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Government spending and economic growth dynamics in Somalia: time series evidence from ARDL bounds testing

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Abstract

Somalia's economy has faced persistent instability due to shocks from COVID-19, climate-related disasters, and conflict, resulting in stagnant GDP growth (averaging 2% from 2019 to 2023) and declining real GDP per capita (−0.8% annually). Despite government expenditure rising to 9% of GDP in 2021, its efficiency in driving growth remains uncertain, raising critical questions about fiscal policy effectiveness in fragile states. We aim to investigate the relationship between government expenditure and GDP growth in Somalia from 1991 to 2021 using the ARDL estimation technique. The results show that, in the long run, both gross fixed capital formation and foreign direct investment (FDI) positively impact long-term GDP growth. However, government expenditure negatively affects GDP growth. In the short run, government expenditures positively impact GDP growth, while gross capital formation negatively influences GDP growth. The study proposes policy reforms where the Somali government should implement strategic expenditure reduction by gradually decreasing overall spending levels while reallocating resources toward high-productivity sectors. To maximize economic returns, the government should shift spending toward sectors that enhance productivity and long-term growth, such as Infrastructure, Agriculture & Livestock, Education and Private Sector Development. This study's originality lies in its focus on Somalia's distinctive economic landscape, a region that has yet to receive much attention in the previous literature. The study suggests policy reforms that encourage the Somali government to prioritize attracting foreign investments and strengthening capital formation as critical drivers of economic growth.

Keywords Somalia, Government expenditure, GDP, Gross fixed capital formation, FDI, ARDL model

1 Introduction

Public expenditure is a pivotal fiscal tool for economic growth, yet its effectiveness hinges on composition, institutional context, and interactions with other macroeconomic variables [1]. It is a critical fiscal tool through which collected revenues are allocated to benefit the broader economy. It is typically categorized into two major types:

current expenditure, which includes expenses such as salaries, wages, and consumables, and capital expenditure, which refers to investments in infrastructure, education, healthcare, and other long-term projects [2]. The correlation between government expenditure and GDP growth has been a central issue in economic discourse, continuing to fuel debate among policymakers and researchers [3]. This has prompted significant attention to how public expenditures can address critical economic challenges such as unemployment, inflation, and inequality and, most importantly, how they can act as a catalyst for economic growth [1]. Increased public spending should improve living standards by enhancing access to essential services such as education, healthcare, and infrastructure, fostering human capital development and stimulating economic activity.

From a global perspective, the issue of government expenditure is a major focus for researchers and policymakers, grounded in competing theoretical frameworks. Keynesian theory posits that government spending stimulates aggregate demand and short-term growth, particularly in underperforming economies [4], while endogenous growth models emphasize productive public investments as catalysts for long-term productivity [5]. In Europe, the sovereign debt crisis prompted a shift toward *productive spending* and austerity in nonproductive areas [6], reflecting Keynesian and neoclassical policy trade-offs. In sub-Saharan Africa, the debate remains unresolved. Nigeria's experience, for instance, reveals mixed outcomes: despite significant expenditure increases, growth stagnates due to misallocation and rent-seeking [7], underscoring the critical role of institutional quality in mediating expenditure effectiveness. These theoretical tensions are acute for Somalia, a fragile state with limited fiscal space. The government faces a dual challenge: short-term stabilization (Keynesian demand support) versus long-term growth (endogenous productivity drivers). This study bridges theory and context by examining whether Somalia's expenditure patterns align with *productive* growth-enhancing frameworks or perpetuate neoclassical inefficiencies.

The role of technological advancement and environmental factors in economic growth has also been explored in the literature. For instance, [8] emphasize that technological advancement enhances well-being and economic growth. Similarly, [9] find that while energy consumption drives environmental harm, technological innovation helps mitigate its effects. Their studies highlight the critical role of innovation in achieving sustainable development. For Somalia, where economic growth must align with environmental sustainability, these findings suggest that strategic policies promoting technological progress and energy efficiency are essential.

