


Trends and Causality between Economic Growth and Foreign Debt: A Comparative Analysis of the ARDL Approach in Ethiopia, Rwanda, and Sudan

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Abstract. Foreign debt represents a country's obligations to foreign creditors and can stimulate economic growth through facilitating investments. However, excessive debt poses risks like debt crises, debt overhang, and nation's vulnerability to external shocks. The study aims to explore trends and causality between economic growth and foreign debt in Ethiopia, Rwanda, and Sudan from 1990 to 2022. It is hypothesized that examining trends and causal relationships between foreign debt and economic growth is crucial for addressing those risks associated with debt crises and nation's vulnerability to external shocks. The study applied the ARDL approach to estimate long-term coefficients alongside a descriptive technique for trend analysis. Ethiopia had an average real GDP growth rate of 6.74 %, Rwanda 5.70 %, and Sudan 2.61 %, indicating varying GDP growth levels among the countries. Increased foreign debt adversely impacts long-term economic growth in Ethiopia, Rwanda, and Sudan. Moreover, there is a notable negative long-term connection between inflation and real GDP growth in Sudan and Rwanda, but this effect is positive in Ethiopia. Debt servicing negatively impacts Ethiopia's long-term economy, with similar but statistically insignificant effects on Rwanda and Sudan. Furthermore, Rwanda and Sudan experienced significant adverse long-term effects due to their current account deficits, with the effect on Ethiopia being negative but statistically insignificant. Government spending promotes long-term economic growth in Ethiopia and Sudan, while its effect is negative but statistically insignificant in Rwanda. The study underscores the necessity for effective debt management, moderate inflation, enhanced public spending, improved governance, and a balanced current account in Ethiopia, Rwanda, and Sudan.

Keywords: regional economy; growth trends; East African countries; external debt; comparative analysis; ARDL approach.

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1. Introduction

The importance of economic growth is significant for developing economies, particularly in East African countries, as they aim to boost their economic potential and improve the quality of life for their increasing populations. East Africa faces challenges from both internal and external sources, including trade policy issues, rising commodity and oil prices, unfavorable financial conditions, exchange rate depreciation, political instability, internal conflicts, and macroeconomic imbalances¹. Inflation presents a major challenge in the region, with Sudan's an-

¹ World Economic Forum (2017). The Global Competitiveness Report 2017–2018. Geneva: World Economic Forum. Available online: <https://clck.ru/3RaR3e> (date of access: 19.09.2025).

nual rate peaking at 359.09 % in 2021, while Ethiopia reached 44.35 % in 2008, Kenya 28.81 % in 1994, Tanzania 28.82 % in 1990, and Burundi 31.11 % in 1994 (WDI)¹. Low HDI scores, high unemployment, and inadequate infrastructure are other developmental challenges in the region. Countries with floating exchange rate regimes, like Burundi, Comoros, Rwanda, Djibouti, Ethiopia, Kenya, and South Sudan, face significant vulnerabilities to debt stemming from exchange rate depreciation and budget deficits².

The federal government's annual budget deficit arises when spending surpasses tax revenue, necessitating borrowing through debt obligations. This deficit differs from the national debt, which consists of a country's total financial obligations to creditors, including public and trust fund debts [1]. Public debt consists of the commitments made by the central government to repay creditors, which includes both principal and interest. As noted in the Ricardian invariance theorem, government debt acts as a vital funding source when revenues fall short. It can be classified as domestic or foreign, depending on the location of debt holders and whether it is issued in domestic or international markets [2].

Economists assess a nation's financial sustainability through the debt-to-GDP ratio, which has fluctuated significantly over time, beginning below 15 % before the Great Depression, rising above 100 % post-World War II, and stabilizing around 25 % in the 1970s. By 2001, the debt ratio had decreased to 31.5 % from nearly 48 % in 1993, but it has since risen sharply due to the Great Recession and the COVID-19 pandemic. This surge has resulted in higher interest rates, prompting policymakers to choose between increasing deficits or implementing a combination of spending cuts and revenue increases to maintain current spending and revenue levels [3].

Accumulating debt negatively impacts government funding for essential services, leading to reduced public investment, currency instability, and hindering national growth. In this instance, Sudan's foreign debt was 251.29 % of its GDP in 1992, Ethiopia's was 147.18 % in 1994, and Rwanda's external debt reached 86.04 % in 2022 (WDI). Hence, understanding the relationship between external debt and economic growth is essential for effective debt management, enabling policymakers and financial institutions to make informed decisions that prevent financial crises and instability.

The existing studies show conflicting findings regarding the causality between economic growth and foreign debt, indicating a research gap. Thus, the current study seeks to fill this gap by exploring the trends and causal relationships between economic growth and foreign debt along with control variables in Ethiopia, Rwanda, and Sudan.

¹ World development indicators (WDI): <https://data.worldbank.org/indicator> (date of access: 19.09.2025).

² Africa's Development Dynamics 2022: Regional Value Chains for a Sustainable Recovery. AUC/OECD. <https://doi.org/10.1787/2e3b97fd-en> (date of access: 19.09.2025).

Over the course of the study, the following *research questions* were formulated:

RQ1: What are the key patterns of real GDP growth in Ethiopia, Rwanda, and Sudan from 1990 to 2022?

RQ2: What impact does foreign debt have on Ethiopia, Rwanda, and Sudan's real GDP growth?

RQ3: What actions should be taken to assist the nations in implementing effective debt management strategies?

Overall, addressing these questions is crucial for creating a strategy to manage debt effectively and reversing negative economic trends in these nations.

The purpose of this study is to explore trends and causal relationships between foreign debt and real GDP growth in Sudan, Rwanda, and Ethiopia between 1990 and 2022. Some of the key tasks in this case are describing growth trends, identifying long-term growth drivers, and offering policy recommendations.

The study hypothesizes that analyzing the trends and causal links between foreign debt and economic growth can help countries mitigate risks associated with debt crises and vulnerabilities of nations to external shocks, potentially reversing negative economic trends. The following *hypotheses* were specifically addressed during the study:

H1: The economies of East African countries, particularly Ethiopia, Rwanda, and Sudan, are expected to show significant fluctuations in real GDP growth from 1990 to 2022.

H2: Higher external debt hinders economic growth in Ethiopia, Rwanda, and Sudan by raising interest rates and borrowing costs and potentially crowding out private investment and consumption.

H3: Higher inflation adversely affects economic growth in Ethiopia, Rwanda, and Sudan by affecting consumer spending and investor confidence.

H4: Government spending stimulates economic growth in Ethiopia, Rwanda, and Sudan by boosting aggregate demand, creating jobs, and improving infrastructure expansion.

H5: Higher debt servicing adversely affects the economies of Ethiopia, Rwanda, and Sudan by limiting government funding for public services, leading to reduced spending on critical public sectors such as healthcare and education.

H6: The deficit in the current account negatively impacts economic growth in Ethiopia, Rwanda, and Sudan, leading to high debt and financial instability.

The remainder of the article is organized into five sections: literature review (section two), materials and methods (section three), results (section four), discussion (section five), and conclusion (section six).

2. Literature Review

The impact of government interventions on economic growth, particularly through taxes, public debt, and spending, is a major topic in global economic policy. Renewed interest in the link between public debt and economic growth has

been arising following the 2007–2008 Global Financial Crisis and the European sovereign debt crisis [3]. Theories and empirical studies suggest that the relationship between public debt and economic growth produces mixed results, categorizing the results into three groups: no impact, positive impact, and negative impact. Theoretically, the Ricardian Equivalence Hypothesis (REH) argues that changes in government spending and public debt result in corresponding adjustments in private savings, leading to no net economic effect. It implies that government debt only affects the allocation of financial resources among economic agents [4].

A study by Buchanan [5] argues that public debt affects private consumption and savings but does not enhance net economic growth, suggesting that variations in domestic and foreign debt have no effect on significant macroeconomic indicators like output and gross investment. The Barro-Ricardo Equivalency Theory contends that government debt is a weak economic stimulus [4].

Literature also suggests that public debt can positively impact economic growth, supported by Wagner's "Law of Increasing State Activity," the fiscal multiplier effect of Keynesians, and conventional public debt theory. The theory hypothesizes that governments utilize international financial markets for borrowing to mitigate the gap between domestic investment and savings [6]. Keynesians contend that prudent borrowing leads to productive public spending, indicating its positive impact on a nation's capital formation and investment through a multiplier effect. They argue that public debt is less concerning when interest rates are lower than economic growth rates. In this perspective, government spending through deficits is more effective for economic growth than tax-funded spending, as it stimulates domestic activity and encourages private investment [3].

