

Review

Exploring the Dynamic Link Between Trade Openness, External Debt, and Economic Growth in Sub-Saharan Africa: Challenges and Considerations

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Abstract: This study investigates the dynamic relationship between trade openness, external debt, and economic growth in Sub-Saharan Africa, focusing on the period from 1990 to 2023. The research examines how trade openness and external debt impact regional economic performance by employing Panel Autoregressive distributed lag (ARDL) techniques utilizing the pool mean group and mean group estimator's approach. The analysis reveals that while trade openness does not stimulate economic growth, external debt similarly has significant challenges, often hindering long-term development prospects within Sub-Saharan African countries. The findings underscore the importance of managing debt sustainably and aligning trade policies with growth-enhancing strategies. Additionally, human capital and institutional quality are essential endogenous growth factors that significantly influence economic growth in Sub-Saharan Africa. The study recommends that while trade openness alone may not directly drive economic growth, its benefits can be amplified by complementary strategies such as investing in human capital, technological adoption, and industrial policy. The study concludes with policy recommendations to enhance economic resilience and foster sustainable growth, such as attracting foreign direct investment, combined with infrastructure development and sound fiscal management.



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1. Introduction

Sustainable economic growth is a significant concern for all economies, especially developing countries in Sub-Saharan Africa (SSA). Due to the limited resources available, these economies rely heavily on external capital, such as concessionary loans, foreign direct investments (FDIs), remittances, and cross-border interbank borrowing to fund essential projects within the country (Kiss 2022). While this external capital is vital, it contributes to the rising external debt burdens (Onafowora and Owoye 2019). A high level of external debt can negatively affect a country's fiscal health and economic growth (Manasseh et al. 2022). This issue is particularly acute in SSA; as external debt increases, allocating resources to productive investments is constrained, limiting economic growth opportunities. The trade-to-GDP ratio, which is a crucial measure of trade openness adopted by many researchers (Bleaney and Tian 2023; Durongkavoroj 2024; Fujii 2019; Jun et al. 2020; Malefane 2020; Ramzan et al. 2019), reflects how an economy engages in international trade relative to its economic output. A high trade openness enhances economic growth by integrating the economy into the global market, but it can also exacerbate vulnerabilities if accompanied by rising external debt levels (Onafowora and Owoye 2019). While trade openness can stimulate economic growth, excessive external debt can undermine these benefits by diverting resources from crucial investments. Therefore, balancing opportunities for trade and managing external debt are essential for sustainable economic growth in SSA.

SSA has long grappled with the complex interactions between trade openness, external debt, and economic growth. As emerging markets in the region seek economic growth, they encounter numerous challenges in navigating this intricate landscape. However, the potential for growth in Sub-Saharan Africa is vast, offering hope for a brighter economic future (Reinman 2015). Additionally, SSA's heavy dependence on international trade makes it vulnerable to external shocks, as evidenced by the impact of the recent COVID-19 pandemic (Obayelu et al. 2021). Following the COVID-19 pandemic, SSA has found itself in a precarious situation; the region has witnessed a significant increase in its external debt as countries scrambled to supplement their domestic revenue mobilization efforts (Sandow et al. 2022). This debt surge was a direct response to the urgent need to address the economic disruptions caused by the pandemic, leading to increased borrowing to support public spending and economic recovery (Sandow et al. 2022; Sennoga and Balma 2022). As the external debt increased, SSA faced the daunting task of balancing the increased financial demands with efforts to enhance revenue collection. For instance, as of 2018, SSA countries commercial debt comprised about 70% of the USD 55 trillion in developed countries; this includes 12% of the multilateral debt from China alone (Agou et al. 2019). Furthermore, in recent years, SSA has struggled with rising debt, with around 60% of its external debt classified as commercial and non-concessional, primarily sourced from private lenders by 2023 (World Bank 2023).

However, despite these challenges, SSA has shown remarkable resilience with economic development in the region (Joseph et al. 2024). This resilience is a testament to the region's potential for growth. For instance, Rwanda has transformed its economy through infrastructural development, robust governance, and a focus on ICT and tourism, achieving steady economic growth even after the genocide in 1994 (Adeola and Evans 2020; Aubert 2018). Ivory Coast has rebounded to become one of Africa's fastest-growing economies by capitalizing on its agricultural sector despite its history of political conflict (Tetzlaff 2022). Ghana's stable democratic governance and prudent management of natural resources have fostered a conducive environment for sustained economic growth (Towah 2019). Similarly, Kenya, known as the "Silicon Savannah", has leveraged innovation in the technology and financial sector, mainly through mobile money (M-PESA), to drive economic resilience and diversification (Bramann 2017).

Most international institutions and donor governments frequently advocate for trade liberalization policies in developing countries, aiming to integrate these economies into the global market (Hoekman 2002; Keho 2017; Siddiqui 2015). This approach unlocks various anticipated benefits, including increased market access, accelerated economic growth, and enhanced competition. By reducing trade barriers and promoting open markets, these benefits stimulate investment, foster technological advancements, and boost exports (Harrison and Rodríguez-Clare 2010). The overarching objective of trade liberalization aims to create a more dynamic and competitive economic environment that facilitates sustainable development and improves the prosperity of developing countries. Olaoye (2023) stated that despite the expectation that an increase in external debt would improve public investment, spur growth, and enhance critical infrastructure, ultimately eradicating extreme poverty in SSA, the reality has been different as the rise in public debt across the region has exacerbated unemployment and poverty while public infrastructure and health systems remain low.

