republic 34% to 27%, and Botswana's dropped from 0.53% to 0.44% in 2022. Similarly, from Coastal Africa, Kenya received 4% in 2020 and this figure was declined to 2.3% in 2022, South Africa 0 .36% to 0.25%, Benin received 6.7% in 2020 and this figure has declined to 4.9% in 2022 (World Bank, 2025).

It is also suggested that to achieve 2030 ''Sustainable Development Goals'' and meet Africa's 2063 Agenda, countries need increased FDI inflows and export growth. Accordingly, many African countries have implemented reforms to create conducive business environments to attract foreign investors. These measures include lowering legislative barriers, improving institutional frameworks and allowing complete foreign ownership of businesses. Despite these efforts, significant gaps remain in attracting FDI and boosting exports.

The nature and intensity of the relationships between FDI and economic growth can vary considerably depending on the specific context of each country. This variability is particularly pronounced in Africa, where trade costs arise from geographical, infrastructural, and institutional differences (UNCTAD, 2024).

Thus, the causal relationship and impact of FDI on growth appear to be country specific, highlighting the need for context-based analysis rather than relying on generalized conclusions for policy making. Changes in globalization, technological advancements and shifts in economic policies may further influence these relationships over time. Understanding the effect of FDI inflows on growth in landlocked and coastal African countries is crucial for several reasons. First it can inform investment to strengthening institutions, infrastructure and human capital development. Second, it enables policymakers to tailor strategies that effectively attract FDI, which is essential for growth, particularly in landlocked nations that face unique trade, logistics and access to international markets challenges.

Landlocked African countries, in particular encounter significant challenges in attracting FDI compared to their coastal counterparts. These challenges include limited access to international markets, higher transportation and logistics costs, and often inadequate infrastructure, which hinder their competitiveness in the global economy (UNCTAD, 2020). In 2023, average growth in landlocked African countries was 2.8%, while coastal countries average 3.2% (World Bank, 2024). Costal countries benefit from better connectivity and more favourable investment climates, which enhance their competitiveness in attracting FDI and contributing to strong growth (OECD, 2019).

Despite the importance of geography in shaping the FDI-growth nexus, there is a lack of comprehensive empirical studies examining this relationship in Africa particularly from a comparative perspective between landlocked and coastal countries. This absence limits our understanding of the nuanced dynamics shaping the FDI-growth nexus, hindering targeted policy formulation. The findings of this study provide updated empirical analyses that account for the evolving global economic landscape, offering a more robust understanding of these relationships.

Furthermore, the existing empirical studies have several limitations; first, most research focused on the Eurozone, Asia, and Latin America, with relatively few African-based studies. Evidence for African countries frequently restricted to single-country analyses or extensive panels that don't adequately address the critical role of seaports for landlocked nations. Second, many studies rely on bivariate or trivariate Granger causality analyses, which are unable to address endogeneity problems associated with omitted variable bias (Maziarz, 2015). Therefore, the introduction of additional relevant factors that affects both inflows of FDI and growth may not only alter the magnitude of effect but also the direction of the observed causality. Therefore, the study employed Panel ARDL model PMG estimation approach to address the limitations of previous studies and provide a more comprehensive understanding of the FDI inflow and economic growth nexus in the African context.

Therefore, the study aims to investigate the causal relationship between FDI and growth in both landlocked and coastal countries in Africa, highlighting the differential impacts of FDI in these distinct geographical contexts. By examining the causal relationship, the study seeks to offer valuable policy insights that can guide investment strategies, infrastructure development and trade agreements tailored to each country's needs. The findings can assist foreign investors in making informed decisions regarding resource allocation, and address regional disparities, fostering balanced development and reducing inequality. Ultimately, this research can contribute to enhancing global competitiveness by identifying best practices for attracting FDI, enriching the theoretical understanding of investment dynamics in developing regions, and offering practical implication for policymakers across the continent.

2. THEORETICAL FRAMEWORK

Different theoretical explanations exist on the causal relationship of FDI and economic growth. Here are some prominent theories; the neoclassical growth theory, Endogenous growth theory, Growth-led FDI hypothesis and Crowding-Out theory.

Neoclassical growth theory posits that ‘‘FDI can enhance economic growth by increasing capital stock and productivity within a host country in the short-run, while acknowledging that long-term growth is ultimately determined by exogenous technological progress’’ (Solow, 1956). According to this framework, FDI inflows contribute to capital accumulation, facilitating infrastructure investment and production capabilities that bolster economic activity. Furthermore, through introduction of advanced technologies it improves competitiveness in export, leading to higher productivity and increased local export capacities. However, the theory also emphasizes diminishing returns to capital and suggests that the growth effect of FDI may be limited over time.

While endogenous growth theory, which serves as the foundation for this study, argues that economic growth is driven by internal factors such as innovation, human capital development, and knowledge spillovers ((Lucas, 1988) and (Romer, 1986)). FDI plays a crucial role in this process by enhancing human capital through training and skill development, which ultimately boosts workforce productivity and competitiveness in international markets. Furthermore, multinational enterprises often introduce new technologies and practices creating positive spillovers that benefit local firms and foster an environment of continuous innovation.
The basic production function,

$$\boldsymbol{Y = AL^{\alpha}K^{\beta}} \tag{1}$$

Y: Output, A: Total factor productivity, K: physical capital, L: Labor, α: Labor share of output and β: capital share of output.
Capital accumulation,

$$\frac{dK}{dt} = I - \boldsymbol{\delta K} \tag{2}$$

I: Investment including FDI and δ: Depreciation

Conversely, the growth-led FDI hypothesis indicates that robust economic growth can attract further FDI by signalling favourable market conditions and opportunities, this reciprocal relationship creates a feedback loop where economic growth attracts FDI, which in turn contributes to enhanced export capabilities and further economic growth(Journal et al., 2016).