Moreover, Modern Monetary Theory argues that government borrowings improve economic outcomes by promoting public investment, thereby boosting the economy's productive capacity [7]. The twin deficit theory highlights the role of borrowed funds in managing fiscal and current account deficits, especially in financially burdened developing countries. According to the threshold effect theory, government debt can enhance economic growth when debt levels are low, but this effect turns negative when the debt surpasses a certain threshold. Specifically, when debt-to-GDP ratios exceed nonlinear limits, additional debt negatively affects economic growth [8].

Critics, therefore, argue that the positive perspectives on public debt may overlook crucial budget deficit dynamics, suggesting that escalating debt-to-GDP ratios could result in higher long-term interest rates, increased taxes, and diminished future incomes [9]. On the contrary side, Myers' [10] debt overhang theory asserts that government debt negatively affects a nation's growth by restricting private sector investment [11].

Traditional growth models, including neoclassical and endogenous frameworks, indicate that public borrowing can weaken budgetary management and lead to higher future tax liabilities, with the risk that external debt may surpass sustainable levels based on a nation's ability to repay [12]. The main cost of foreign

borrowing is the debt service cost, which heavily burdens developing countries as it takes a portion of their future revenue and represents fixed charges on savings, income, and foreign reserves [13]. The liquidity constraint hypothesis and debt overhang theory suggest that excessive debt hinders a nation's growth by raising interest rates and borrowing costs, resulting in a crowding-out effect on investment [3]. Malthus and Ricardo also claim that excessive debt levels hinder capital formation, which restricts a country's ability to thrive [14].

In sum, the adverse effects of public debt on a nation's growth are evident through four main channels: (1) crowding out private investment due to government competition for capital; (2) rising long-term interest rates from excessive debt; (3) increased distortionary taxes to manage future liabilities; and (4) heightened inflation rates [8].

Empirically, recent research by Pegkas et al. [15] indicates a negative connection between debt and growth. A study by Sami et al. [13] discovered that external borrowing negatively impacts economic growth in emerging economies, while optimal use of debt may promote growth.

A study by Lim [16] explored the link between total debt and economic growth across 41 countries, revealing that increasing debt accumulation has a detrimental effect on a nation's growth. A study by Abubakar and Mamman [17] found that public debt negatively impacts long-term economic growth in 37 OECD countries. A study by Pegkas et al. [15] confirmed that public debt negatively affects long-term growth in Eurozone countries. Vinokurov et al. [18] found that countries with weak political institutions have a debt threshold of 37 percent, compared to 56 percent in countries with strong institutions. Baum et al. [19] examine the connection between public debt and economic growth in Euro Area countries, revealing a positive short-term effect of debt on GDP growth. Padoan et al. [20] found that debt levels up to 71.66 % positively affect growth, while exceeding this threshold leads to negative consequences.

Therefore, the current study is motivated to examine the impact of foreign debt on economic growth in Ethiopia, Rwanda, and Sudan, addressing the conflicting findings in the existing literature.

3. Materials and Methods

The World Development Indicators database provided data for the study, which covered the period from 1990 to 2022. The study examines how Ethiopia, Rwanda, and Sudan's economic growth (RGDP) was impacted by external debt (EXDEBT), taking into account the effect of control variables such as inflation (INF), government spending (GSPEND), debt servicing (DSERVICE), and current account balance (CACT). The study utilized the ARDL approach to investigate the long-term causal relationships among variables and a descriptive technique for trend analysis. The ARDL approach is favored for its flexibility with variables of differing integration orders and its effectiveness in capturing both short- and

long-term correlations. The approach maintains reliability by utilizing lagged data to improve comprehension of the dynamic interactions among variables [21].

The study used the Augmented Dickey Fuller (ADF) unit root test to evaluate the stationarity conditions of variables, the AIC criteria for optimum lag length, and the ARDL bounds co-integration test to examine long-run co-integration. The reliability of the ARDL model was confirmed through various diagnostic tests, including the Breusch-Godfrey LM test, Durbin-Watson d-statistic, Breusch-Pagan/Cook-Weisberg test, VIF test, Jarque-Bera test, Ramsey RESET test, and recursive stability tests.

The standard ARDL model takes the following mathematical form:

$$RGDP_t = \beta_0 + \beta_1 EXDEBT_t + \beta_2 INF_t + \beta_3 GSPEND_t + \beta_4 DSERVICE_t + \beta_5 CACT_t + \mu_t. \quad (1)$$

Where: $RGDP_t$ is the real GDP growth rate of countries; $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are coefficients of the explanatory variables in time t , which measures the sensitivity of variables to the economic growth; $EXDEBT_t$ is a nation's liabilities to foreign lenders; INF_t is the annual inflation rate, which is typically measured using the consumer price index. It measures the rate at which prices are rising in an economy and has an impact on the real value of debt and the government's ability to repay it. $GSPEND_t$ is the government spending, which is expressed as a percentage of GDP and indicates the size of the government sector.

$DSERVICE_t$ is a nation's debt service, reflecting the total payments required for a loan or debt obligations, encompassing both principal and interest. $CACT_t$ is the current account balance of countries, reflecting the difference between exports and imports of goods and services, along with net income and transfers with other nations. And μ_t is the error term at time t .

According to Pesaran et al. [21], the ARDL approach to co-integration is outlined:

$$\begin{aligned} \Delta RGDP_t = & \alpha_0 + \sum_{i=1}^K \beta_1 \Delta RGDP_{t-i} + \sum_{i=1}^K \beta_2 \Delta EXDEBT_{t-i} + \sum_{i=1}^K \beta_3 \Delta INF_{t-i} + \\ & + \sum_{i=1}^K \beta_4 \Delta GSPEND_{t-i} + \sum_{i=1}^K \beta_5 \Delta DSERVICE_{t-i} + \sum_{i=1}^K \beta_6 \Delta CACT_{t-i} + \\ & + \delta_1 RGDP_{t-1} + \delta_2 EXDEBT_{t-1} + \delta_3 INF_{t-1} + \delta_4 GSPEND_{t-1} + \\ & + \delta_5 DSERVICE_{t-1} + \delta_6 CACT_{t-1} + \gamma ECT_{t-1} + \mu_t, \end{aligned} \quad (2)$$

Where: γECT_{t-1} — error correction term at time $t-1$; γ — error correction coefficient, reflecting adjustment rate towards long-term equilibrium. Δ denotes the change of each variable; δ_i is the drift component, and μ_t is the white noise residual. The variables $RGDP_t, EXDEBT_t, INF_t, GSPEND_t, DSERVICE_t$ and $CACT_t$ are as defined earlier.

4. Results

This section provides an overview of summary statistics, along with comparative trend analysis, pre-estimate testing, ARDL model estimation, and post-diagnostic tests.

4.1. Summary Statistics

Table 1 provides summary results of the study. The table summarizes statistical measures, including mean, median, maximum, minimum, and standard deviation. The mean is the average value of a dataset, the median is the middle value, the maximum is the highest number, and the minimum is the lowest data point. The standard deviation values indicate how much the data departs from the actual mean value.

Trends in economic indicators in East African countries, including Ethiopia, Rwanda, and Sudan, illustrate fluctuations in average real GDP among different

Table 1. Summary statistics of data from 1990 to 2022

Country	Variable	Mean	Median	Maximum	Minimum	Std. Dev.
Ethiopia	<i>RGDP</i>	6.740	8.364	13.572	-8.672	5.625
	<i>EXDEBT</i>	57.988	33.188	147.181	10.512	40.547
	<i>INF</i>	12.974	9.568	44.356	0.662	10.941
	<i>GSPEND</i>	15.910	17.112	27.041	7.361	5.764
	<i>DSERVICE</i>	1.448	1.375	4.092	0.295	0.714
	<i>CACT</i>	-4.465	-4.201	1.810	-12.641	3.941
Rwanda	<i>RGDP</i>	5.703	7.958	35.224	-50.248	12.206
	<i>EXDEBT</i>	52.875	56.643	127.415	13.177	25.771
	<i>INF</i>	7.376	7.449	19.637	-2.405	5.295
	<i>GSPEND</i>	14.085	14.286	17.131	9.582	2.329
	<i>DSERVICE</i>	1.590	1.141	5.727	0.557	1.061
	<i>CACT</i>	-6.246	-6.324	1.023	-15.303	4.198
Sudan	<i>RGDP</i>	2.610	3.858	18.3126	-17.004	5.758
	<i>EXDEBT</i>	83.183	69.844	251.293	17.642	60.649
	<i>INF</i>	57.553	32.351	359.093	1.935	71.155
	<i>GSPEND</i>	8.274	6.714	17.852	4.835	2.994
	<i>DSERVICE</i>	0.921	0.592	9.320	0.027	1.568
	<i>CACT</i>	-6.723	-5.543	-1.106	-21.606	4.406

Source: compiled by the authors.

countries, showcasing a range of maximum and minimum values. Additionally, an analysis of average foreign debt and debt servicing presents varied figures alongside insights into government spending and the current account balance across nations.