A large strand of the literature relating to international trade opines that trade openness is crucial for promoting economic growth and increasing income levels in developed and developing countries (Herzer 2013; López 2005; Sakyi et al. 2015). However, there remains an ongoing debate about the extent of these positive effects, particularly concerning developing countries. Other theoretical evidence (Lucas 1988; Redding 1999; Sarkar 2008; Young 1991) reveals that trade openness does not positively influence economic growth. These authors further stated that trade openness decreases countries' economic growth, concentrating on dynamic comparative advantage. Balamoune-Lutz and Ndikumana (2007) suggested that more trade openness has detrimental effects on some African coun-

tries, especially low-income countries. [Keho \(2017\)](#) stated that countries with more trade openness relatively outperform countries with less trade openness. He further noted that developing economies gain much more by trading with developed countries.

Unlike previous studies, this study extends the current research on trade openness, external debt, and economic growth by making two substantial, unique contributions. Firstly, our study is the first to investigate the dynamic link among the three variables (i.e., trade openness, external debt, and economic growth) in the SSA region by accounting for the heterogeneity across countries and temporal changes in economic conditions. Our study used the panel ARDL estimation and the pooled mean group (PMG) and mean group (MG) estimators to capture the intricate relationship and causal interactions between the variables. Secondly, our study incorporates the Cobb–Douglas production function alongside endogenous growth factors (i.e., human capital and institutional quality) to explore their influence on these relationships, thereby providing a detailed understanding of the interaction effect on how these factors affect economic outcomes in the region. The remaining part of this study is structured as follows: Section 2 presents the literature review, Section 3 focuses on the materials and methods, Section 4 presents the data analysis, estimation, and discussion of the results, and Section 5 presents the conclusion and policy recommendations.

1.1. Objective of the Study

The study intends to achieve the following objectives:

- i. To investigate the dynamic relationship between trade openness, external debt, and economic growth in SSA, accounting for country-specific heterogeneity and temporal changes in economic conditions using panel ARDL;
- ii. To examine the influence of the endogenous growth factors, such as human capital and institutional quality, within the Cobb–Douglas production function framework, and analyze their interaction effects on trade openness, external debt, and economic growth in the SSA region.

1.2. Research Hypotheses

- i. A dynamic relationship exists between trade openness, external debt, and economic growth in SSA;
- ii. As endogenous growth factors within the Cobb–Douglas production function framework, i.e., human capital and institutional quality, significantly impact the relationship between trade openness, external debt, and economic growth in SSA.

2. Literature Review

2.1. Trade Openness and Economic Growth

[Steiner \(2017\)](#) defined trade openness as the ratio of exports plus imports divided by the GDP. [Alotaibi and Mishra \(2014\)](#) also defined trade openness as the sum of exports and imports normalized by GDP. Practically, trade openness occurs when a country that practices an open economy exhibits a high level of trade in its overall economic activities, having extensive interaction and interconnectedness with the global economy ([Squalli and Wilson 2011](#)). In other words, an open economy must substantially contribute to international trade by expanding markets and fostering competition.

The relationship between trade openness and economic growth has been a central topic of extensive research and debate among policymakers and economists. While some studies revealed a positive relationship between trade openness and economic growth ([Al-Shayeb and Hatemi-J 2016](#); [Çevik et al. 2019](#); [Dollar 1992](#); [Ezeani 2013](#); [Herzer 2013](#); [López 2005](#); [Malefane 2020](#); [Malefane and Odhiambo 2021](#); [Raghutla 2020](#); [Sachs et al. 1995](#); [Sakyi et al. 2015](#); [Tahir and Azid 2015](#); [Wacziarg and Welch 2008](#)), others have found negative results ([Jalil and Rauf 2021](#); [Lucas 1988](#); [Redding 1999](#); [Sarkar 2008](#); [Young 1991](#)). One of the study's perspectives argues that increased trade openness leads to high economic growth by promoting specialization, competition, knowledge, and technology transfer

(Eskelinen et al. 2002). The endogenous growth theory supports this perspective, positing that increased trade openness stimulates innovation, investment, and productivity, thereby expanding the economy (Aghion et al. 1998; Howitt 2010; Martin and Sunley 1998).

Conversely, other studies have suggested that the impact of trade openness on economic growth may be more complex and context-dependent. For instance, Rodriguez and Rodrik (2000) have criticized the methodological approach used in some studies, arguing that the positive relationship between trade openness and economic growth may be less robust than commonly claimed due to challenges in measuring trade openness and potential collinearity between trade policies and other factors (Baldwin and Mairesse 2003). Moreover, some studies have found that the impact of trade openness on economic growth can depend on the economic and institutional environment. For example, Cooray et al. (2014) argued that trade openness can be beneficial in a favorable economic and social setting but can negatively affect the economy if the overall financial environment is not conducive to reaping trade benefits. Wani (2022) examined the linkage between capital formation, trade openness, and economic growth. The result showed a negative relationship exists between capital formation, trade openness, and economic growth. Other empirical studies by Sharma and Panagiotidis (2005) and Tang (2006) stated that the relationship between trade openness and economic growth is inverse. Gabriel and David (2021) stated that trade openness does not significantly impact economic growth in low-income countries. Their study further noted that trade openness does not catalyze economic growth.

Liargovas and Skandalis (2012) stated that FDI inflows have significantly propelled economic growth, as they play a crucial role by supplying funds for domestic investment, thereby fostering capital formation in the host country (Omisakin et al. 2009). Donghui et al. (2018) examined the impact of trade openness on FDI in a selection of Asian countries (India, Iran, and Pakistan) for 31 years spanning from 1982 to 2012. The study adopted the fixed effects and pooled OLS techniques to assess the individual country, group, and time effects. Their research findings revealed that variables such as exchange rate and inflation used to proxy macroeconomic stability and GDP per capita significantly increased FDI inflow. The study concludes that a higher level of trade openness led to FDI inflows at national and global levels. This suggests that trade openness is conducive to sustained FDI over the long term.