Government expenditure is a pivotal fiscal tool for economic growth, yet its effectiveness in fragile states like Somalia remains contested. Despite rising public spending [10], Somalia's economy has stagnated, with real GDP per capita declining [11], exacerbated by structural weaknesses such as security-dominated budgets, minimal social sector allocations and heavy reliance on volatile external grants. Moreover, inefficient public expenditure allocation risks crowding out private investment, particularly Gross Fixed Capital Formation (GFCF) and Foreign Direct Investment (FDI)—essential drivers of long-term economic growth. This disconnect raises critical questions: Does government spending in Somalia stimulate short-term demand at the expense of long-term productivity? To what extent do GFCF and FDI mediate this relationship? While Keynesian theory suggests that increased government spending can boost short-term demand, endogenous growth models emphasize the necessity of productive investments

in sustaining long-term economic expansion. These competing perspectives are particularly relevant in Somalia, where high informality and institutional fragility may distort fiscal multipliers. To address this issue, this study employs the Autoregressive Distributed Lag (ARDL) bounds testing approach, using data from 1991 to 2021, to examine both the short-run and long-run dynamics of government spending, GFCF, and FDI with economic growth. The findings will provide empirical insights into the effectiveness of fiscal policy in Somalia's unique economic landscape.

Somalia's government spending remains constrained by structural weaknesses, with total expenditures reaching $1.1 billion in 2023 and projected to rise modestly to $1.2–1.3 billion in 2024 [10]. Limited domestic revenue, accounting for just 5–6% of GDP, continues to hinder fiscal sustainability, forcing the government to rely heavily on external grants to cover budget deficits [6, 7]. A significant portion of government spending, approximately 35–40%, is allocated to security, while public sector wages consume 25–30% of total expenditures [10]. Although debt servicing has declined from 10–15 to 5–10% following the 2023 HIPC Completion Point, which provided $4.5 billion in debt relief, social sectors remain underfunded, with only 10–12% of the budget allocated to health and education combined [12]. Despite some fiscal improvements, the government remains highly dependent on donor assistance, with minimal progress in expanding the domestic revenue base or reallocating spending toward long-term development priorities [13].

Somalia's economy presents a distinctive case for examining the government expenditure-growth nexus due to its fragile post-conflict recovery, reliance on external aid, and underdeveloped industrial base. The country's GDP remains heavily dependent on agriculture (60% of employment) and services (30% of GDP), with limited manufacturing capacity [14]. Government expenditure, mainly financed by remittances and international grants, prioritizes security and recurrent costs over productive investments—a pattern that may distort fiscal multipliers. Meanwhile, FDI inflows are concentrated in telecommunications and logistics, while GFCF is hindered by weak infrastructure and institutional instability. These structural features create a unique environment where traditional fiscal policy theories may not hold: high informality (70% of employment) and low tax capacity amplify the risk of crowding-out effects from government spending, while FDI and GFCF face distinct institutional barriers. By analyzing this context, our study sheds light on how fiscal policy interacts with Somalia's fragile economic foundations, offering insights for similarly structured post-conflict economies.

Studying the connections between government expenditure and economic growth in Somalia is paramount, as the country is undergoing significant economic reforms and recovery efforts. However, internal and external challenges have significantly hindered Somalia's economic development, including political instability, recurrent natural disasters, and a fragile institutional framework. Despite ongoing reforms and international assistance, the country's GDP growth has been consistently low and unstable between 2019 and 2023, reflecting persistent economic stagnation [11]. Understanding the role of government expenditure in this context is essential for sustainable development. By analyzing the short-run and long-run effects of public expenditure, this study can provide valuable insights into whether current fiscal policies contribute to growth or hinder progress. Additionally, a reduction in public expenditure may result in a decrease in inflation, which in turn stimulates economic development by increasing aggregate

demand [15]. This dynamic is particularly relevant in Somalia, where inflationary pressures have been a persistent challenge. Understanding how this interaction works in Somalia could offer policymakers valuable strategies for promoting economic growth.