4.2. Comparative Analysis

4.2.1. Trend of Real GDP Growth

Figure 1 compares the real GDP growth trends in Ethiopia, Rwanda, and Sudan over the study period. The average real GDP growth rate is 6.740 % for Ethiopia, 5.703 % for Rwanda, and 2.610 % for Sudan. Real GDP growth trend analysis reveals distinct economic growth patterns across countries, underscoring the impact of differing economic policies, unique development challenges faced by each country, political stability, and governance. In this regard, Ethiopia maintained stronger and more consistent real GDP growth compared to Rwanda and Sudan, largely attributed to effective economic policies and investments in public sectors. Rwanda experienced steady growth driven by structural reforms, whereas Sudan’s economic performance greatly suffered from ongoing political instability.

4.2.2. Trend of Share of External Debt Stocks

Figure 2 compares the trends of foreign debt in Ethiopia, Rwanda, and Sudan over the study period. Ethiopia’s foreign debt stock averages 57.988 % of GDP, with a peak of 147.181 % and a low of 10.512 %. Rwanda’s average is 52.875 %, reaching a high of 127.415 % and a low of 19.53 %. Moreover, Sudan’s foreign debt averages 83.183 %, fluctuating between 251.293 % and 47.84 %. To compare debt situations among countries, Sudan faces challenges of debt sustainability due

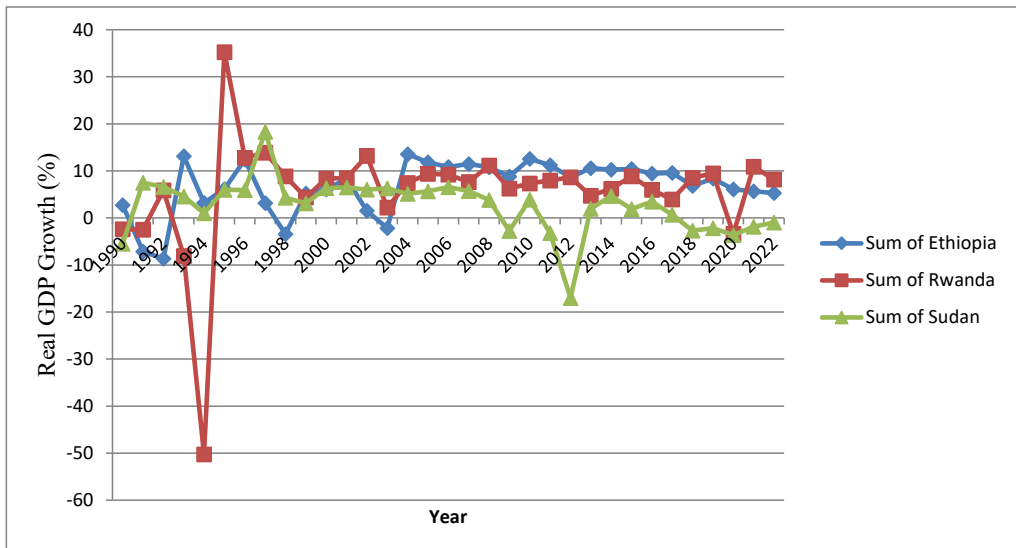


Figure 1. Trends of real GDP growth in Ethiopia, Rwanda, and Sudan

Source: compiled by authors.

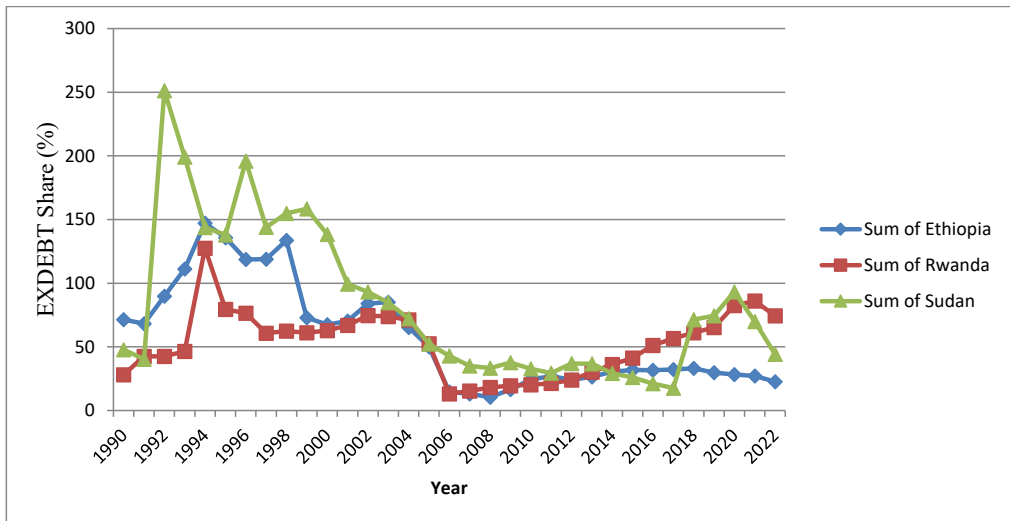


Figure 2. Trends of the percentage share of external debt from total GDP in Ethiopia, Rwanda, and Sudan

Source: compiled by authors.

to political instability, creating an unstable financial situation. Moreover, Ethiopia has a higher debt level relative to its GDP, which poses economic challenges. Conversely, Rwanda benefits from its lower debt-to-GDP ratio, allowing for the implementation of fiscal measures that promote stability and growth in the country.

Generally, foreign debt levels vary significantly across countries, reflecting their unique economic contexts and debt management strategies. In this regard, Sudan's debt situation is exacerbated by political instability, while Ethiopia takes second position with a higher debt burden. In contrast, Rwanda maintained a relatively stable foreign debt.

4.2.3. Trend of Inflation Rate

Figure 3 indicates a comparison of inflation trends in Ethiopia, Rwanda, and Sudan over the specified period. Ethiopia's inflation rate averages 12.974 %, with a peak of 44.356 % and a low of 0.662 %. Rwanda's average is at 7.376 %, reaching a high rate of 19.637 % and a low rate of -2.405 %. In contrast, Sudan has a much higher inflation average of 57.553 %, peaking at 359.093 % and a low of 1.935 %.

For comparison and contrast, the analysis results of inflation trends in Ethiopia, Rwanda, and Sudan reveal significant differences attributed to differences in monetary policies and external shocks. In this regard, Sudan faced the highest inflation challenges driven by political instability and economic sanctions, leading to economic instability. Ethiopia's inflation has varied considerably, largely attributed to political reforms, economic liberalization initiatives, higher public spending, and external factors, while Rwanda achieved moderate inflation through strong governance and growth strategies.

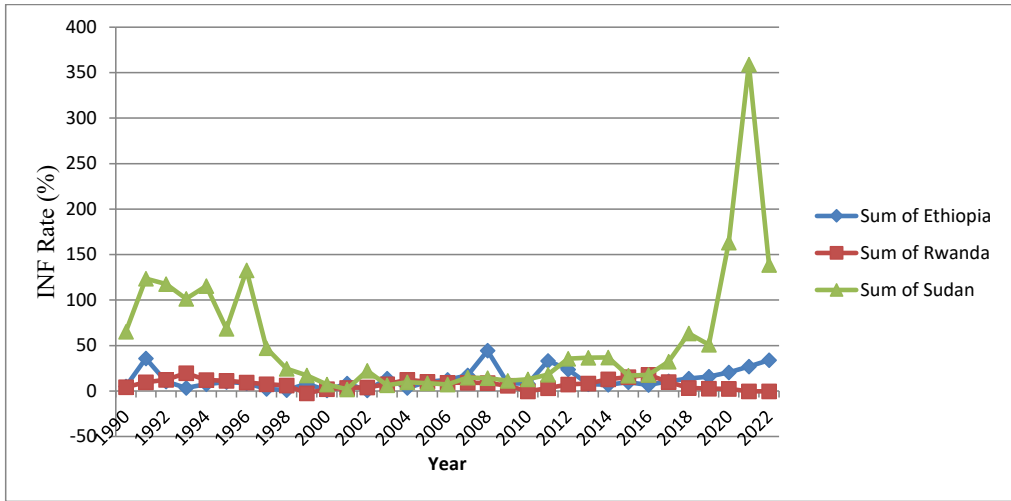


Figure 3. Trends of inflation in Ethiopia, Rwanda, and Sudan

Source: compiled by authors.