Studies by Nannicini and Billmeier (2011); Sachs et al. (1995); Sachs and Warner (1995); and Oatley (2017) found that economies with open trade policies undergo faster growth than economies with closed trade policies. Their research indicated that trade openness to international trade fosters economic growth by encouraging competition, innovation, and the efficient allocation of resources. This conclusion has been supported by more recent studies adopting advanced econometric techniques, further validating the positive relationship between trade openness and economic growth. For instance, Frankel and Romer (2017) demonstrated through instrumental variables that trade openness provides robust evidence that trade significantly boosts income levels. Their analysis highlighted that countries engaging in international trade can achieve high income and growth rates, benefiting from technology diffusion, ideas, and economies of scale.

2.2. External Debt and Economic Growth

Just as in the case of trade openness, the relationship between external debt and economic growth has been a subject of extensive research and debate in development economics. Several empirical and theoretical studies have examined the impact of external debt on economic growth, particularly from the context of developing economies. For instance, a study by Reinhart and Rogoff (2010) examined the impact of external debt on real GDP growth across 44 countries. Their research findings revealed a weak relationship between external debt and economic growth when the debt-to-GDP ratio is below a critical threshold of 90%. However, once this threshold is surpassed, the median growth rate decreases by one percentage point, with the average growth rate significantly declining.

The study by [Daba Ayana et al. \(2023\)](#) is of significant importance, as their research, which examined the effect of external debt on economic growth in SSA using system GMM, revealed compelling insights. The study found that external debt significantly hampers economic growth in SSA countries, with the long-term effects being particularly severe. Their study recommended that government policy be geared towards productive debt use and enhancing domestic revenue sources. The findings and recommendations of [Daba Ayana et al. \(2023\)](#) are crucial for policymakers, economists, and researchers interested in African economics. [Cecchetti et al. \(2011\)](#) stated that when a country's external debt is moderate, it improves welfare and enhances economic growth. However, when the external debt level is high, it has a detrimental effect on the economy.

[Adegbite et al. \(2008\)](#) opined that a high level of external debt can constrain growth, as economies with significant debt repayment may limit their resource availability for investment and development. [Kharusi and Ada \(2018\)](#) examined the effect of government external debt on Oman's economic growth, using data from 1990 to 2015. The findings reveal that external debt negatively affects Oman's economic growth. [Kibona and Kirama \(2024\)](#) examined the causal relationship between external debt and economic growth using a sample of East African Countries (EACs) from 1988 to 2022 using GMM. Their study showed a negative impact of external debt on economic growth, indicating debt overhang, while a high inflationary rate negatively affects economic growth.

Other studies concluded a significant positive relationship exists between external debt and economic growth, emphasizing that external debt is crucial in stimulating economic growth ([Oladipo et al. 2020](#)). External debt can expand productivity, thus making external debt plausible and creative ([Farooq and Yasmin 2017](#)). Also, at a reasonable level, external debt has increased the return on investment, aggregate demand, and fostered economic growth despite rising interest rates ([Eisner and Pieper 1984](#)). External debt can encourage domestic production and enhance economic activities by providing the necessary capital to meet domestic investment needs for national projects.

It suffices to state that the relationship among trade openness, external debt, and economic growth and the various channels through which capital flows and debt affect growth differs between regions in terms of their institutional quality, macroeconomic structure, access to international markets, resilience to shocks, and political environment ([Onafowora and Owoye 2019](#)). These variations underscore the dynamics and complexities of formulating effective policies, as what may work in one region could be ineffective in another.

2.3. Theoretical Framework

The neoclassical growth theory suggests no relationship between trade openness and economic growth ([Aggarwal and Karwasra 2024](#)). This indicates that technological advancements exogenously define economic growth and suggests that interactions with other countries cannot drive long-term economic growth. Conversely, the endogenous growth theory also provides a robust theoretical foundation for empirically examining the link between trade openness and economic growth ([Aghion et al. 1998](#); [Howitt 2010](#)). According to the theory, trade openness enhances economic growth by facilitating the exchange of ideas and technological and cross-border innovations ([Nguyen and Bui 2021](#); [Sultanuzman et al. 2019](#)). Also, trade openness improves knowledge spillovers, which enhances productivity and innovation within an economy. As countries engage in international trade, they gain access to advanced technologies that drive endogenous factors such as research and development (R&D) investment and human capital development ([Rivera-Batiz and Romer 1991](#); [Wen et al. 2022](#)).

The Debt Overhang Theory posits that excessively high external debt can limit the economic growth of a country ([Dawood et al. 2024](#)). When the external debt level reaches an unsustainable level, it discourages investment and hampers economic growth ([Ayadi and Ayadi 2008](#)). This reduction in investment leads to stifling innovation, lower capital accumulation, and reduced productivity, which are critical drivers of economic growth. As

a result, the economy undergoes slow growth and even stagnation. The Debt Overhang Theory highlights a vicious cycle where high debt burdens restrict economic expansion and make it difficult for countries to generate the necessary growth to repay their debt (Krugman 1988).

3. Methodology

This section dwells on the data sample and the estimation technique utilized in testing the hypotheses and achieving the objectives of this study.