However, the Crowding-Out theory warns that increased FDI could potentially displace domestic investment, leading to negative consequences for local firms and overall economic growth if foreign investors dominate local markets (Caballero & Lyons, 1992) and (Agosin & Machado, 2005). Thus, while FDI presents opportunities for growth and development, it is essential to consider its complex interaction with domestic industries and the potential trade-offs involved.

2.1 Empirical Review Literature

The causal relationship of FDI inflows and economic growth has widely researched, yet there is no consensus among various studies due to variations in time periods, characteristics of countries and econometric methodologies. researchers like, Sadekin (2025) studied the effect of tourism and FDI on Bangladesh’s economy and revealed the positive effect of FDI on economic growth, (Okoh, 2024), which explored the effect of institutional quality and FDI on sustainable growth in emerging country in Africa, the result of the study revealed positive long-run relationship between economic growth and FDI. Further, (Kristofano & Febriani, 2024), and (Asafo-Agyei & Kodongo, 2022) highlighted similar positive effect of FDI in 48 SSA countries. Moreover, Joo & Shawl (2023) on BRICS countries and Yimer (2023), applying CCE estimation procedure in African countries, further confirmed a beneficial impact of FDI on economic growth in long and short run. Wondimu (2023) also confirmed this effect of FDI in Ethiopia’s economic growth, while Khan et al. (2023) demonstrated that FDI has strong effect in driving economic growth in BRIC nations compared to non BRIC countries. Similarly studies by; Bilas & Franc (2022) in new EU members states, Ayenew (2022) in 22 SSA countries also confirmed the positive long run effect of FDI on economic growth.

Conversely many studies suggested that it is economic growth that drives FDI inflows to a country, for instance, Ghazalian (2024), Kalu (2024), Alharthi et al. (2024), Khan et al. (2023) and Rahman & Alam (2021) studies indicated significant positive impact of economic growth on FDI inflows. Despite of these findings, researchers found bidirectional causality relationship of FDI and economic growth, (Otieno & Aduba, 2022), (Acquah & Ibrahim, 2020) for Africa, (Sunde, 2023), (Bouchrika & Bardi, 2025) and (Wang et al., 2022) Nupehewa et al.(2022) analysed across seven regions with 117 countries, (Banday et al., 2021) for BRICS countries respectively.

However, some studies found no causal relationships of FDI inflows and economic growth. Siddikee & Rahman (2021) examined the effect of FDI, FD, capital formation, and labour forces Bangladesh's economic growth, and reported insignificant impact of FDI on economic growth in both short and long run, while (Ali & Mingque, 2018) noted absence of short-run causal relationship between FDI and economic growth in Bangladesh, Malaysia, India, and Indonesia. Further, investigated the links between FDI, and economic growth in, their results demonstrated no causality relationship between FDI and economic growth, suggesting that FDI does not directly drive economic growth (Arthur & Addai, 2022), (Yimer, 2023), and (Ali & Mingque, 2018).

In summary, the recent empirical literature provides mixed evidence on the causal relationship of FDI inflow and economic growth. These mixed findings highlight the importance of country-specific characteristics and the need for contextual analysis when examining the FDI-growth nexus. Furthermore, comparative analysis focusing on the distinctions between landlocked and Coastal countries is notably rare. This necessitates further research using up-to-date data and sound methodology, and it inspired the researchers to look into the connection of FDI and economic growth while taking into account the unique features of landlocked and coastal African nations.

3. THE STUDY METHODOLOGY

3.1 Types and Sources of Data

The study utilized balanced panel data of net inflow of FDI, mean years of schooling (Human capital), political stability and absence of violence/terrorism, trade openness, official exchange rate and real GDP from two panels of 10 landlocked and 24 Coastal African counties during 1996-2023. Countries are selected based on the availability of data (see Table 1). The main source of the data is from the World Bank and UNCTAD databases.

Table: -1 List of Coastal and landlocked countries

S. N	Landlocked Africa	Coastal Africa		
1	Niger	Benin	Algeria	Tunisia
2	Central African Republic	Egypt	Gabon	Namibia
3	Mali	Ghana	Gambia	Sierra Leone
4	Burkina Faso	Kenya	Morocco	Congo-Brazzaville
5	Rwanda	Tanzania	Madagascar	
6	Chad	South Africa	Mauritania	
7	Uganda	Cote d'Ivoire	Mauritius	
8	Botswana	Cameroon	Sudan	
9	Burundi	Congo Republic	Senegal	
10	Zambia	Comoros	Togo	

3.2 Methods of Data Analysis

In this study we employed a panel ARDL model PMG estimation technique for the data analysis. The data covering from 1996 to 2023, was encoded, categorized and transformed into suitable statistical formats. A comprehensive descriptive analysis was conducted and outlier values for FDI were addressed using the moving average method, while mean imputation techniques were applied to handle missing data. The analysis includes cross-sectional dependency (CD), panel unit root, optimal lag selection, co-integration, panel causality and slop homogeneity tests, all performed using STATA version 17.