In summary, Sudan showed high inflation volatility, Ethiopia had higher but less volatile rates, and Rwanda maintained stability throughout the study period.

4.2.4. Trend of Share of Government Spending

Figure 4 compares the trends in government spending among Ethiopia, Rwanda, and Sudan during the specified period. Ethiopia’s public spending averaged 15.91 % of GDP, with a maximum of 27.04 % and a minimum of 7.36 %. In comparison, Rwanda’s average government spending was 14.085 %, peaking at 17.131 % and a low of 9.582 %, while Sudan’s spending averaged 8.274 %, ranging from 4.835 % to 17.852 %.

Generally, public spending varies by country, with a decline observed in Ethiopia, while Rwanda exhibits higher and more stable government expenditure compared to Sudan. Moreover, these trends underscore varying budget allocations and expenditure patterns across the three countries.

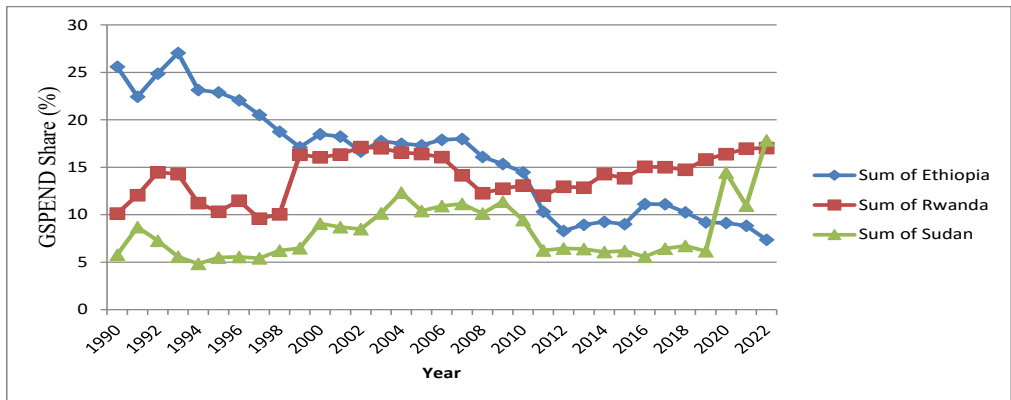


Figure 4. Trends of share of government spending in Ethiopia, Rwanda, and Sudan

Source: compiled by authors.

4.2.5. Trend of Share of Debt Servicing

Figure 5 illustrates the trends in the share of debt servicing among countries such as Ethiopia, Rwanda, and Sudan from 1990 to 2022. In this regard, Ethiopia's average debt servicing share is 1.448 %, with a range of 0.295 % to 4.092 %. Rwanda has an average debt servicing share of 1.590 %, varying from 0.557 % to 5.727 %. Sudan's average debt servicing ratio stands at 0.921 %, with fluctuations between 0.027 % and 9.320 %. Debt servicing trends from 1990 to 2022 reveal distinct differences among Ethiopia, Rwanda, and Sudan. In this regard, Sudan faced a rising debt burden, worsened by ongoing political instability and economic challenges. Ethiopia experienced substantial debt growth, while Rwanda effectively managed its debt-to-GDP ratio through prudent fiscal policies.

Overall, debt servicing trends in Rwanda and Ethiopia are favorable, while Sudan's remain low, indicating a need for effective financial management and stability for sustainable debt servicing.

4.2.6. Trend of Current Account Balance

Figure 6 shows the trends in the current account balance (deficit) for Ethiopia, Rwanda, and Sudan. In comparison, Ethiopia's economy has an average current account deficit of -4.465 %, which peaks at -12.641 % and balances to 1.810 %. The average current account deficit in Rwanda is -6.246 %, with a range of -15.303 % to 1.023 %. Sudan's average current account deficit is at -6.723 %, compared to a possible better balance of -1.106 % and a notable worst of -21.606 %. During the study period, the countries showed distinct current account balances: Sudan faces the highest current account deficit of -21.606 %, mainly due to the ongoing political instability and economic challenges from the mid-1990s to early

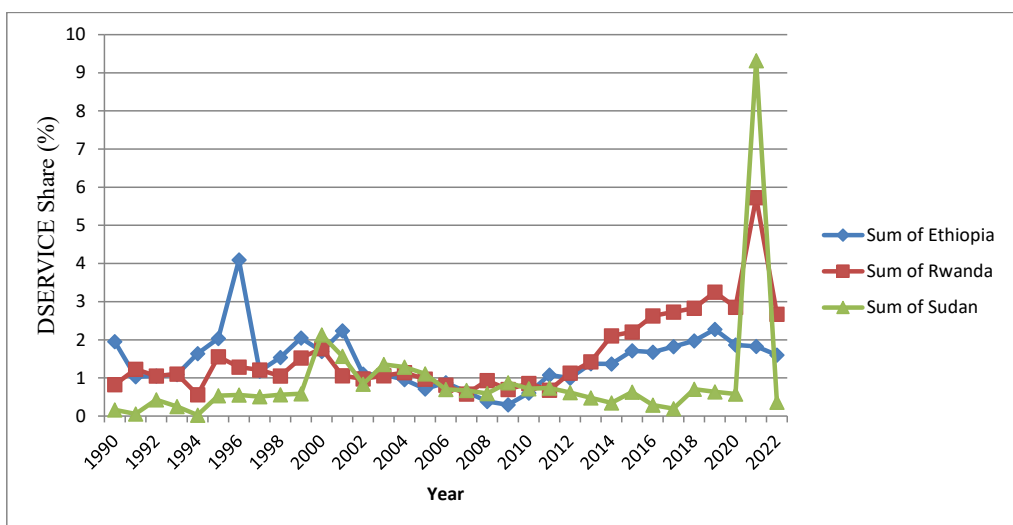


Figure 5. Trend of the percentage share of debt servicing in Ethiopia, Rwanda, and Sudan

Source: compiled by authors.

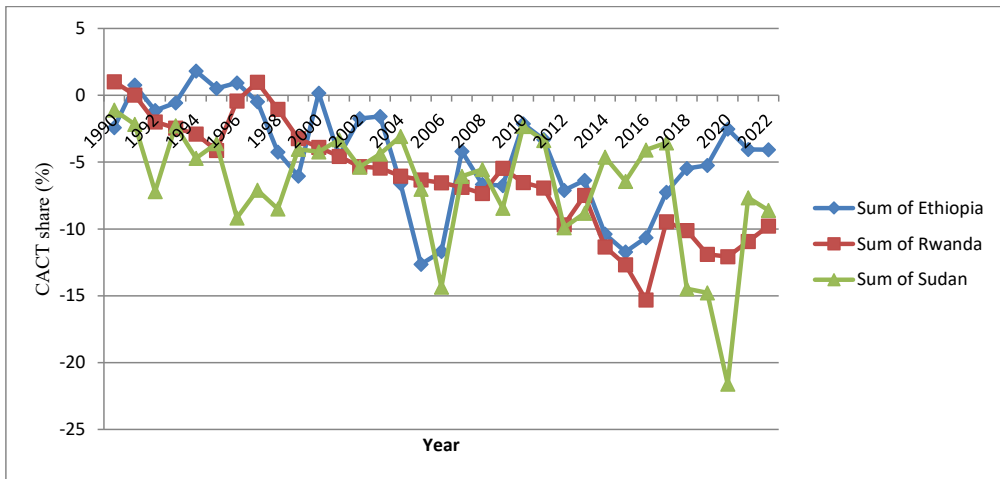


Figure 6. Trend of current account balance in Ethiopia, Rwanda, and Sudan

Source: compiled by authors.

2000s. Moreover, Ethiopia’s current account deficit has risen significantly due to increased imports and infrastructure projects, impacting its balance of payments. In contrast, Rwanda maintains a relatively low current account deficit, attributed to stable economic policies and a focus on exports.

Ultimately, Ethiopia’s and Rwanda’s deficits correspond to their developmental strategies, while Sudan’s reflects its political and economic instabilities.

4.3. Econometrics Model Results

4.3.1. Pre-estimation Tests

Unit root tests. A stationary data set exhibits a mean value with both variance and covariance equal to zero. This particular study employed the Augmented Dickey-Fuller (ADF) test to assess the stationarity conditions of variables. The approach was selected because it reliably maintains a mean value over time [22].