3.1. Data and Sample

Based on the peculiarity of this study, the SSA region was used because of its diverse economies, high debt level, and varying trade openness, which uniquely impact economic growth. The samples of 33 SSA countries used in this study in no particular order include the following; Sierra Leone, Nigeria, Togo, Tanzania, Uganda, Zambia, Zimbabwe, South Africa, Senegal, Rwanda, Niger, Mozambique, Mali, Malawi, Madagascar, Liberia, Lesotho, Kenya, Guinea, Ghana, Gabon, Ethiopia, Eswatini, Côte d'Ivoire, the Democratic Republic of the Congo, Chad, Central African Republic, Cameroon, Burundi, Burkina Faso, Botswana, Benin, and Angola.

3.2. Estimation Technique

Previous studies (Duodu and Baidoo 2020; Keho 2017; Yeboah et al. 2012) that examined the effects of trade openness and economic growth made use of the basic endogenous Cobb–Douglas production function in their estimation, as seen in Equation (1). Other studies that explored the other strand of this study that examined the effects of external debt and economic growth focused on using the dynamic panels involving GMM and the panel Autoregressive Distributed Lag model (ARDL) in the case of panel data analysis, while other studies made use of ARDL and ordinary least squares (OLS) techniques in the case of time series data (Ayadi and Ayadi 2008; Daba Ayana et al. 2023; Manasseh et al. 2022; Oladipo et al. 2020; Sandow et al. 2022; Tahir and Azid 2015; Wani 2022).

Therefore, this study used the extended endogenous growth model, as seen in Equation (2), because it provides a robust framework for analyzing how trade openness and external debt influence economic growth in SSA. The extended endogenous growth model transforms the traditional Cobb–Douglas function into a suitable framework that analyses the dynamics of endogenous growth, emphasizing how internal factors within an economy, such as institutional quality and human capital, drive long-term growth beyond just labor and capital inputs.

$$K(t) = \int_0^t \left[A \cdot K(s)^\alpha \cdot HC(s)^\beta \cdot L(s)^{1-\alpha-\beta} - \delta \cdot K(s) \right] ds + K(0) \quad (1)$$

$$K(t) = \int_0^t \left[A \cdot K(s)^\alpha \cdot HC(s)^\beta \cdot L(s)^{1-\alpha-\beta} \cdot TO(s)^\gamma \cdot FDI(s)^\delta \cdot IQ(s)^\epsilon \cdot ED(s)^\zeta \cdot \exp(-\eta INF(s)) - \delta \cdot K(s) \right] ds + K(0) \quad (2)$$

$TO(s)$ represents trade openness at time s and $FDI(s)$ represents foreign direct investments that potentially drive technology transfer and capital accumulation. $IQ(s)$ represents the institutional quality at time s that influences efficiency and productivity, $ED(s)$ represents the external debt at time s , and ζ represents the elasticity of output with respect to the level of external debt in SSA. $HC(s)$ represents the human capital at time s , representing the skills and knowledge level of the workforce. $INF(s)$ is the adjusting impact of inflation and $K(t)$ is the capital stock at time t , which is represented by gross domestic growth rate (GDP growth) for this study.

3.3. Unit Root Test

Table 4 shows that this study conducted the unit root test to determine whether the individual time series across different cross sections are non-stationary and exhibit unit

roots. This helps in choosing the appropriate modelling technique for the study. From Table 4, it can be seen that the variables are integrated in different orders, specifically I(0) and I(1), further satisfying the condition for a panel ARDL to be undertaken (Nkoro and Uko 2016).

3.4. Panel ARDL Model

From the context of SSA, the panel ARDL model is helpful because it allows for examining both short-term and long-term effects of trade policies and debt accumulation on economic growth across different SSA countries (Galadima et al. 2022; Zardoub 2023). By capturing the heterogeneous dynamics within SSA, the model reveals how trade openness might spur growth or how external debt may impact economic stability over time. From the panel dataset, i represents individual cross-sections (i.e., SSA country as used in this study) and t represents the time (i.e., 2000 to 2022 as used in this study); the panel ARDL (p, q) model is expressed in Equation (3).

$$\begin{aligned} \Delta Y_{it} = & \alpha_i + \sum_{j=1}^p \lambda_{ij} \Delta Y_{it-j} + \sum_{j=0}^q \beta_{1j} \Delta TO_{it-j} \\ & + \sum_{j=0}^q \beta_{2j} \Delta FDI_{it-j} \\ & + \sum_{j=0}^q \beta_{3j} \Delta IQ_{it-j} + \sum_{j=0}^q \beta_{4j} \Delta ED_{it-j} + \sum_{j=0}^q \beta_{5j} \Delta INF_{it-j} + \sum_{j=0}^q \beta_{6j} \Delta HC_{it-j} + \phi_i \cdot ECM_{it-1} + \epsilon_{it} \end{aligned} \quad (3)$$

where Y_{it} is the dependent variable (GDP) for country i at time t . TO_{it} , FDI_{it} , IQ_{it} , ED_{it} , INF_{it} , and HC_{it} are the independent variables (trade openness, foreign direct investment, institutional quality, external debt, inflation, human capital) for country i at time t . α_i is the fixed effect for cross-section i . λ_{ij} are the coefficients on the lagged differences of Y_{it} . β_{1j} , β_{2j} , β_{3j} , ..., β_{6j} are the coefficients on lagged differences of the independent variables. Δ denotes the first difference ($\Delta Y_{it} = Y_{it} - Y_{it-1}$). ECM_{it-1} is the error correction term from the long-term relationship, capturing the speed of adjustment back to equilibrium. ϕ_i is the error correction term's coefficient, representing the adjustment speed. ϵ_{it} is the error term.