The Somali economy has experienced numerous shocks, including the COVID-19 pandemic, floods, droughts, and ongoing political instability. Despite these adversities, the country has a unique economic landscape marked by its reliance on trade as a crucial component of its economic activity [16]. The economy showed progress with GDP growth rates of 4.6 and 4.7% in 2015 and 2016, driven primarily by increased livestock exports, a substantial contributor to the country's development. However, growth sharply declined to 2.2% in 2017 due to severe drought before recovering in 2018 and 2019 as private sector investments and improved agricultural output, spurred by favourable rains, supported economic activity [17]. Yet, GDP growth has remained low and volatile, averaging just 2% per year between 2019 and 2023, while real GDP per capita declined by an average of − 0.8% per year during the same period [11]. Despite these fluctuations, the Somali government has increased its expenditure to stabilize and grow the economy. In 2021, government expenditure represented approximately 9% of the country's GDP [18]. As a result, the Somali government faces growing pressure to utilize public spending to drive economic growth and address critical social needs. However, despite substantial expenditure, the paradoxical decline in economic growth raises important questions about the effectiveness and efficiency of such spending in fostering development.

While multiple factors influence Somalia's economic volatility, including external shocks and institutional fragility, this analysis prioritizes government expenditure as the central transmission mechanism. Given Somalia's limited private sector dynamism and heavy reliance on fiscal policy, public spending is both a shock absorber and a potential destabilizer. Unlike more diversified economies, where monetary policy or private investment may dominate growth dynamics, Somalia's macroeconomic trajectory is disproportionately shaped by fiscal decisions, particularly due to its dependence on volatile foreign aid and securitized budgets. Thus, examining the efficiency and composition of government expenditure offers critical insights into stabilizing growth in fragile states.

Despite extensive research on the impact of government expenditure on economic growth, critical gaps persist in understanding its temporal dynamics, particularly regarding short-term versus long-term effects across different institutional contexts. While studies demonstrate positive correlations in stable economies [13, 19–21], others reveal null or negative effects in fragile states [22], suggesting that institutional capacity mediates fiscal outcomes. Notably, existing literature focuses primarily on middle-income African nations such as Nigeria [23] while overlooking post-conflict economies like Somalia, where weak governance and security-dominated budgets comprising 35 to 40 per cent of expenditure remain underexplored, this relationship remains unclear in Somalia, highlighting the need for further investigation. This study aims to fill these gaps by examining the short- and long-run effects of government expenditure, gross fixed capital formation, and GDP per capita using an ARDL framework.

Using World Bank and SESRIC data, we first test for stationarity and cointegration to ensure robust econometric analysis. Our findings reveal that GFCF significantly boosts long-run GDP growth, while FDI has a marginally positive effect. Conversely, government expenditure exhibits a negative long-term impact, likely due to tax distortions and

unproductive allocations. In the short run, FDI and government expenditure positively influence GDP, whereas GFCF shows a negative effect. The significant error correction term confirms a strong adjustment mechanism toward equilibrium. These results underscore the need for policy reforms, including reallocating government spending toward productive sectors, enhancing FDI incentives, and improving capital formation efficiency to foster sustainable economic growth in Somalia.

This study is critically important as it provides a comprehensive empirical analysis of the short- and long-term effects of government expenditure on economic growth in Somalia—a fragile, post-conflict economy with unique structural challenges. By employing the ARDL approach to examine data from 1991 to 2021, we uncover a paradoxical finding: while government spending stimulates short-term growth, it exerts a significant negative long-term impact (– 0.33% GDP per 1% spending increase) due to unproductive allocations and tax distortions. These results challenge conventional fiscal policy assumptions and offer timely insights into Somalia's ongoing IMF-backed reforms, debt relief conditionalities, and World Bank development frameworks. Moreover, our context-specific findings address a glaring gap in the literature on fragile states, where institutional weaknesses and aid dependence fundamentally alter expenditure-growth dynamics. The study's policy recommendations—particularly the reallocation of security spending toward high-multiplier sectors—provide actionable solutions to enhance fiscal sustainability and align Somalia's limited resources with its development priorities.