The stationary properties of the variables are shown in Table 2. In Ethiopia and Rwanda, *DSERVICE* and *CACT* are stationary at the first difference (I(1)), while *RGDP*, *EXDEBT*, *INF*, and *GSPEND* are stationary at levels (I(0)). In Sudan, *INF*, *GSPEND*, and *DSERVICE* are stationary at the first difference (I(1)), with *RGDP*, *EXDEBT*, and *CACT* being stationary at levels (I(0)).

Table 2. ADF Unit Root Test Result

Variable	Ethiopia			Rwanda			Sudan		
	t-stat.	5 % Critical	Remark	t-stat.	5 % Critical	Remark	t-stat.	5 % Critical	Remark
<i>RGDP</i>	-4.576	-3.576	I(0)	-4.576	-3.576	I(0)	-3.999	-3.576	I(0)
<i>EXDEBT</i>	-1.819	-1.701	I(0)	-1.819	-1.701	I(0)	-4.073	-3.576	I(0)

End of table 2

Variable	Ethiopia			Rwanda			Sudan		
	t-stat.	5 % Critical	Remark	t-stat.	5 % Critical	Remark	t-stat.	5 % Critical	Remark
<i>INF</i>	-2.567	-1.701	I(0)	-2.567	-1.701	I(0)	-5.979	-3.580	I(1)
<i>GSPEND</i>	-2.216	-1.701	I(0)	-2.216	-1.701	I(0)	-3.154	-1.701	I(1)
<i>DSERVICE</i>	-4.741	-3.580	I(1)	-4.741	-3.580	I(1)	-3.408	-1.703	I(1)
<i>CACT</i>	-4.510	-3.580	I(1)	-4.510	-3.580	I(1)	-3.664	-3.576	I(0)

Source: compiled by the authors.

Overall, the mixed stationarity of ADF test results suggests the importance of the ARDL model, with the ARDL Bounds test crucial for identifying long-term relationships among model variables.

Co-integration Test. The study utilized the ARDL bound testing approach, specifically the F-test, for evaluating long-term relationships. The method evaluates the link between the critical upper bound value and the F-statistic; if the F-statistic exceeds the 5 % upper bound, co-integration between variables is indicated.

Table 3 presents the results of the co-integration test. Since the F-statistic values for Ethiopia (12.497), Rwanda (16.209), and Sudan (5.837) exceed the critical upper bound of 5 % (3.79), there exists a long-term co-integration among variables in all three countries.

Optimal Lag Length Selection. Shrestha & Bhatta [23] recommend selecting models based on the lowest values using the Hannan-Quinn Criterion (HQ), Akaike Information Criterion (AIC), or Schwarz Criterion (SC). The results of optimal lag length selection criteria are shown in Table 4. The smallest AIC value is used in this study to determine the lag selection. The computation indicates that lag 4 is the maximum lag selected.

Table 3. The results of the ARDL Bounds Test

Ethiopia			Rwanda			Sudan		
Sign. level	I(0)	I(1)	Sign. level	I(0)	I(1)	Sign. level	I(0)	I(1)
10 %	2.26	3.35	10 %	2.26	3.35	10 %	2.26	3.35
5 %	2.62	3.79	5 %	2.62	3.79	5 %	2.62	3.79
2.5 %	2.96	4.18	2.5 %	2.96	4.18	2.5 %	2.96	4.18
1 %	3.41	4.68	1 %	3.41	4.68	1 %	3.41	4.68
F-stat = 12.497 t-stat = -5.302			F-stat = 7.227 t-stat = -5.457			F-stat = 5.837 t-stat = -4.984		

Source: compiled by the authors.

Table 4. Selection order criteria

Country	Lag	LL	LR	Df	P	FPE	AIC	HQ	SC
Ethiopia	0	-498.526				5.2e+07	34.794	34.883	35.077
	1	-401.594	193.86	36	0.000	825509	30.593	31.212	32.572
	2	-346.094	111	36	0.000	306127	29.247	30.399	32.925
	3	-260.646	170.89	36	0.000	31572.7	25.837	27.521	31.212
	4	994.824	2510.9*	36	0.000	3.9e-31*	-58.267*	-56.048*	-51.191*
Rwanda	0	-437.107				1.2e+07	30.490	30.564	30.725
	1	-364.295	145.62	36	0.000	457556	27.192	27.635	28.607
	2	-333.778	61.034	36	0.000	370392	26.812	27.624	29.405
	3	-309.71	48.135	36	0.000	645976	26.876	28.057	30.648
	4	-235.019	149.38*	36	0.000	71808*	23.449*	25.001*	28.402*
Sudan	0	-521.938				4.2e+09	36.340	36.414	36.576
	1	-445.266	153.34	36	0.000	1.2e+08	32.777	33.22	34.191*
	2	-412.967	64.599	36	0.000	8.7e+07	32.273	33.085	34.866
	3	-385.857	54.22	36	0.000	1.2e+08	32.128	33.309	35.899
	4	-329.034	113.65*	36	0.000	4.7e+07*	29.933*	31.483*	34.883

Source: compiled by the authors.

4.3.2. ARDL Model Estimation

The long-term relationship between variables is assessed by the ARDL approach. For the three countries, we fitted an independent ARDL model. The models were formulated considering variables such as *RGDP*, *EXDEBT*, *INF*, *GSPEND*, *DSERVICE*, and *CACT*, along with their respective lag lengths:

Model 1: ARDL for Ethiopia (1, 4, 1, 1, 1, 4) with the smallest AIC of -58.267.

Model 2: ARDL for Rwanda (1, 2, 2, 1, 3, 1) with the smallest value of 23.449.

Model 3: ARDL for Sudan (2, 1, 0, 1, 0, 1) with the smallest value of 29.933.

Model 1: The Long-Run Equation for Ethiopia's Economy (ARDL: 1, 4, 1, 1, 1, 4). In this case, the model uses the ARDL framework with lag structure (1, 4, 1, 1, 1, 4) to formulate the long-run equation for Ethiopia, establishing a basis for examining the country's long-term economic relationships. Table 5 presents the long-term ARDL model outcomes. The results highlight that in Ethiopia, government spending and inflation contribute significantly and positively to long-term real GDP growth, whereas foreign debt and debt servicing impact it negatively. The following equation represents Ethiopia's long-term model:

$$\begin{aligned}
 RGDP_t = & 9.50 - 0.302EXDEBT_t + 0.247INF_t + 1.184GSPEND_t - \\
 & -2.936DSERVICE_t + 0.642CACT_t - 0.734ECT_{t-1}.
 \end{aligned} \tag{3}$$

The error correction term (*ECT*), which is crucial for model validation, measures how quickly a model's disturbance can be corrected to restore its long-term equilibrium. In this instance, the *ECT* coefficient for Ethiopia's economy is -0.734 , indicating a significant negative sign. The figure suggests that disequilibrium in the model is corrected annually, returning to its long-term equilibrium at a rate of 73.40 % after 2022.

The intercept value of 9.50 shows that when all other explanatory variables are kept at zero, Ethiopia's real GDP increases by 9.50 units.

Given the coefficient of foreign debt -0.302 , a unit increase in the proportion of foreign debt would result in a 0.302-unit slowdown in Ethiopia's real GDP, suggesting a significant negative correlation between economic growth and foreign debt in Ethiopia. Theoretically, the result aligns with debt overhang theory, which argues that excessive public debt negatively affects economic growth by raising interest rates and borrowing costs, which finally leads to a crowding out of investment [11]. Neoclassical and endogenous frameworks also suggest that higher public borrowings weaken budgetary management [12]. Empirically, the conclusion by Sami et al. [13] indicates that excessive debt obstructs a nation's growth by diverting revenue to repayment and imposing fixed costs on savings.

The coefficient of inflation for Ethiopia's economy is $+0.247$, indicating a significant and positive long-term connection with real GDP growth; a unit rise in inflation leads to a 0.247 unit increase in long-term real GDP. When we confirm empirically, Ethiopia's economy demonstrated notable resilience with a real GDP growth of 6.74 %, despite facing an average inflation rate of 12.9 %. Theoretically, the result supports Keynesians' view that inflation promotes investment and spending, indicating an expanding economy [24]. The Mundell-Tobin Effect theory posits that inflation aids producers by encouraging investment in interest-earning assets, which enhances capital accumulation [25]. Empirically, the result is consistent with a conclusion by Kragulj & Jednak [26] in East African nations.

Given the coefficient of government spending, $+1.184$, Ethiopia's real GDP increased by 1.184 units for every unit increase in the share of government spending, indicating a strong positive correlation between government spending and the country's economic growth. Theoretically, the result supports the Keynesian perspective that increased government spending enhances investment and production growth [27]. Empirically, the outcome is similar to what Mose [28] concluded in Kenya.