3.5. Panel FMOLS Model

Kao and Chiang (2001) discovered that the limiting distributions of ordinary least squares (OLS) estimators in panel data with cointegration are normally distributed but have non-zero means, leading to potential bias. To overcome this issue, they introduced fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) estimators (Kao and Chiang 2001). These advanced techniques are designed to correct for endogeneity and serial correlation, providing more accurate and consistent estimates in panel data models that involve long-run relationships between variables. Therefore, this study adopted the FMOLS and DOLS to address endogeneity and serial correlation issues, ensuring more reliable and unbiased estimates. The panel FMOLS model estimates long-run relationships in panel data by correcting endogeneity and serial correlation (Merlin and Chen 2021; Yahyaoui and Bouchoucha 2021). The panel FMOLS model is specified in Equation (4):

$$GDP_{it} = \alpha_i + \beta_1 TO_{it} + \beta_2 FDI_{it} + \beta_3 IQ_{it} + \beta_4 ED_{it} + \beta_5 INF_{it} + \beta_6 HC_{it} + \mu_{it} \quad (4)$$

where GDP_{it} is the dependent variable for country i at time t . TO_{it} , FDI_{it} , IQ_{it} , ED_{it} , INF_{it} , and HC_{it} are the independent variables for country i at time t . α_i is the fixed effect for cross-section i . β_1 , β_2 , β_3 , β_4 , β_5 , and β_6 are the long-run coefficients to be estimated. μ_{it} is the error term. To ensure that the long-run coefficient β is consistent and unbiased, μ_{it} is adjusted to account for endogeneity and serial correlation (Focarelli 2005).

3.6. Panel DOLS Model

The panel DOLS model extends the panel FMOLS approach by incorporating leads and lags of differenced regressors to correct for serial correlation and endogeneity (Dritsaki and Dritsaki 2014). The panel DOLS model is specified in Equation (5).

$$GDP_{it} = \alpha_i + \beta_1 TO_{it} + \beta_2 FDI_{it} + \beta_3 IQ_{it} + \beta_4 ED_{it} + \beta_5 INF_{it} + \beta_6 HC_{it} + \sum_{j=-q}^q \lambda_j \Delta X_{it-j} + \mu_{it} \quad (5)$$

where GDP_{it} is the dependent variable for country i at time t . TO_{it} , FDI_{it} , IQ_{it} , ED_{it} , INF_{it} , and HC_{it} are the independent variables for country i at time t . α_i is the fixed effect for cross-section i . $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$, and β_6 are the long-run coefficients to be estimated. ΔX_{it-j} represents the first difference of the independent variables X_{it} and j indicates the leads and lags of the differenced independent variables. μ_{it} is the error term.

4. Data, Estimation and Results

Table 1 presents the description of the variables and summary statistics for the variables used for the study. This provides insights into the economic conditions across the sample countries. From Table 1, the GDP growth rate averages 4.307%, reflecting moderate economic growth across SSA but with a considerable standard deviation of 4.847, which indicates varying economic performances. The GDP growth rate ranges from −36.392% to 33.629%, indicating wide disparities in the annual economic growth rate amongst SSA countries. Trade openness (TO) shows a high mean of 60.214%, signifying SSA's high global trade integration. Ackah and Morrissey (2007) stated that despite TO being a crucial determinant of economic growth, the potential benefits for low-income countries are not guaranteed. They further opined that SSA countries adopting trade liberalization without strong complementary economic policies would result in sub-optimal policy options. Table 1 shows that foreign direct investment (FDI) inflows across SSA are unevenly distributed as they display a vast level of disparity with a mean of 3.839 and a standard deviation of 7.927. The most considerable variation in inflation (INFL), ranging from −16.86 to 557.2 (Consumer Price Index), indicates high economic instability in some SSA regions.

Table 1. Summary statistics and variable description.

Variable	Description	Unit of Measurement	Variable Type	Source	Mean	Std. Dev.	Min	Max
GDPR	Annual growth rate of GDP	Percentage (%)	Dependent	WDI	4.307	4.847	−36.392	33.629
TO	Trade to GDP ratio	Percentage (%)	Independent	WDI	60.214	37.769	0	363.732
FDI	Net inflow of FDI as % of GDP	Percentage (%)	Independent	WDI	3.839	7.927	−10.038	103.337
INFL	Consumer Price Index (Annual % change)	Percentage (%)	Independent	WDI	10.602	35.109	−16.86	557.202
HC	Human Capital	Index (0–1)	Control	WDI	68.89	9.816	46.882	89.45
IQ	Institutional Quality	Index (1–6)	Control	WDI	2.472	1.117	1	4.5
ED	External Debt Stock (% of GNI)	Percentage (%)	Independent	WDI	54.37	64.355	3.342	610.452

Source: Author's synthesis and stata output (2024). Note: WDI means world development indicator, GDPR means gross domestic product annual growth rate used to proxy economic growth, GNI means gross national income, TO means trade openness, FDI means foreign direct investment, INFL means inflation, HC means human capital, IQ means institutional quality, and ED means external debt.