This research contributes to the literature in the following ways. First, the study contributes to the literature by addressing the short-term and long-term impacts of public spending on Somalia's economic development. Policymakers can make informed decisions regarding fiscal policies to promote sustainable development and address economic challenges more effectively. Second, this study enhances the understanding of how Somalia's unique economic conditions shape the relationship between government expenditure and economic growth. Unlike many countries studied in the existing literature, Somalia faces political instability, insecurity, and a fragile economic structure. By examining these dynamics, the study offers context-specific findings that can inform local policymakers and contribute to the broader academic debate on the varying effects of public expenditure in developing countries with similar conditions.

The rest of our study is arranged as follows: The first section introduces the topic, followed by a review of the theoretical and empirical literature in section two. The methodology is presented in section three. Section four offers the empirical findings, while sections five and six discuss the study's results and conclusions.

2 Literature review

2.1 Theoretical literature about government expenditure and economic growth

The relationship between government expenditure and economic growth can be interpreted from two primary theoretical approaches: Wagner's Law and the Keynesian hypothesis. Wagner's Law, first posited by Adolf H. Wagner, is one of the oldest hypotheses on expanding public spending. This theory asserts that the increase in public expenditure is intrinsically connected to society's structural transformation, especially during economic advancement [24]. Wagner suggested that expanding the public sector is unavoidable since the demand for public infrastructure, education, and healthcare—increases with economic progress. Moreover, Wagner's Law implies that public

sector expansion can drag further economic growth, as increased government activity places financial pressure on the economy [25]. The Keynesian theory argues that public expenditure is an exogenous policy tool that impacts short-term economic activity. In particular, the [4] posits that government spending is the primary catalyst for economic expansion via fiscal policy. Consequently, fiscal policy may be seen as a potent instrument for combating economic stagnation [26]. Both hypotheses have undergone empirical testing in many nations, with inconclusive findings. Studies that have found evidence in support of Wagner's Law, such as [27] indicate that economic growth results in increased public expenditure, consistent with Wagner's proposition that expanding economies inherently enlarge their public sectors. These studies highlight the positive association between increased GDP and higher government spending, driven by growing public demand for infrastructure, social services, and welfare programs. However, not all empirical studies support Wagner's Law. For example, [28] failed to find evidence that governmental expenditure always results from GDP growth. Their results contradict Wagner's presumption, particularly when government expenditure does not match economic development.

Furthermore, the relationship between government expenditure and economic growth has been debated across exogenous and endogenous growth frameworks. Exogenous growth models [29] view government spending as temporarily influencing capital accumulation but incapable of sustaining long-term growth due to diminishing returns—particularly relevant for Somalia, where low savings rates and capital flight constrain capital formation [30]. In contrast, endogenous growth theories [5] posit that productive public investments in infrastructure or education can permanently raise growth rates by enhancing private sector productivity, though this depends critically on expenditure allocation. For Somalia, where over 60% of spending targets security [19], the endogenous growth potential remains unrealized, creating a tension between stabilization needs and growth-oriented expenditure. This study bridges these theoretical perspectives by examining whether Somalia's expenditure patterns exhibit the productivity thresholds required for endogenous growth despite its fragile institutional context.