3.2.1 Cross-sectional Dependency test

We utilized Pesaran's test to check a null hypothesis of cross-sectional independence against the presence of cross-sectional dependence (CD) and the null hypothesis is rejected when p-value is less than 5% (Pesaran, 2004).

3.2.2 Panel unit root test

Based on the results of CD test, we employed second generation unit root tests, specifically the cross-sectionally Augmented IPS et al. (2003) (CIPS) and the cross-sectional Augmented Dickey-Fuller (CADF) tests, as recommended by Pesaran, the null hypothesis for CADF posits that the series exhibits non stationarity, the alternative hypothesis suggests that the series is stationary when the p-value is less than 0.05 (Pesaran, 2007). While CIPS is calculated as the average of the individual CADF statistics across N countries and T time period (Im et al., 2003).

3.2.3 Optimal Lag selection

After the panel root test has carried out, the next step is that appropriate lag length for the panel models is selected using information criteria, such as the modified Bayesian information criterion (MBCI), Akaike information criterion (MAIC) and Quasi information criterion (MQIC) (Akaike, 1974; Schwarz, 1978; Quasi, 2001).

3.2.4 Panel co-integration test

Based on the results of root tests, the analysis continues to explore the long-run co-integrating relationships among the variables. In this study Pedroni and Kao residual co-integration tests were employed, the null hypothesis states that there is no long-run co-integration among the variables, while the alternative hypothesis

asserts that long-run co-integration exists when the p-value is less than 0.05 (Pedroni, 1999 and 2004) and (Kao, 1999).

3.2.5 Panel causality test

Granger causality test is used to examine the existence of causality. Specifically, we applied the panel Granger non causality test for heterogeneous panel developed by (Juodis et al., 2021).

$$Yit = \alpha_i + \delta_{it} + \beta_{1i}X_{1i,t} + \beta_{2i}X_{2i,t} + \cdots + \beta_{Mi}X_{Mi,t} + \varepsilon_{1i,t} \quad (3)$$

For t = 1…, T; i = 1…, N; m = 1…, M

The null hypothesis is that $X_{i,t}$ dose not Granger cause $Y_{i,t}$ for all i, whereas the alternative hypothesis is $X_{i,t}$ dose Granger causes $Y_{i,t}$ for some i.

3.2.6 Slope Homogeneity test

To examine slope homogeneity, we applied Swamy's (1970) test which utilize ‘‘Delta’’ statistics. The null hypothesis of homogenous slope coefficient is rejected if P-value < 0.05, indicating heterogeneous co-integration coefficients. Additionally, we assessed heteroscedasticity and autocorrelation consistency (HAC) using option proposed by Pesaran and Yamagata (2008), an extension of Swamy’s test that assumes homoscedastic and non-auto-correlated error terms.

3.3 Analytical models and its specification

The FDI-growth studies start from the Cobb–Douglas (1928) production function as a theoretical framework (because it links capital, labor, and technology to output) (Douglas, 1976). The Cobb-Douglas (CD) function expresses the relationship among inputs; labor (L), capital (K) and total output/ real GDP (Y) as

$$\boldsymbol{Y = AL^{\alpha}K^{\beta}} \quad (4)$$

Where, **A** represents total factor productivity, **α** refers to output elasticity of labor and **β** is output elasticity of capital. The logarithmic transformation becomes

$$\boldsymbol{lnY = lnA + \alpha ln(L) + \beta \ln(K)} \quad (5)$$

Building on Romer's (1990) endogenous growth model, which links productivity to advancements in human and physical capital, the augmented Solow-Swan model is expressed as, $\boldsymbol{Y = f(L, K, Hc, A)}$ (6)

Modifying this based on Barro (1991), Romer (1990) and Mankiw et al. (1992). The model becomes,

$$\boldsymbol{Y = f\big(Hc, FDI, C(t)\big)} \quad (7)$$

In the equation, $\mathbf{H_c}$ represent human capital measured by mean years of schooling (MYS), **FDI** denotes net inflows of foreign direct investment and $\mathbf{C_{(t)}}$ stands for control variables such as political stability, Exchange rate and trade Openness. This equation can be expressed in logarithmic form to facilitate the analysis of each variable’s contribution to economic growth.

$$\boldsymbol{ln(GDP) = ln(FDI) + ln(Hc) + \ln(Ct)} \quad (8)$$

3.3.1 Panel Autoregressive distributive lag (P-ARDL) Model

In this study, the Panel ARDL model using PMG estimation technique was employed to investigate the differential impact of FDI on growth between landlocked and coastal countries in Africa. This method is advantageous as it effectively handles variables integrated at I(0) or I(1) or mutually co-integrated (Pesaran et al., 1999) and (Pesaran et al., 2001). PMG approach pools data across cross-sectional units to estimate stable long-run relationship while allowing for varying short-term adjustments. The PMG estimator allows for country heterogeneity in error variances, the short-run coefficients, together with the intercepts, and the speed of adjustment to the long-run equilibrium values with a proposal of homogenous long-run slope coefficients across countries (Loayza & Rancière, 2016). It is particularly suitable when the time period T is large relative to the number of cross-sectional units N (Pesaran et al., 1999). Further, the dataset doesn’t need to be normally distributed in order to use PMG estimator, because the assumption pertains to the error terms of the model. The