From Table 2, GDP growth shows a weak correlation with trade openness, inflation, and external debt at −0.031, −0.122, and −0.155, respectively. This connotes that the three variables have minimal impact on the growth of the SSA economies, aligning with

the studies of [Jalil and Rauf \(2021\)](#) and [Reinhart and Rogoff \(2010\)](#). [Amna Intisar et al. \(2020\)](#) opined that human capital, measured by labor force participation, negatively affects Southern Asia's economic growth. This assertion does not align with the findings of this study, as it can be deduced from Table 2 that human capital positively correlates with economic growth. Trade openness negatively correlates with human capital (-0.398), suggesting that more open economies may have lower levels of human capital. This assertion aligns with the findings of [Ibrahim and Sare \(2018\)](#), who opined that the impact of trade openness on private credit is more significant than that of human capital. It has been argued that the effect of FDI on key macroeconomic variables, such as economic growth, is contingent upon a country's absorptive capacity, often measured by the development of its human capital and financial system ([Fu 2008](#); [Nguyen et al. 2009](#)). This argument is widely accepted, given that one of the primary benefits of FDI is the transfer of technology. However, the extent to which an economy can absorb these benefits determines the overall impact on domestic investment. In countries with weak absorptive capacities, such as SSA, the effect of FDI may be adverse ([Aigheyisi 2017](#)).

Table 2. Matrix of correlations.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) GDPR	1.000						
(2) TO	−0.031	1.000					
(3) FDI	0.066	−0.046	1.000				
(4) INFL	−0.122	−0.054	0.010	1.000			
(5) HC	0.082	−0.398	0.100	0.056	1.000		
(6) IQ	0.140	0.022	0.044	−0.051	0.102	1.000	
(7) ED	−0.155	−0.075	0.211	0.072	0.163	−0.218	1.000

Conversely, the impact is likely positive in developed countries and fast-growing emerging market economies, where absorptive capacities are more vital. Table 2 shows that FDI positively correlates with both human capital (0.100) and external debt (0.211), implying that countries attracting FDI also tend to have higher human capital and debt levels ([Noorbakhsh et al. 2001](#)). The correlation highlights that nations with more vital absorptive capacities, reflected in human capital development, are often more successful in leveraging FDI for economic growth, even though they also tend to carry higher debt levels. Inflation has minimal impact on other variables, with a slight negative correlation to GDP growth (-0.122). Human capital is positively linked to institutional quality (0.102) and external debt (0.163). Lastly, institutional quality negatively correlates with external debt (-0.218), indicating that stronger institutions are typically associated with lower debt levels.

It is essential to ensure that no multicollinearity amongst the independent variables exists to avoid the spuriousity of our results. [Daoud \(2017\)](#) stated that multicollinearity distorts regression estimates, making determining the individual effect of correlated independent variables difficult. This is because the violation of regression assumptions occurs when independent variables are highly correlated. As mild multicollinearity may be manageable, moderate to high levels can distort regression results. To determine the issue of multicollinearity, this study conducted the variance inflation factor (VIF) test, as seen in Table 3, to determine if multicollinearity exists among the independent variables. The result of the VIF indicates that multicollinearity is not a concern in the model. This is because all the VIF values are below the threshold of 10, which means there is a minimal correlation between the variables. The $1/\text{VIF}$ values, or tolerance levels, further support this, as variables are close to 1. A mean VIF of 1.124 confirms that multicollinearity is minimal.

Table 4 presents the results of panel unit root tests, specifically the Fisher Phillips–Perron (FPP) and Fisher Augmented Dickey–Fuller (ADF) tests, to assess the stationarity of the variables adopted in the study. Stationarity is crucial for ensuring valid econometric modelling ([Hadri 2000](#)). At the 1% level, the results show that the GDP growth rate, foreign direct investment, inflation, and external debt were stationary as their test statistics are

significant, as seen in Table 4. This indicates that the null hypothesis of a unit root is rejected for these variables, suggesting that they are stationary without differencing. However, trade openness, human capital, and institutional quality are non-stationary at the 1% level, as evidenced by their higher p -values, failing to reject the null hypothesis of a unit root. Therefore, all variables became stationary after taking the first difference, as indicated by significant test statistics at the 1% level. This shows that the non-stationary variables at the 1% level, such as trade openness, institutional quality, and human capital, achieve stationarity after conducting their first difference. Thus, a first-difference transformation is necessary for these variables to ensure valid regression modelling. Table 8 shows that a panel ARDL (PMG and MG) is undertaken to further the analysis. This is because the panel ARDL approach requires that the variables adopted in a study are integrated in different orders, specifically $I(0)$ and $I(1)$ (Nkoro and Uko 2016).

Table 3. Variance inflation factor.

Variables	VIF	1/VIF
HC	1.25	0.8
TO	1.196	0.836
ED	1.145	0.874
IQ	1.086	0.921
FDI	1.06	0.944
INFL	1.01	0.99
Mean VIF	1.124	

Table 4. Panel unit root test.

	Fisher Phillips–Perron (FPP) Test			Fisher Augmented Dickey–Fuller Test	
	Variables	Statistics	p -Value	Statistics	p -Value
level	GDPR	487.0147 ***	0.0000	219.0529 ***	0.0000
	TO	81.8984	0.0896	70.6200	0.3261
	FDI	227.7084 ***	0.0000	108.5309 ***	0.0008
	INFL	513.4009 ***	0.0000	347.4314 ***	0.0000
	HC	106.0127 ***	0.0013	79.1820	0.1280
	IQ	63.2704	0.5725	79.6426	0.1207
	ED	115.6046 ***	0.0002	95.4968 ***	0.0102
1st diff	GDPR	1537.1660 ***	0.0000	700.2364 ***	0.0000
	TO	613.0016 ***	0.0000	450.3497 ***	0.0000
	FDI	1207.0031 ***	0.0000	483.1900 ***	0.0000
	INFL	1193.0412 ***	0.0000	823.0911 ***	0.0000
	HC	399.3921 ***	0.0000	296.2913 ***	0.0000
	IQ	563.6570 ***	0.0000	246.4737 ***	0.0000
	ED	511.9979 ***	0.0000	203.9946 ***	0.0000

Note: *** indicates the null hypothesis is rejected at 1% significance level.