Furthermore, the coefficient of debt servicing is -2.936 , showing that a unit increase in the share Ethiopia's debt servicing results in a 2.936-unit reduction in real GDP, highlighting a significant negative connection between debt servicing and real GDP. Theoretically, Keynesians support the result that excessive debt servicing strains government budgets, leading to reduced spending on essential services and increased interest rates [29]. The empirical evidence also supports the result indicating that higher debt payments negatively impacts fixed capital formation and real GDP growth in Nigeria [30].

Note: although Ethiopia's current account balance has a positive long-term correlation with real GDP growth, it is statistically insignificant.

Model 2: The Long-Run Equation for Rwanda's Economy (ARDL: 1, 2, 2, 1, 3, 1). In Rwanda, foreign debt, inflation, and current account deficit significantly and negatively affect long-term economic growth. The following equation illustrates the estimated long-term ARDL model for Rwanda's economy:

$$RGDP_t = 19.30 - 0.289EXDEBT_t - 0.903INF_t - 1.605GSPEND_t - 10.018DSERVICE_t - 2.270CACT_t - 0.967ECT_{t-1} \quad (5)$$

With an *ECT* coefficient of -0.967 , Rwanda's economy is expected to correct for model disequilibrium annually, returning to its long-term equilibrium at a rate of 96.7 % after 2022.

The intercept value of 19.30 indicates that, when all other explanatory variables are set to be zero, Rwanda's real GDP growth will rise by 19.30 units.

Based on coefficient of -0.289 for foreign debt, Rwanda's real GDP dropped by 0.283 units for each unit increases in the share of foreign debt. Theoretically, the result aligns with debt overhang theory, indicating that excessive debt impedes national growth by crowding out investment [11]. Empirically, the result is supported by Lim [16]'s conclusion, indicating a significant negative connection between foreign debt and economic growth in 41 indebted nations.

Moreover, Rwanda's economic growth exhibits a significant negative correlation with inflation, as indicated by a coefficient of -0.903 , where a one-unit increase in annual inflation results in a 0.903-unit decline in real GDP. The outcome is theoretically supported by Ghosh and Phillips [31], suggesting that higher inflation hinders investment by causing uncertainty, negatively impacts terms of trade by increasing import costs and decreasing export prices, and induces money illusion. Empirically, the result aligns with Olamide et al. [32], indicating a significant negative connection between the two variables in South African countries.

Based on the coefficient of current account balance, -2.270 , Rwanda's real GDP declines by 2.270 units for each unit increase in the nation's current account deficit. In support of this, the twin deficit theory suggests that a current account deficit exacerbates government budget deficits, which, if improperly financed, may cause the exchange rate to decline and perhaps cause a currency crisis [33]. Empirically, the conclusion by Abera [34] highlights a long-term negative association between current account deficits and Ethiopia's real GDP growth, indicating that these deficits, along with budget deficits, are co-integrated with real GDP growth.

Note: despite being statistically insignificant, Rwanda's government spending and debt servicing shares have a beneficial effect on real GDP growth.

Model 3: The Long-Run Equation for Sudan's Economy (ARDL: 2, 1, 0, 1, 0, 1). In Sudan, government spending positively impacts long-term economic growth, whereas foreign debt, inflation, and current account deficit have a significant

negative effect on it. The following is the long-run estimated model for Sudan's economy:

$$RGDP_t = -1.902 - 0.061EXDEBT_t - 0.042INF_t + 0.457GSPEND_t - 0.043DSERVICE_t - 0.164CACT_t - 0.842ECT_{t-1}. \quad (6)$$

With an *ECT* coefficient of -0.842 , Sudan's long-term equilibrium is maintained by correcting at a rate 84.2 % of the model's disequilibrium annually. The intercept value of -1.902 suggests that Sudan's real GDP growth declines by 1.902 units if all variables in the model are set to be zero.

Sudan's foreign debt share negatively affects real GDP growth, with a unit increase in external debt corresponds to a 0.061-unit reduction in real GDP growth. Theoretically, the result is supported by debt overhang theory as well as by neo-classical and endogenous frameworks [11]. A study by Augustino et al. [35] provides empirical evidence of a significant negative connection between excessive foreign debt and economic growth in East African countries.

The coefficient of -0.042 for inflation suggests that for every unit increase in the inflation rate, Sudan's real GDP declines by 0.042 units, suggesting a significant negative association between inflation and Sudan's economic growth. Theoretically, Ghosh and Phillips [31]'s theory supports the result that higher inflation adversely affects nation's economy by creating uncertainty, increasing import costs, decreasing export prices, and inducing money illusion. Empirically, the result aligns with Abdelkreem & Sisay's [36] conclusion in Sudan and Kenya, suggesting that rising inflation affects consumer spending, undermine investor confidence, and lessen the incentives for saving.

Given that government spending has a coefficient of $+0.457$, Sudan's real GDP rises by 0.457 units for every unit increase in government spending, suggesting a strong positive correlation between public spending and Sudan's economic growth. The result is in line with the Keynesian perspective, which holds that increased government expenditure boosts investment and production output. Empirically, the finding aligns with Mose's [28] conclusion in Kenya. The coefficient of current account balance for Sudan's economy is -0.164 , indicating that each unit increase in the current account deficit results in a 0.164 unit slowdown in Sudan's real GDP growth. The result is comparable with twin deficit theory and with empirical studies, including by Abera [34] in Ethiopia.

Note: Sudan's real GDP growth is adversely affected by debt servicing, although this effect is statistically insignificant. Table 5 presents the simulation results.

4.3.3. Post-diagnostic tests

To ensure the model accurately represents the data set, we must verify its robustness and applicability through post-diagnostic tests.

Autocorrelation Test. The Breusch-Godfrey LM test and Durbin-Watson d-statistic test assessed the model for serial correlation, accepting the null hypothesis

Table 5. Long-run ARDL results

Variable	Ethiopia			Rwanda			Sudan		
	Coeff.	Std. Error	t-stat.	Coeff.	Std. Error.	t-stat.	Coeff.	Std. Error	t-stat.
<i>EXDEBT</i>	-0.302***	0.052	-5.81	-0.289**	0.132	-2.20	-0.061***	0.018	-3.41
<i>INF</i>	0.247**	0.096	2.55	-0.903**	0.377	-2.40	-0.042**	0.020	-2.10
<i>GSPEND</i>	1.184***	0.188	6.30	-1.605	0.897	-1.79	0.457***	0.129	3.53
<i>DSERVICE</i>	-2.936**	1.095	-2.68	-10.018	5.211	-1.92	-0.043	0.977	-0.04
<i>CACT</i>	-0.642	0.384	-1.67	-2.270**	0.973	-2.33	-0.164***	0.047	-3.49
<i>ECT(-1)</i>	-0.734***	0.138	-5.30	-0.967***	0.177	-5.46	-0.842***	0.214	-3.93

Note: ** & *** denote significance at 5 % and 1 % significance levels, respectively.

Source: model result.

when the probability value exceeds 0.05. The serial correlation test results are shown in Table 6.

The Durbin-Watson d-statistic test results indicated no serial correlation among variables for Ethiopia's economy ($d = 2.129$), Rwanda ($d = 1.869$), and Sudan ($d = 1.891$). Similarly, the $\text{prob.} > \text{chi}^2$ values of the Breusch-Godfrey LM test for Ethiopia, Rwanda, and Sudan were 0.361, 0.541, and 0.286, respectively, all above 5 %, failing to reject the null hypothesis.

Heteroskedasticity Test. The Breusch-Pagan/Cook-Weisberg test assesses the constancy of variances and mean values of disturbances over time, with the null hypothesis accepted if the probability value exceeds 0.05.

The results of the heteroskedasticity test are shown in Table 7. Test results indicate no heteroscedasticity issues in the models, as the $\text{prob.} > \text{chi}^2$ values for Ethiopia (0.793), Rwanda (0.686), and Sudan (0.945) all exceed the 5 % threshold.

Table 6. Serial correlation test results

Country	Breusch-Godfrey LM Result (prob. > chi ²)	Durbin-Watson d-statistic test	Remark
Ethiopia	0.361	2.129	There is no statistical evidence for serial autocorrelation ($d = 2.129$ is nearly equal to 2, or $\text{prob.} = 0.361 > 0.05$)
Rwanda	0.541	1.869	There is no statistical evidence for serial autocorrelation ($d = 1.869$ is nearly equal to 2, or $\text{prob.} = 0.541 > 0.05$)
Sudan	0.286	1,891	There is no statistical evidence for serial autocorrelation ($d = 1.891$ is nearly equal to 2, or $\text{prob.} = 0.286 > 0.05$)

Source: compiled by the authors.