Gross Domestic Product (GDP) serves as the most comprehensive and widely accepted measure of a nation's economic performance, providing policymakers with critical insights into the effectiveness of fiscal and monetary interventions. Government expenditure plays a pivotal role in economic growth by financing infrastructure, public services, and strategic investments, with Keynesian theory emphasizing its stimulative effect in the short run—a relationship empirically supported by studies such as [31, 20], though long-term impacts remain debated. Foreign Direct Investment (FDI) acts as a catalyst for development, particularly in fragile economies like Somalia, by enhancing productivity through technology transfer and capital inflows, as underscored by endogenous growth theory and confirmed by [21]. Meanwhile, Gross Fixed Capital Formation (GFCF) reflects domestic investment in physical assets, a cornerstone of the Solow growth model, with robust empirical evidence from [31, 32] linking it to sustained GDP expansion. Together, these variables offer a holistic framework for analyzing growth dynamics, capturing the interplay of public fiscal policy (government expenditure), private and foreign investment (FDI and GFCF), and their collective impact on Somalia's economic trajectory—ensuring both short-term fluctuations and long-term structural drivers are accounted for in policy formulation.

2.2 Empirical review

Despite continuous economic developments, the influence of government expenditures on economic growth remains a significant issue. Researchers seek to understand its long-term effects on development, efficiency, and sustainable growth. This issue is critical in formulating fiscal policies and directing economic changes in emerging and developed nations. Using data from 1970 to 2016, [31] examine how government expenditure influences economic growth in Ghana using the ARDL econometric estimate approach. The author found that government spending had a favourable short-term connection with economic growth. Similarly, [20] identified a positive relationship between public spending and economic growth. However, contrasting evidence is provided by [31], who found that government expenditure negatively but insignificantly affects Ghana's economic growth in the long run, suggesting that initial positive effects may diminish over time.

Recent studies in fragile states, including Somalia, provide further insights. Using ARDL, Fully Modified Least Squares (FMOLS), and Dynamic Least Squares (DOLS), [33] found that government expenditure has a positive long-run correlation with CO2 emissions, with a 1% increase in total government spending leading to a 0.05% rise in emissions. This finding aligns with the Environmental Kuznets Curve (EKC) hypothesis, which posits that economic growth initially increases emissions before environmental improvements occur. In contrast, [34] integrates the EKC and Armey Curve (AC) hypotheses, arguing that while government spending contributes to real GDP per capita (RGDPPC) growth up to an optimal level, it also influences environmental outcomes, thereby requiring a balanced policy approach. Notably, the IMF's 2022 Article IV report on Somalia underscores the disproportionate allocation of government expenditure (60%) toward security, potentially distorting its impact on economic growth compared to more diversified economies [34]. However, [31] Government expenditures negatively but insignificantly influence economic growth in Ghana. This indicates that government expenditures do not contribute to sustained economic growth in Ghana, as their positive impact diminishes over the long run. Moreover, some scholars suggest that while the impact of government expenditure on economic development may be indirect, it might act as a catalyst for growth [35]. While some studies suggest that government spending positively impacts economic growth, its long-term effects remain uncertain. Contradictory findings indicate that in some cases, government expenditures negatively but insignificantly affect economic growth, raising questions about their sustainability and effectiveness in different economic contexts.

Numerous studies have explored the link between gross fixed capital formation and economic growth. Meyer and Sanusi [36] find a positive long-term association between gross fixed capital formation and growth, highlighting its essential contribution to sustained economic expansion. The long-term association suggests that productivity and economic output improve over time as a country increases its capital investment. Such investments enhance production capacity, create employment opportunities, and contribute to technological advancements, supporting continued economic development. Similarly, [31] demonstrate that Gross Capital Formation significantly impacts economic growth, underscoring its importance in fostering economic development. Hussein et al. [32] further confirm that gross fixed capital formation drives economic growth, emphasizing the importance of capital investment in enhancing productivity and growth. Furthermore, [37] underscore the significance of public investment in sustainable

agricultural practices and education, contributing to Somalia's poverty alleviation and economic development through targeted policies aligned with the Sustainable Development Goals (SDGs). Studies confirm a positive association between gross fixed capital formation and economic growth but do not sufficiently analyze variations across different economic structures, such as fragile states, resource-dependent economies, or post-conflict regions like Somalia.