The Kao test for cointegration in Table 5 examines the null hypothesis (H_0) that there is no cointegration against the alternative hypothesis (H_a) that all panels are cointegrated. With 33 panels (SSA countries) and 23 periods (2000 to 2022), the test includes a panel mean and employs a Bartlett Kernel with Newey–West lags. From the various statistics in Table 5, the Modified Dickey–Fuller, Augmented Dickey–Fuller, and other statistics are highly statistically significant, with their probability values being 0.0000. The Kao test result strongly suggests that the null hypothesis should be rejected, indicating the presence of cointegration across the panels. This means that there is a long-run equilibrium and relationship between the variables.

As seen in Table 6 results of the diagnostics test, the model exhibits a moderate goodness of fit, with the R^2 and adjusted R^2 values indicating 42% and 39%, respectively, indicating that the predictors in the model explain a significant proportion of the variance

in the dependent variable. The results of the Breusch–Godfrey test results suggest that there is no significant serial correlation in the residuals. This indicates that the model errors are not correlated over time. The Breusch–Pagan test results show no substantial evidence of heteroscedasticity, implying that the error variance is consistent across observations. The normality test, as seen in Table 6, indicates that the residuals follow a normal distribution, supporting the validity of the model’s assumption.

Table 5. Kao test for cointegration.

	Statistics	p-Value
Modified Dickey–Fuller t	−19.6654	0.0000
Dickey–Fuller t	−16.2565	0.0000
Augmented Dickey–Fuller t	−10.4148	0.0000
Unadjusted modified Dickey–Fuller t	−25.8295	0.0000
Unadjusted Dickey–Fuller t	−17.1390	0.0000

Table 6. Diagnostic test.

Diagnostic Test	Statistics
R ²	0.42
Adjusted R ²	0.39
Breusch–Godfrey (serial correlation)	8.185
Breusch–Pagan test	1.551
Normality Test	0.75

As seen in Table 7, The ECM shows vital short and long-run relationships between the GDP growth and other key economic variables. The short-run results in Table 7 show that external debt and trade openness have significant negative effects. This suggests that increased trade openness and external debt hinder SSA’s economic growth, possibly due to the increased debt repayment pressure and increased competition (Ayadi and Ayadi 2008; Mbate 2013). Inflation similarly had a negative impact on economic growth, reinforcing the need for stable prices. The significant error correction term (ECT) of 0.7788 indicates that 78% of the deviations from the long-run equilibrium are corrected each year, signaling a fast return to stability after short-run shocks. From the long-run results in Table 7, foreign direct investment, human capital, and institutional quality positively contribute to GDP growth. This highlights the importance of investments in education and improving institutions and FDI to achieve sustained economic development. On the other hand, external debt and inflation have adverse long-run effects, emphasizing the importance of prudent debt management and price stability in promoting long-term economic growth across SSA (Assibey-Yeboah et al. 2016). Equations (6) and (7) show the short and long-run dynamic formula, as seen in Table 7.

$$\Delta GDP_t = \alpha_0 + \beta_1 \Delta TO_t + \beta_2 \Delta FDI_t + \beta_3 \Delta INFL_t + \beta_4 \Delta HC_t + \beta_5 \Delta IQ_t + \beta_6 \Delta ED_t + \lambda ECT_{t-1} + \varepsilon_t \quad (6)$$

$$GDP_t = \alpha_0 + \theta_1 TO_t + \theta_2 FDI_t + \theta_3 INFL_t + \theta_4 HC_t + \theta_5 IQ_t + \theta_6 ED_t + \varepsilon_t \quad (7)$$

From the results of the four empirical models in Table 8, foreign direct investment indicates a positive but weak impact across all the models, with statistical significance observed only in the DOLS model. The coefficient of 0.043 in DOLS suggests that FDI has a small but meaningful contribution to economic growth, implying that increased FDI marginally boosts economic growth. This result is consistent with other research findings (Hayat 2019; Mehic et al. 2013; Osei and Kim 2020). From Table 8, inflation is seen to have a significant adverse effect across all models. The MG, FMOLS, and DOLS models indicate that a unit increase in inflation reduces economic growth by about 0.017 to 0.019 units. This infers that higher inflation within SSA leads to an unfavorable effect on the economic performance of countries in the region. The negative findings of inflation on economic

growth relate with other research results (Adaramola and Dada 2020; Baharumshah et al. 2016; Gillman et al. 2004). Human capital positively impacts economic growth, with the MG and FMOLS models reporting significant coefficients around 0.18, suggesting that an increase in human capital substantially enhances economic growth. This underscores the importance of investing in human capital, as evidenced in other studies (Azam and Ahmed 2015; Maitra 2016). External debt indicates a consistent and statistically significant negative effect in the FMOLS and DOLS models. The coefficients suggest that rising external debt reduces economic performance, highlighting the potential risk associated with high debt levels. In contrast, institutional quality and trade openness have inconsistent and mostly insignificant effects, indicating that their influence on the dependent variable is unclear and less pronounced in this analysis.

Table 7. Error correction model (ECM).