Table 7. Heteroskedasticity Test

Country	Breusch-Pagan/Cook-Weisberg test result (prob. > chi2)	Remark
Ethiopia	0.793	No evidence for heteroscedasticity (prob. 0.793 > 0.05)
Rwanda	0.686	No evidence for heteroscedasticity (prob. 0.686 > 0.05)
Sudan	0.945	No evidence for heteroscedasticity (prob. 0.945 > 0.05)

Source: compiled by the authors.

Multicollinearity Test. The relationship between model variables was analyzed with the Variance Inflation Factor (VIF), where multicollinearity is signified by a high mean VIF score, typically above 5. In this case, a highly correlated variable is discarded while maintaining variables with strong theoretical support [22]. Table 8 illustrates the results of the VIF test. The mean VIF values for Ethiopia, Rwanda, and Sudan are 4.21, 4.89, and 2.86, respectively, confirming the absence of multicollinearity issues in the models.

Table 8. Variance Inflation Factor

Ethiopia			Rwanda			Sudan		
Variable	VIF	1/VIF	Variable	VIF	1/VIF	Variable	VIF	1/VIF
<i>EXDEBT</i>	13.05	0.076	<i>DSERVICE</i>	17.45	0.057	<i>INF</i>	3.91	0.255
<i>GSPEND</i>	7.47	0.133	D1.	12.55	0.079	<i>DSERVICE</i>	3.47	0.288
<i>DSERVICE</i>	4.66	0.214	LD.	8.84	0.113	<i>GSPEND</i> D1.	3.16	0.316
<i>INF</i>	3.97	0.252	<i>CACT</i>	7.72	0.129	<i>RGDP</i> L1.	3.00	0.333
<i>CACT</i>	3.92	0.254	<i>EXDEBT</i>	6.34	0.157	<i>EXDEBT</i>	2.87	0.348
<i>RGDP</i> L1.	2.96	0.337	LD.	4.20	0.238	<i>GSPEND</i>	2.78	0.359
<i>DSERVICE</i> D1.	2.89	0.346	<i>RGDP</i> L1.	3.65	0.274	<i>CACT</i>	2.64	0.379
<i>GSPEND</i> D1.	2.84	0.351	<i>DSERVICE</i> L2D.	3.40	0.294	D1.	2.75	0.364
<i>EXDEBT</i>	2.69	0.371	<i>INF</i>	3.16	0.316	<i>RGDP</i> LD.	2.14	0.467
<i>INF</i> D1.	2.27	0.439	<i>CACT</i> D1.	3.15	0.317	<i>EXDEBT</i> D1.	1.88	0.531
<i>EXDEBT</i> LD.	1.93	0.517	<i>EXDEBT</i> D1.	3.08	0.324	Mean VIF = 2.86		
L2D.	1.83	0.547	<i>GSPEND</i>	2.83	0.353			
Mean VIF = 4.21			<i>INF</i> LD.	2.63	0.379			
			D1.	2.42	0.413			
			<i>GSPEND</i> D1.	1.82	0.548			
			Mean VIF = 4.89					

Source: compiled by the authors.

Normality Test. To assess the normality assumption, the Jarque-Bera test was employed, comparing the data's skewness and kurtosis to a normal distribution. The Jarque-Bera test results are presented in Table 9.

In Ethiopia, the variables *EXDEBT*, *INF*, *GSPEND*, and *DSERVICE* exhibit leptokurtic characteristics, indicating a peaked distribution with positive skewness, whereas *RGDP* and *CACT* are platykurtic, reflecting a negatively skewed distribution that results in more outliers. Moreover, all variables' residuals in the series are normally distributed, indicated by Jarque-Bera statistic probability values greater than 0.05. Rwanda's economy exhibits leptokurtic distributions for *EXDEBT*, *INF*, and *DSERVICE*, while *RGDP*, *GSPEND*, and *CACT* display platykurtic distributions. The Jarque-Bera statistic indicates that all variables are normally distributed. In Sudan, variables like *EXDEBT*, *INF*, *GSPEND*, and *DSERVICE* exhibit leptokurtic character, whereas *RGDP* and *CACT* show platykurtic character. The variables are normally distributed, as evidenced by the Jarque-Bera statistic probability values.

Model Adequacy Test. We evaluated a model's adequacy using the Ramsey RESET test. As seen from Table 10, the Ramsey RESET test findings confirm that all ARDL models are sufficiently specified, with probability values greater than 0.05.

Model Stability Test. The CUSUMSQ method assesses the stability of long-term coefficients in the presence of external shocks, accepting the null hypothesis when the residuals' distribution remains below the 5 % critical bounds. Consequently, the test graphs illustrate the structural stability and reliability of the estimated ARDL parameters, as the estimated plot line consistently remains within the critical boundaries.

Table 9. Normality Test Results

Variable	Methods	<i>RGDP</i>	<i>EXDEBT</i>	<i>INF</i>	<i>GSPEND</i>	<i>DSERVICE</i>	<i>CACT</i>
Ethiopia	Skewness	-1.207	0.758	1.310	0.140	1.345	-0.428
	Kurtosis	3.887	2.342	4.035	1.885	6.797	2.384
	J. Bera	6.64	4.32	5.63	4.66	4.29	1.78
	Prob.	0.073	0.115	0.084	0.107	0.119	0.410
Rwanda	Skewness	-2.652	0.428	0.238	-0.386	2.037	-0.098
	Kurtosis	15.423	3.305	2.620	1.948	8.002	2.300
	J. Bera	3.51	2.25	0.44	4.61	2.52	0.75
	Prob.	0.142	0.325	0.803	0.099	0.297	0.686
Sudan	Skewness	-0.762	1.047	2.539	1.255	4.854	-1.513
	Kurtosis	6.469	3.211	10.792	4.433	26.486	5.424
	J. Bera	5.64	4.40	6.53	4.94	6.08	3.42
	Prob.	0.092	0.163	0.067	0.103	0.071	0.151

Source: compiled by the authors.

Table 10. Model specification test results

Country	Breusch-Pagan/Cook-Weisberg Ramsey RESET test (Prob. > chi2)	Remark
Ethiopia	0.0855	There is no Issue with model specification (prob. = 0.0855 > 0.05).
Rwanda	0.0638	There is no Issue with model specification (prob. = 0.0638 > 0.05).
Sudan	0.071	There is no Issue with model specification (prob. = 0.071 > 0.05).

Source: compiled by the authors

5. Discussion

Comparative analysis of economic growth dynamics is essential for fostering rapid and sustained economic growth in developing economies. The current study explores the causal relationships between real GDP growth and foreign debt, using factors like inflation, public spending, debt servicing, and current account balance as control variables. The study applied the ARDL approach alongside descriptive techniques. We utilized the AIC method to determine the optimal lag length, the ADF unit root test to validate stationarity, and the ARDL bounds co-integration test for assessing long-term co-integration. We also applied various diagnostic tests to check the model's reliability and applicability. For verifying the results against predefined hypothesis, existing theories, and similar prior studies, we made the following discussions.

The empirical result confirms the first hypothesis (*H1*) that from 1990 to 2022, real GDP growth in Ethiopia, Rwanda, and Sudan has shown significant fluctuations. These variations in economic growth are influenced by factors including differences in economic policies, political stability, governance, investment, infrastructure expansion, and external economic conditions. In this regard, for the past 33 years, Ethiopia maintained a stronger real GDP growth rate of 6.74 % (average) compared to Rwanda (5.70 %) and Sudan (2.61 %), which was linked to successful economic policies and investments in the country. However, Sudan's economic performance suffered from being impacted by political instability, while Rwanda's development remained stable due to structural reforms. Indeed, the countries have undergone notable economic fluctuations, marked by periods of both expansion and recession. For instance, Ethiopia's economy experienced substantial economic recession in 1992, with a real GDP decline of -8.672 %, contrasting with the growth trends seen in Rwanda and Sudan. By 1996, Ethiopia's economy rebounded with a growth rate of 12.43 %, while Rwanda suffered a significant drop of -50.24 % in 1994 but recovered to 35.22 % in 1996. Sudan also faced an economic decline in 1995 but rebounded in 1996. However, Ethiopia's economy encountered another economic decline in 1998, while Rwanda and Sudan continued

to experience economic growth in this period. Indeed, Ethiopia's real GDP growth showed fluctuations between 2001 and 2022 but still maintained positive growth, whereas Rwanda experienced optimal economic growth during this specific period. In contrast, Sudan's economy faced significant decline in this period.

Overall, during the whole study period, Ethiopia demonstrated relatively higher and steady economic development compared to the notable changes in GDP growth seen in Rwanda and Sudan.