Numerous researchers have suggested that FDI is essential in driving economic development, particularly in developing economies [31] indicate that FDI and Gross Capital Formation greatly contribute to short- and long-term economic development. Both FDI and capital formation contribute to job creation, which increases household incomes, stimulates consumption, and supports economic growth. Another study by [21] demonstrated a favourable correlation between FDI and Gross Domestic Product (GDP). This result shows that FDI creates new jobs across various sectors, increasing household incomes, boosting consumption, and stimulating economic demand. Similarly, [38] suggest that fluctuations in FDI, whether increases or decreases, contribute to Somalia's economic expansion, further highlighting the pivotal role of FDI in fostering growth. Furthermore, [39] extend the discourse by linking FDI to renewable energy consumption, arguing that FDI inflows contribute to economic growth and environmental sustainability. This result promotes renewable energy consumption, which in turn supports both economic growth and environmental sustainability. While FDI is acknowledged as a driver of economic growth, there is a lack of research on how its impact varies across different sectors. The relationship between FDI, employment creation, and technological spillovers in developing economies remains underexplored.

Figures 1, 2, 3, 4 indicate the trends in Somalia's GDP per capita, Government expenditures, gross fixed capital formation, and FDI.

3 Data and methods

3.1 Data sources

This study used yearly data from the period from 1991 to 2021. The period beginning in 1991 offers a substantial 31-year time series, enabling accurate econometric analysis, especially for models such as ARDL requiring adequate observations to examine long-term and short-term relationships effectively. This duration can incorporate economic cycles, policy alterations, and structural transformations. Data is sourced from the World Bank and the SESRIC, ensuring reliability and consistency across the variables.