	Estimate	Std. Error	t-Value
Short-run Dynamics			
ΔTO	−0.01918	0.003483	5.04×10^{-8} ***
ΔFDI	−0.01134	0.028332	0.689131
$\Delta INFL$	−0.01754	0.006147	0.004452 **
ΔHC	−0.29837	0.263607	0.258077
ΔIQ	−0.74252	0.361205	0.040191 *
ΔED	−0.03501	0.008091	1.74×10^{-5} ***
ECT _(t−1) (Error Correction Term)	0.778769	0.040758	$<2.20 \times 10^{-16}$ ***
Long-run Equilibrium			
TO	−0.001213	0.004948	0.80644
FDI	0.053881	0.022195	0.01526 *
INFL	−0.015475	0.004887	0.00158 **
HC	0.046436	0.017871	0.01730 **
IQ	0.370618	0.004948	0.02044 *
ED	−0.012265	0.002839	1.8×10^{-5} ***
Diagnostic Test			
R-Squared	0.42847		
Adj. R-Squared	0.39686		
F-statistic	8.19567		

Signif. Codes: '***' 0.001, '**' 0.01, '*' 0.05.

Table 8. Panel estimation using PMG, MG, FMOLS, and DOLS.

Variables	PMG	MG	FMOLS	DOLS
FDI	0.35 (0.022)	0.038 (0.026)	0.025 (0.025)	0.043 * (0.023)
INFL	−0.012 * (0.056)	−0.019 *** (.005)	−0.018 *** (0.005)	−0.017 *** (0.005)
HC	0.60 (0.486)	0.197 ** (0.076)	0.181 ** (0.075)	0.064 ** (0.026)
IQ		0.321 (0.209)	−0.13 (0.22)	0.118 (0.175)
TO		−0.002 (0.007)	0.004 (0.007)	0 (0.006)
ED	−0.060 ** (0.002)		−0.019 *** (0.003)	−0.015 *** (0.003)
_cons	−46.56 (35.13)	−9.83 * (5.52)	−6.927 (5.437)	0.432 (1.974)
Observations	759	759	759	759
R-squared	0.51	0.03	0.069	0.53

Standard errors are in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Note: PMG means pooled mean group, MG means mean group, FMOL means fully modified ordinary least squares, DOL means dynamic ordinary least squares.

5. Conclusions

Our study explored the dynamic relationship between trade openness, external debt, and economic growth in SSA from 2000 to 2022, employing panel ARDL estimation using both PMG and MG estimators. The results revealed that economic growth across SSA was influenced by various factors, with significant regional variations. Notably, our findings emphasize the positive role of FDI and human capital in driving economic growth. Contrary to these findings, [Anetor \(2020\)](#) found that FDI and human capital had no significant impact on economic growth in SSA, which diverges from our conclusion that both FDI and human capital play a crucial role. This discrepancy may stem from differences in methodology, sample period, or the inclusion of additional variables in our study, such as external debt and trade openness, which may moderate the effects of FDI and human capital. Similarly, [Karambakuwa et al. \(2020\)](#) reported an insignificant effect of human capital on economic growth, even when FDI was included as an interaction term. However, our study suggests a strong and positive relationship between human capital and economic growth, likely reflecting improvements in educational and skill development policies in SSA during the period under study, as well as the increasing emphasis on foreign investment that complements human capital formation. Conversely, [Ayenew \(2022\)](#), whose research focused on the long-run effects of FDI in SSA, aligns with our findings by showing that FDI significantly enhances economic growth. The difference in temporal scope between short- and long-term effects could explain why some earlier studies found weaker impacts. Studies by [Dankyi et al. \(2022\)](#) and [Asafo-Agyei and Kodongo \(2022\)](#) also support our findings, noting that FDI and human capital have substantial influences on economic growth. Their findings reinforce the argument that investing in human capital, particularly through education and skills training, alongside promoting FDI, is essential for sustained economic growth in SSA.

Conversely, our study opined that external debt and inflation are found to have a negative effect on economic growth in SSA, highlighting the need for stable economic policies and prudent debt management. This finding aligns with other studies ([Ali et al. 2023](#); [Dey and Tareque 2020](#); [Kharusi and Ada 2018](#); [Lopes da Veiga et al. 2016](#); [Osewe 2017](#)). The correlation and regression analyses confirm that trade openness, while high, does not directly impact economic growth significantly in the short run, suggesting that its benefits may be contingent upon complementary economic policies. The strong evidence of cointegration indicates that a long-term equilibrium relationship exists among the variables, reinforcing the importance of addressing these factors cohesively. Analyzing the effects of the Cobb–Douglas production function framework, human capital and institutional quality are essential endogenous growth factors that significantly influence economic growth in SSA. This framework further reinforces FDI and human capital as crucial drivers of long-term economic growth across SSA regions.

Based on the findings of this study, the alternative hypothesis for both hypotheses 1 and 2 will be accepted as the study confirms a dynamic relationship between trade openness, external debt, and economic growth in SSA, with external debt negatively affecting economic growth, while trade openness requires complementary policies to show significant impact (as in the case of hypothesis 1). Human capital and institutional quality, within the Cobb–Douglas framework, significantly influence the relationship between trade openness, external debt, and economic growth, with both human capital and FDI driving long-term growth positively (as in the case of hypothesis 2).

Policy Implications

The empirical findings of this study underscore several crucial policy implications for fostering economic growth across SSA. Government and policymakers across all levels should prioritize investment in education and skill acquisition to enhance human capital, which has been shown to correlate with economic growth positively. At the same time, several efforts should be put in place to attract and sustain FDI, as it has been shown to contribute significantly to economic expansion. Furthermore, addressing inflation through

stable economic policies and managing external debt prudently are essential to mitigate their adverse effect on economic growth. While trade openness may not directly boost economic growth, its effectiveness can be enhanced through complementary economic strategies such as investing in human capital and technological adoption, followed by trade openness alongside industrial policy, attracting FDI paired with infrastructural development and ensuring efficient debt management and fiscal stability.

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