PMG estimator is implemented using Maximum Likelihood (ML) estimation, which assumes normality of error terms not about the data, in practice this is Quasi-Maximum Likelihood (QML) estimation, this implies that the estimator can still generate consistent parameter estimates even if the errors are not normally distributed (Pek et al., 2018). Moreover, the approach provides reliable and efficient estimators by addressing endogeneity issues through incorporation of lagged values for both endogenous and exogenous variables (Attiaoui et al., 2017). Despite of these, to test whether there is any significant difference between the PMG and MG estimation Hausman (1978) test is utilized.

$$(\Delta \boldsymbol{Y_{it}}) = \alpha i + \sum_{\mathbf{j=1}}^{\mathbf{p}} \boldsymbol{\delta_j}\left(Y_{i,t-j}\right) + \sum_{\mathbf{k=1}}^{\mathbf{q}} \boldsymbol{\beta'_k}\left(\mathbf{X_{i,t-1}}\right) + \varepsilon it \quad (\mathbf{9})$$

$$\Delta \boldsymbol{ln(RGDP_{it})} = \boldsymbol{\alpha i} + \sum_{\mathbf{j=1}}^{\mathbf{p-1}} \boldsymbol{\delta_j} \mathbf{ln}\left(\mathbf{RGDP_{i,t-j}}\right) + \sum_{\mathbf{k=1}}^{\mathbf{q-1}} \boldsymbol{\beta_k} \mathbf{ln}\left(\mathbf{FDI_{i,t-1}}\right) + \sum_{\mathbf{m=1}}^{\mathbf{r-1}} \boldsymbol{\theta'_m} \mathbf{ln}\left(\mathbf{CV_{i,t-1}}\right) + \boldsymbol{\varepsilon it} \quad (\mathbf{10})$$

Since the variables have long run relationship to assess the contributions of each variable in the growth model, we specify the basic panel ARDL model in logarithmic form as error correction (ECM) form as.

$$\Delta\ \boldsymbol{ln(RGDP_{it})} = \boldsymbol{\alpha_i} + \sum_{j=1}^{p-1} \boldsymbol{\delta_j} \Delta \boldsymbol{ln}\left(\boldsymbol{RGDP_{i,t-1}}\right) + \sum_{k=0}^{q-1} \boldsymbol{\beta_k} \Delta \boldsymbol{ln}\left(\boldsymbol{FDI_{i,t-1}}\right) + \sum_{m=0}^{r-1} \boldsymbol{\theta'_m} \Delta \boldsymbol{ln}\left(\boldsymbol{CV_{i,t-1}}\right) + \boldsymbol{\gamma}\left(\boldsymbol{ECT_{i,t-1}}\right) + \boldsymbol{\varepsilon_{it}} \quad \mathbf{(11)}$$

The long-run equilibrium relationship becomes,

$$\left(\boldsymbol{ECT_{i,t-1}}\right) = \mathrm{RGDP}_{i,t-1} - \left[\rho_0 + \rho_1 \sum_{k=1}^{q-1} \beta_k ln\left(FDI_{i,t-1}\right) + \rho_2 \sum_{m=1}^{r-1} \theta'_m ln\left(CV_{i,t-1}\right)\right] \quad \mathbf{(12)}$$

Where,$\Delta \ln(RGDP_{it})$, $\Delta ln\left(FDI_{i,t}\right)$ and $\Delta ln\left(CV_{i,t}\right)$ are a change in natural logarithm of real GDP, FDI and control variables (TOP, EXCH, MYS, and PS) for a country i at time t respectively. $ln\left(RGDP_{i,t-1}\right)$, $ln\left(FDI_{i,t-1}\right)$ and $ln\left(CV_{i,t-1}\right)$ are natural logarithm of lagged values of real GDP, FDI and control variables for a country i at time t. α_i is country specific fixed effect to capture unobserved heterogeneity, δ_j, β_k, θ'_m are short run coefficients, while ρ_1, ρ_2 are long run coefficients, ρ_0 is constant term for long run coefficients and γ is the coefficient of speed of adjustment to the long-run equilibrium.

Based on the endogenous growth theory, Yeboah (2024) and Joo & Shawl (2023) the following three null hypotheses are postulated in this research.

H1: FDI inflows positively affect economic growth in both landlocked and coastal countries.
H2: FDI inflows cause economic growth in both landlocked and coastal countries and vice versa.
H3: FDI results in higher economic growth in costal countries than landlocked countries.

3.4 Definition and measurement of Variables

In the next section, we describe concept and measurement of dependent and independent variables. A natural logarithm transformation of the continuous variables is applied to make the results easier to interpret.

Real Gross Domestic Product: refers to the inflation-adjusted value of all goods and services produced in a country, data are in constant 2015 prices, expressed in U.S. dollars (World Bank, 2025).

Net FDI inflow: it refers to the total value of investments made by foreign entities in a country's economy, minus the value of investments withdrawn by those entities over a specific period. It is measured by millions of USD (World Bank, 2025). To address negative observations, such as Chad's -675.55 in 2014 we adjusted all values by adding 675.55 and 1 for consistence, while transforming the ARDL model to logarithmic form. Additionally, South Africa's 2021 value of 40,215.1 was considered an outlier and replaced using a three-year moving average.