The empirical results also validate the second hypothesis (*H2*) that excessive foreign debt hinders economic growth in Ethiopia, Rwanda, and Sudan. In this regard, the long-term model results confirmed the hypothesis, showing a significant and negative correlation between foreign debt and real GDP growth in Ethiopia, Rwanda, and Sudan. Theoretically, the result confirms debt overhang theory [11] while refuting Keynesian fiscal multiplier effects and conventional public debt theory [6]. The finding empirically supports the conclusions by Sami et al. [13] and Lim [16] but contrasts the conclusion by Baum et al. [19] and Padoan et al. [20].

The study's findings also validate the third hypothesis (*H3*), which states that higher inflation has a detrimental impact on economic growth of Ethiopia, Rwanda, and Sudan. The results established a significant negative long-term relationship between inflation and real GDP growth in Sudan and Rwanda, while a significant positive impact on Ethiopia's economy. The results in Rwanda and Sudan validate Cost-Push Theory and Fisher's Assertions [27], while findings in Ethiopia align with Tobin's theory [25]. Empirically, the results from Rwanda and Sudan confirm the work of Olamide et al. [32] and Abdelkreem & Sisay [36], whereas the Ethiopian results validate the conclusions of Kragulj & Jednak [26].

According to the fourth hypothesis (*H4*), increased government expenditure is anticipated to promote aggregate demand, generate employment, and enhance infrastructure in countries like Ethiopia, Rwanda, and Sudan. The results validated a significant positive long-term correlation between real GDP growth and public spending in Ethiopia and Sudan, while in Rwanda; the correlation is negative but statistically insignificant. Theoretically, the results in Ethiopia and Sudan support the Keynesian view point [25], while also empirically validating Mose's [28] findings in Kenya.

The fifth hypothesis (*H5*) suggests that excessive debt servicing is expected to negatively impact economic growth in Ethiopia, Rwanda, and Sudan. The results confirmed that debt servicing significantly and negatively affects Ethiopia's real GDP growth, while its impact on Rwanda's and Sudan's economies is negative but statistically insignificant. The result in Ethiopia reinforces the Keynesian perspective [29] and empirically aligns with the conclusions reached by Adesola [30].

Finally, the sixth hypothesis (*H6*), which holds that a higher current account deficit has a detrimental effect on economic performance of Ethiopia, Rwanda, and Sudan, is also confirmed by the study. The results established a strong negative connection between current account deficit and real GDP growth in Rwanda and Sudan, whereas in Ethiopia, exhibited negative but statistically insignificant

relationships. The results in Rwanda and Sudan theoretically validate trade theories such as the Mundell-Fleming model and the Twin Deficit Hypothesis [25], aligning with empirical findings of Abera [34] in Ethiopia.

Apart from the remarkable contributions, the study also admits some drawbacks that might influence the reliability of findings.

1. The study's generalizability may be limited due to its narrow focus on few variables, which overlooks crucial institutional aspects.

2. The study's focus on only three countries may restrict its generalizability to other economies, necessitating more extensive cross-country comparisons with additional countries.

3. The study's reliability may be potentially compromised by excluding external factors like exchange rate volatility and trade openness, primarily due to data unavailability.

Hence, future research may address the identified limitations by exploring economic growth dynamics, applying insights to other economies, and incorporating overlooked variables.

6. Conclusion

The study investigates the trends and causal linkages between economic growth and foreign debt in Ethiopia, Rwanda, and Sudan, utilizing data from 1990 to 2022 and the ARDL approach along with a descriptive technique. The results indicated significant fluctuations in real GDP growth in Ethiopia, Rwanda, and Sudan over the study period. Based on the ARDL results, higher foreign debt adversely impacts long-term growth in Ethiopia, Rwanda, and Sudan. Moreover, inflation has a significant long-term negative effect on the real GDP growth of Sudan and Rwanda, while positively affecting Ethiopia's growth. Debt servicing has a considerable negative impact on Ethiopia's economy, whereas its effect on Rwanda and Sudan is negative but statistically insignificant. Additionally, there is a significant long-term negative influence of the current account deficit on Rwanda and Sudan's economies, with a negative but statistically insignificant effect on Ethiopia's economy. The study also maintained a significant positive association between government spending and long-term growth in Ethiopia and Sudan, while in Rwanda, the effect is negative but insignificant.

Based on the findings, the study recommends the following key policy areas.

1. Ethiopia, Rwanda, and Sudan's growing foreign debt raises borrowing costs and interest rates, which restricts private investments and consumption. Thus, it is advisable that these countries should work to reduce their excessive reliance on foreign debt through enhancing domestic revenue generation, debt restructuring, and improving governance for efficient resource use.

2. The economies of Rwanda and Sudan are adversely affected by high inflation, prompting the need for their central banks to adopt strict monetary policy measures to achieve a single-digit inflation rate.

3. Public spending boosts the long-term economic growth in Ethiopia and Sudan, stimulating aggregate demand and infrastructure expansion. Hence, it is recommended that the governments of Ethiopia and Sudan invest more in public sectors, including the construction of roads, houses, power plants, and health and education infrastructures.

4. Debt servicing adversely affects long-term economic growth in Ethiopia by redirecting resources to debt repayment; however, the effect is insignificant in Rwanda and Sudan. Hence, countries should prioritize responsible debt management, fiscal adjustments with targeted spending cuts, and considering debt restructuring or relief.

5. Current account deficits significantly and negatively affect the long-term growth of Rwanda and Sudan, whereas the effect on Ethiopia's economy is statistically insignificant. Thus, governments, especially in Rwanda and Sudan, should safeguard their current account balances by promoting export-led policies and minimizing dependence on imported final goods.

Generally, the conclusions have significant policy implications for Ethiopia, Rwanda, and Sudan, calling comprehensive policy reforms and economic strategies that focus on effective debt management, inflation moderation, improved public spending, enhanced governance, and maintaining a balanced current account.

To sum up, our results support multiple economic growth theories, including debt overhang theory, liquidity constraint, endogenous growth, Keynesian growth, Cost-Push Theory, Fisher's Assertion, Tobin's theory, the Mundell-Fleming model, and the Twin Deficit Hypothesis. These theories emphasize that macroeconomic variables such as foreign debt, inflation, government spending, international trade, foreign direct investment (FDI), and exchange rate stability are crucial factors influencing a nation's economic growth. Moreover, the results of the study have been corroborated with various previous empirical studies.

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Тенденции и причинно-следственные связи между экономическим ростом и внешним долгом: сравнительный анализ подхода ARDL в Эфиопии, Руанде и Судане

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Аннотация. Внешний долг представляет собой обязательства страны перед иностранными кредиторами и может стимулировать экономический рост, способствуя инвестициям. Однако чрезмерный долг создает такие риски, как долговые кризисы, долговая нагрузка и уязвимость страны к внешним потрясениям. Цель исследования — изучить тенденции и причинно-следственные связи между экономическим ростом и внешним долгом в Эфиопии, Руанде и Судане в период с 1990 по 2022 г. Выдвигается гипотеза, что изучение тенденций и причинно-следственных связей между внешним долгом и экономическим ростом имеет решающее значение для решения проблем, связанных с долговыми кризисами, долговой нагрузкой и уязвимостью страны к внешним потрясениям. В исследовании использовался подход ARDL для оценки долгосрочных коэффициентов, а также описательная методика для анализа тенденций. Средний темп роста реального ВВП в Эфиопии составил 6,74 %, в Руанде — 5,70 %, а в Судане — 2,61 %, что указывает на различия в темпах роста ВВП между странами. Увеличение внешнего долга негативно влияет на долгосрочный экономический рост в Эфиопии, Руанде и Судане. Более того, в Судане и Руанде наблюдается заметная отрицательная долгосрочная связь между инфляцией и ростом реального ВВП, тогда как в Эфиопии этот связь положительная. Обслуживание долга негативно влияет на долгосрочную экономику Эфиопии, оказывая аналогичное, но статистически незначительное воздействие на Руанду и Судан. Кроме того, Руанда и Судан испытали значительные негативные долгосрочные последствия из-за дефицита текущего счета, при этом влияние на Эфиопию было отрицательным, но статистически незначимым. Государственные расходы способствуют долгосрочному экономическому росту в Эфиопии и Судане, в то время как в Руанде их влияние отрицательное, но статистически незначимое. Исследование подчеркивает необходимость эффективного управления долгом, умеренной инфляцией, увеличения государственных расходов, улучшения управления и сбалансированного текущего счета в Эфиопии, Руанде и Судане.

Ключевые слова: региональная экономика; тенденции роста; страны Восточной Африки; внешний долг; сравнительный анализ; подход ARDL.

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