Human Capital (mean years of schooling): is the average number of completed years of education of a population, is a widely used measure of a country's stock of human capital (UNDP, 2025). Previous empirical studies found that MYS affects RGDP growth positively (Khan et al., 2023), thus the expected sign is positive.

Trade Openness (TOP): It is the measure of a country's integration in to the global economy and expressed as the ratio of sum of exports and imports to gross domestic product (GDP) of a country (World Bank, 2025). Some empirical studies found that trade openness affects economic growth positively Monyela & Saba (2024),

Banday et al. (2021) and other studies report it has a negative effect on growth (Yeboah et al., 2025a). Thus, the expected sign of is mixed, and hence prior indeterminate.

Official exchange rate: it the exchange rate determined by national authorities. It is calculated as an average based on monthly averages (local currency units relative to the U.S. dollar (World Bank, 2025). Some empirical studies found that exchange rate affects real GDP growth positively (Ridhwan et al., 2024; Warnes, 2022) and, while other argue the opposite (Fofanah, 2022; Okoh, 2024). Thus, the expected sign is mixed, and hence prior indeterminate.

Political Stability and Absence of Violence/Terrorism: It is measured using World Bank's worldwide governance indicators (WGI) which ranges from -2.5 to 2.5 where 2.5 indicates strong stability, 0 represents moderate stability and -2.5 represents high instability (World Bank, 2025). Some empirical studies found that it affects growth positively (Alim et al., 2024), (Hussain & Shah, 2022) and (Uddin et al., 2017) and this study expects stability enhances economic growth.

4. Results and Discussion

4.1 Descriptive Statistics of Variables

There is a significant difference in real GDP between coastal and landlocked African countries (See Table 2). Over the period 1996 to 2023, the average real GDP for coastal African countries was 49.4 billion, compared to $10.0.3 billion for landlocked countries. The maximum real GDP observed was $471 billion for Egypt during 2023 among coastal countries, whereas, Uganda reached a maximum of $46.5 billion in the same year for landlocked panel. On the other hand, the minimum real GDP were $0.54 billion for Comoros in 1996 among coastal countries and $1.5 billion for Central Africa republic in 1996 for landlocked countries.

The analysis of FDI reveals a significant difference between landlocked and coastal nations. The average for coastal nations was $1,041.83 million, while for landlocked nations was $312.63 million. The net FDI inflows are more volatile in coastal countries although these countries receive highest net inflows. The highest FDI was $40,215 million in South Africa during 2021 in coastal nations, whereas Uganda received a maximum of $2,952.94 million during 2022 in landlocked nations. The minimum net FDI was -$584.5 million for Algeria during 2015 among coastal nations and -$675.54 million for Chad in 2014 within landlocked nations.

Furthermore, the analyses for mean years of schooling, trade openness, exchange rate and political stability reveals notable differences between coastal and landlocked African countries. For coastal countries the average 5.5 years schooling, significantly higher than the 3.6 average of landlocked countries. In terms of openness of trade coastal countries also outperform with average of 66.36 compared to 53.78 for landlocked countries. However, landlocked countries exhibit a higher average exchange rate of 716.31 as compared to 385.5 of coastal average. Politically, coastal countries have a stability score of -0.36, which is better than the -0.76 observed in landlocked countries. In general, coastal countries tend to excel in educational attainment, openness in trade, political stability, while landlocked countries show higher exchange rates.

Table: -2 Summary of Descriptive statistics

Variables	Coastal Countries				Landlocked Countries			
	Mean	Maximum	Minimum	SD	Mean	Maximum	Minimum	SD
Real GDP	49.4	470.9	0.54	83.9	10.03	46.5	1.5	8.15
Net FDI inflow	1,041.8	40,215.1	-584.5	2,241.8	312.63	2952.94	-675.54	439.4
Human capital	5.5	11.61	1.38	2	3.6	10.42	1	2.4
Trade openness	66.36	156.9	24	25.25	53.78	126.35	20.96	21.8
Official exchange rate	385.55	4429.6	0.16	596	716.31	3727.1	1.21	745.5
Political stability	-0.36	1.22	-2.85	0.72	-0.76	1.1	-2.73	0.94
Observation	**672**				**280**			

4.1.1 Pair-wise Correlations of ARDL Model

The pair-wise correlation analysis shows that the highest correlation coefficient between independent variables was 0.69, which was below 0.7, indicating that multicollinearity is not an issue. Correlation coefficients more than 0.70 results in biased standard errors and test statistic (Ratner, 2009). For coastal countries, FDI and Human capital positively correlate with real GDP, while, Political stability and Official exchange rate negatively correlate with real GDP. For landlocked countries, FDI, Human capital, Trade openness and Political stability positively correlate with real GDP, whereas Official exchange rate negatively correlates with real GDP (see table 3).

Table 3: Pair-wise Correlations result

	(1)	(2)	(3)	(4)	(5)	(6)
Coastal African Panel						
ln_real GDP (1)	1.0000					
Ln_Net FDI inflow (2)	0.69*	1.0000				
ln_Human capital (3)	0.46*	0.46*	1.0000			
ln_Trade openness (4)	-0.12*	-0.00	0.31*	1.0000		
ln_Official exchange rate (5)	-0.19*	-0.22*	-0.19*	-0.22*	1.0000	
Political stability (6)	-0.38*	-0.20*	-0.07	0.29*	-0.16*	1.0000

Landlocked African Panel						
ln_real GDP (1)	1.0000					
Ln_Net FDI inflow (2)	0.42*	1.0000				
ln_Human capital (3)	0.34*	0.19*	1.0000			
ln_Trade openness (4)	0.44*	0.12*	0.37*	1.0000		
ln_Official exchange rate (5)	-0.21*	-0.08	-0.56*	0.61*	1.0000	
Political stability (6)	0.39*	0.14*	0.41*	0.41*	-0.61*	1.0000

Note: * denote statistical significance at the 5 % level.

4.2 Empirical Analysis

4.2.1 Cross-sectional dependence (CD) test

The test for CD confirmed the presence of cross-sectional dependency as the null hypothesis of cross-sectional independency was rejected at less than 1% significance level (see table 4). Hence robust econometric techniques are required to handle cross-sectional dependency because it reveals strong cross-country interdependence. In order to accommodate both slope intercept heterogeneity and uniformity in the long run, we employed the PMG approach, which allows differentiation of short-term parameters between groups while maintaining equal long-term coefficients.

Table: - 4 Cross-sectional Dependency test results

Variables	Coastal Countries		Landlocked Countries	
	CD test statistic	P-value	CD test statistic	P-value
Real GDP	83.29	0.000	31.07	0.000
Net FDI inflow	36.69	0.000	8.96	0.000
Human capital	40.21	0.000	10.42	0.000
Trade openness	12.66	0.000	6.74	0.000
Official exchange rate	38.21	0.000	15.31	0.000
Political stability	-1.36	0.174	-2.35	0.019

4.2.2 Panel Unit root (Stationarity) test results

On the basis of the panel unit root test results, net FDI inflow and Political stability are stationary at level I (0) and the data series real GDP, Human capital, Trade openness and Official exchange rate were found to be stationary at the first difference, I (1) for coastal panel. Similarly, FDI is stationary at level I (0) and real GDP, Human capital, Trade openness, Official exchange rate and Political stability were found to be stationary at the first difference, I (1) for landlocked panel. The unit root analysis results lay the foundation for conducting the co-integration analysis (see table 5).

Table: -5 Panel unit root tests result

Variable	Coastal African countries				Landlocked African countries			
	CIPS		CADF		CIPS		CADF	
	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
Real GDP	-1.013	-3.03***	-1.34	-2.109**	-1.75	-4.30***	-1.58	-2.83***
Net FDI inflow	-2.65***	-5.56***	-2.01	-3.78***	-2.46**	-5.88***	-1.76	-4.00***
Human capital	-1.52	-2.27**	-1.97	-2.01*	-2.31*	-1.65	-3.67***	-1.70
Trade openness	-1.64	-5.01***	-1.44	-3.86***	-1.79	-5.21***	-1.52	-3.61***
Official exchange rate	-1.10	-3.79***	-1.39	-2.36***	-1.73	-4.10***	-1.18	-3.17***
Political stability	-3.49***	-6.13***	-1.69	-4.04***	-1.67	-5.74***	-0.88	-3.65***

Note: ***, ** and * denotes statistical significance at the 1%, 5% and 10 % levels respectively.

4.2.3 Lag selection

To determine the optimum order of lag length for this study, the MBCI, MAIC and MQIC was used. Accordingly, the optimum lag for the model was lag 1 for both panels (see table 6).

Table: -6 Lag length Selection

lag	CD	J	J P-value	MBIC	MAIC	MQIC
Coastal Countries						
1	1	184.38	6.57e-06	-497.48	-31.61	-213.64
2	1	79.77	.25	-374.8	-64.22	-185.57
3	1	41.33	.25	-185.96	-30.67	-91.35
4	1	-	-	-	-	-
Landlocked Countries						
1	1	129.56	.07	-457.75	-86.43	-236.21
2	1	79.71	0.25	-311.63	-64.28	-164.31
3	1	32.69	0.63	-163.1	-39.30	-89.23
4	1	-	-	-	-	-

4.2.4 Panel co-integration test results

The result of Pedroni (1999, 2004) and Kao (1999) co-integration tests indicated existence of long-run relationship among all variables for both panels. Both test results rejected the null hypothesis of no co-integration in favor of co-integration (see table 7 and 8).

Table: -7 Kao panel co-integration test

Panel group statistics	Coastal countries	Landlocked countries
Modified Dickey–Fuller t	-21.72***	-4.83***
Dickey–Fuller t	-17.50***	-7.77***
Augmented Dickey–Fuller t	-11.03***	-4.16***
Unadjusted modified Dickey–Fuller t	-30.31***	-21.24***
Unadjusted Dickey–Fuller t	-18.54***	-13.05***

Table: -8 Pedroni panel co-integration test

Panel Group Statistics	Coastal Africa		Landlocked Africa	
	Trend	Constant	Trend	Constant
Modified Phillips–Perron t	1.76*	1.44*	0.32	-0.77
Phillips–Perron t	-10.04***	-7.03***	-17.43***	-9.61***
Augmented Dickey–Fuller t	-9.22***	-6.84***	-10.4***	-9.12***

4.2.5 Slope Homogeneity test

The results of the slope homogeneity test (Δ) and the biased adjusted homogeneity test (Δ_adj) are presented in table 9. The result of both tests rejects the null hypothesis of slope homogeneity, indicating that the model's slope coefficients are heterogeneous, supporting the validity of using heterogeneous panel data estimation approaches. Further the heteroscedasticity and autocorrelation consistency (HAC) result confirms presence of slope heterogeneity.

Table: -9 Slope homogeneity test

Slope homogeneity test	Coastal Africa		Landlocked Africa	
	Δ statistics	P-Value	Δ statistics	P-Value
Δ	1.93	0.053	1.97	0.04
Δ_adj	2.30	0.021	2.34	0.02
ΔHCA	12.88	0.000	-1.21	0.02
ΔHCAadj	15.35	0.000	-1.45	0.048

4.2.6 Pooled Mean Group Model Estimation result

The homogeneity and cross-sectional dependency tests indicated that the two panels exhibit heterogeneity and are cross-sectionally dependent. Further the CADF and CIPS root tests revealed the variables are integrated at different order of integration. Furthermore, the Kao and Pedroni co-integration tests and the ECT confirm existence of a stable long-run relationship among the variables in both panels (see table 10). These justifies the use of the ARDL-PMG estimation approach. The ARDL model PMG estimation approach and the ECM were

run concurrently to capture the speed of adjustment when there is disequilibrium (Pesaran et al., 1999), (Pedroni, 1999b) and (Apergis and Payne 2009).

Table: -10 Pool mean group Estimation Results

Independent variables	Coastal Africa Δln_real GDP	Landlocked Africa Δln_real GDP
Results of the short-run dynamics and the error correction model (ECM)		
Δln of net FDI inflow	0.04	0.14
Δln_Human capital	-0.05	-0.05**
Δln_trade openness	0.05**	0.03
Δln_official exchange rate	-0.03	-0.02
ΔPolitical stability	0.01***	0.01*
Constant	0.40***	1.13***
ECT	-0.02***	-0.06***
Results for long run Pooled Mean Group (PMG) Estimations.		
Δln of net FDI inflow	1.44***	0.26***
Δln_Human capital	-0.36	0.16
Δln_trade openness	-0.50*	0.40***
Δln_official exchange rate	-0.83***	0.37***
ΔPolitical stability	0.33***	0.36***

4.2.7 Panel causality test result

The findings of the panel Granger causality test revealed the presence of bidirectional causal relationship between real GDP and FDI in coastal countries and one way in landlocked once (see table 11).

Table: -11 Panel Granger Causality Test results

Variable	Coastal Coefficient	Landlocked Coefficient
ln_RGDP → ln_FDI	0.26***	
ln_FDI → ln_RGDP	0.01**	-0.04***

4.3 Discussions of the findings

The analysis of the differential impact of FDI on growth in Africa, particularly landlocked versus coastal regions, using panel data from 24 coastal and 10 landlocked countries (1996 to 2023), reveals nuanced insights. Results from the PMG estimation shed light on how various factors influence economic growth in these distinct geographic contexts. Tables 10 and 11 presents PMG estimation and ECM outputs establishing long and short-run relationships as well as causation analysis between real GDP and net inflows of FDI, for both coastal and landlocked African countries.

The CD and slope homogeneity tests indicated that the dataset for both panels exhibits cross-sectional dependence and heterogeneity. In addition, the results from the CADF and CIPS unit root tests revealed the variables are integrated at different orders. Further, the pedroni, Kao co-integration tests and the ECT confirm a stable long-run relationship among the variables in both geographical contexts, hence the ARDL-PMG approach is the appropriate estimation method (Pesaran, Shin & Smith, 1999).

The ECT is significant and negative in both panels, indicating slow convergence to long-run equilibrium after a short run deviation. For coastal economies short run deviations adjust slowly as compared with land locked countries. For example, 2% and 6% of disequilibrium is corrected for costal and landlocked countries respectively each year implying that costal economies take longer to return to their long-run equilibrium after short-run disturbances.

The PMG estimation reveals that FDI has a strong long-run growth effect in coastal economies compared to landlocked countries. That is, in coastal African nations, a 1% increase in FDI inflow corresponds to a 1.44% increase in the economic growth rate, while in landlocked countries, the same increase in FDI results in only a 0.26% growth. This indicates a positive long-run relationship between FDI and growth in the two panels, aligning with findings from (Yeboah, 2024), (Joo & Shawl, 2023) and (Wondimu, 2023). However, FDI create a

1.18% growth disparity, attributed to coastal countries better access to global routes, which enhance FDI spillovers. In contrast, landlocked nations face higher trade costs and weaker infrastructure, limiting their ability to utilize FDI effectively, as highlighted in recent studies on Africa's logistics challenges (UNCTAD, 2024) and (Luwedde, 2025). Thus, FDI positively influences economic growth in both coastal and landlocked African countries, albeit with varying impacts in the long run.

Human capital negatively impacts growth in landlocked countries, with a 1% increase in human capital reduces growth by 0.05% in the short run. This suggests challenges there are challenges in effective human capital development. Systematic issues in African countries such as theory-oriented curricula which lacks competency and outcome-based education results in skill mismatch hinder educational investments translating into immediate productivity gain. Overall despite improvements in human capital, these educational advancements may not lead to immediate economic growth (Rahman & Alam, 2021).

The PMG estimation reveals that openness in trade positively impacts economic growth in landlocked countries, a 1% increase in openness boosts growth by 0.4%, however reduces growth by 0.5% in the long-run despite is significant at 10% level. This aligns with findings from (Banday et al., 2021). While in the short-run, trade openness has a positive effect in coastal nations, with a 1% increase leading to a 0.05% rise in economic growth, this finding also aligns with (Yeboah et al., 2025b).

Further, the result reveals that depreciation of official exchange rate boosts growth in landlocked countries, a 1% rise increases growth by 0.37% but negatively affects coastal economies by -0.83% in the long-run. The result is consistent with findings of (Fofanah, 2022), Sabina et al. (2017) and Agbo et al. (2022) for coastal countries and (Okoh, 2024), (Ridhwan et al., 2024) and (Warnes, 2022), Nwakarame & Awogbemi (2024) for the landlocked countries.

Finaly, the result showed that, political stability has a positive and significant impact on economic growth in both landlocked and coastal African countries, in the long run and short run, a unit increase in stability boosts growth by 0.36% in landlocked countries, while its effect is 0.33% in coastal countries. Similarly In the short-run, a 1-unit improvement in stability leads to a 0.01% increase in growth in both regional panels. These findings align with those of (Alim et al., 2024), (Hussain & Shah, 2022) and (Nurwahyudi et al., 2025), reinforcing the critical role of governance in creating a conducive environment for both FDI and real GDP.

Regarding the causality analysis there is a unidirectional causality from FDI to real GDP, indicating that FDI may not effectively translate into economic growth in the short run, potentially even leading to a decline in real GDP in landlocked countries. This finding aligns with (Ahmed et al., 2025) and (Arthur et al., 2024). However, in coastal countries exhibit bidirectional causality, suggesting a reinforcing cycle, this aligns with the findings of Elimam & Alattas (2025) and Nupehewa et al. (2022), Coastal countries benefit from lower trade costs and better access to global markets, enhancing the productivity of FDI. The presence of ports facilitates the import of capital goods and the export of finished products, improving the efficiency of foreign investments. Lane & Pretes, (2020), highlight those countries with sea access experience significant benefits from FDI, a trend less evident in landlocked nations, which face higher transportation costs and logistic challenges, ultimately diminishing FDI's impact on growth.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study examined the differential short and long run impact of FDI on economic growth in coastal and landlocked African countries from 1996 to 2023 using the panel ARDL (PMG) estimation technique.

The empirical findings confirm a stable long run relationship among the variables in Africa despite of distinct dynamics. In coastal Africa, FDI net inflows and political stability exert a significant positive long run impact on growth, while trade openness and official exchange rate depreciation show negative impact. Whereas in landlocked countries, FDI, openness of trade, official exchange rate and political stability impact long run growth positively. Specifically, a 1% increase in FDI inflows corresponds to a growth of 1.44% in coastal countries compared to only 0.26% in landlocked once, highlighting a 1.18% difference that underscores the advantages coastal countries enjoy in accessing global trade routes.

While, in the short run trade openness impact positively coastal countries growth, whereas political stability impact growth positively in both geographical contexts. However, human capital negatively affects growth in landlocked countries. The Granger causality test further reveal a positive bidirectional causality between growth and FDI in coastal countries indicating a reinforcing cycle, but a negative unidirectional from FDI to growth in landlocked countries in the short run. This disparity raises important questions regarding the adequacy of current strategies in landlocked nations.

These results carry important theoretical and policy interpretations, first they validate and extend growth theory by demonstrating the effectiveness of FDI is not uniform but is mediated strongly by geography specifically, by access to maritime trade. Coastal economies benefiting from port access and integration into global value chains, are better positioned to translate FDI into sustained growth. In contrast landlocked countries face structural constraints that dilute FDI's growth payoff, despite positive contributions from stability, openness in trade and exchange rate policies in the long run. The negative short run impact of human capital in landlocked countries suggests that education systems may not be aligned with the skill demands of foreign investors, creating a mismatch that temporarily hinders growth. The findings answer the core research question, FDI promotes economic growth in both geographical context but its magnitude, transmission channels and long and short run dynamics differ fundamentally due to institutional and geographical factors.

The finding underscores the importance of tailored economic policies that consider the geographical context when analyzing the impact of FDI on economic growth in Africa. While FDI can be a powerful driver of growth, its effectiveness depends on a variety of factors, including access to the sea, institutional quality, trade facilitation, improving educational outcome and monetary policy.

The policy implication emphasizes the need for tailored strategies to improving educational outcome, trade facilitation, strengthen regional cooperation, political stability and improve infrastructure connectivity to achieve SDG 4, 8 and 17.

Landlocked countries advocate for port access under the frameworks like United Nations convention on the Law of the sea (UNCLOS), negotiate transit agreements and invest in infrastructure to address logistical challenges while liberalizing trade. Prioritizing quality education and vocational training ensures that human capital aligns with market needs and fosters inflows of FDI in sectors adaptable to geographic constraints. Maintaining competitive exchange rate and political stability are also crucial to achieve sustainable growth.

Coastal countries invest in port and logistic infrastructure to lower trade costs, improve education to labor market alignment, evaluate trade agreements, leverage short term trade benefits and stabilize exchange rates and prioritize political stability to harness inflows of FDI for sustain development. Therefore, implementing these strategies both landlocked and coastal African countries can leverage FDI for sustainable economic growth, contributing to the broader goals of SDGs 4, 8 and 17.

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There is no conflict of interest.

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