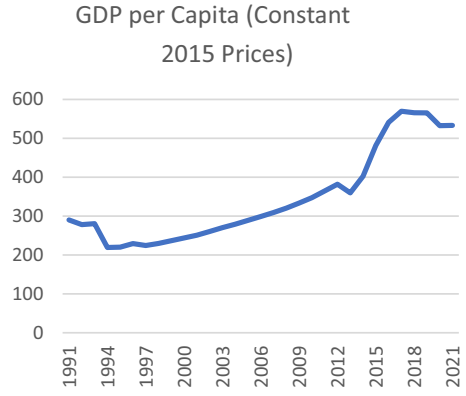

Fig. 1 GDP per capital

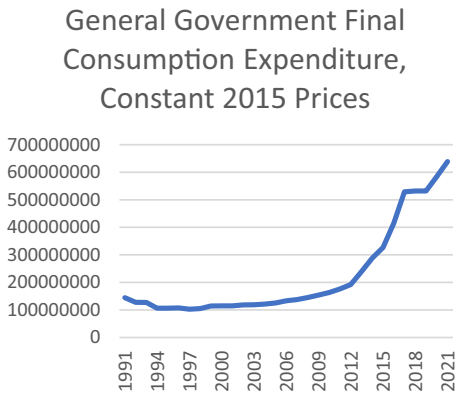

Fig. 2 Government expenditure

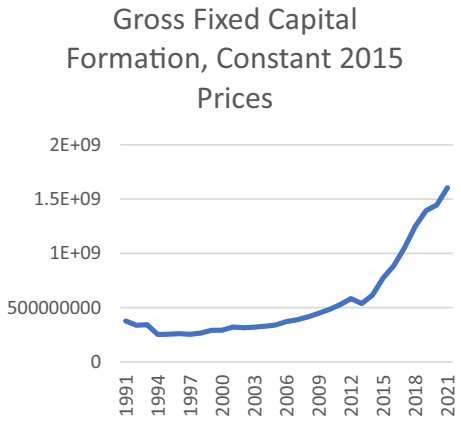

Fig. 3 Gross fixed capital formation

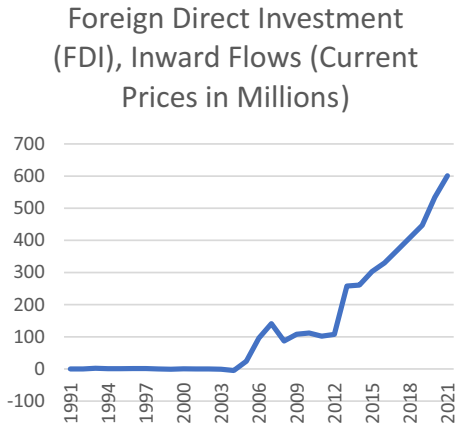

Fig. 4 Foreign direct investment (FDI)

Table 1 presents a detailed overview of the variables used in the analysis and their corresponding explanations and data sources. The primary variables used in the analysis include GDP per capita, government expenditures, gross fixed capital formation (GFCF), and foreign direct investment (FDI). All monetary values are expressed in constant U.S. dollars to account for inflationary effects.

Table 1 Variable description

Variable	Symbol	Variable type	Years	Source	Unit measurement
GDP per capital	GDP	Dependent variable	1991–2021	Sesric	GDP per Capita (Constant 2015 Prices)
Government expenditure	EXP	Independent variable	1991–2021	Sesric	General Government Final Consumption Expenditure, Constant 2015 Prices
Gross fixed capital formation	GFCF	Independent variable	1991–2021	Sesric	Gross Fixed Capital Formation, Constant 2015 Prices
FDI	FDI	Independent variable	1991–2021	Sesric	Foreign Direct Investment (FDI), Inward Flows (Current Prices in Millions)

3.2 Data and log transformation

To reduce variation and make consistent interpretation coefficients in terms of elasticities, all variables were transformed into their natural logarithmic form. However, before transformation, the dataset underwent a rigorous data-cleaning process. During the initial inspection, it was observed that the FDI series contained a few negative values in the raw data. Since natural logarithms are only defined for positive values, these observations were not suitable for direct log transformation.

To address this issue, we add a constant to all FDI values, where adding the constant makes negative values in the FDI series become positive. Then, the natural logarithm transformation was applied only after confirming that all values in each variable were strictly positive and valid. This ensures both the statistical validity of the transformation and the reliability of the empirical estimations. The transformed variables were then used in the estimation of the model, which follows an Autoregressive Distributed Lag (ARDL) framework suitable for small-sample time series with mixed integration orders.

3.3 Model specification

This study explored the effect of government expenditure on growth in Somalia. The model specification in this study is written in log-linear form as follows:

$$LGDP_t = \beta_0 + \beta_1 LEXP_t + \beta_2 LFDI_t + \beta_3 LGFCF_t + \varepsilon_t$$

LGDP is a natural logarithm of GDP per capita (constant 2015 US$) that measures economic growth. Source: SESRIC (2023), LEXP represents the Natural logarithm of general government final consumption expenditure (constant 2015 US$). Reflects fiscal policy intensity—source: SESRIC. LFDI stands for Natural logarithm of net foreign direct investment inflows (current US$ millions). Captures external investment effects. Source: SESRIC., and LGFCF is the Natural logarithm of gross fixed capital formation (constant 2015 US$). Proxies domestic investment. Source: SESRIC. In addition, parameter estimates for each independent variable are represented by and. *t* denotes time while ε signifies the error term. All variables were converted to natural logarithms to stabilize variance, enable elasticity interpretation of coefficients, and mitigate skewness [40].

3.4 Estimation technique

We first tested the stationarity of all variables to determine the most appropriate estimation technique for time series analysis. Based on the unit root test, we found that Autoregressive Distributed Lag (ARDL) is deemed reliable as all variables contain a mix of order of integration I(1) and order of zero I(0). Since none of the variables are in an order of integration of two I(2), we can proceed with the ARDL.

3.4.1 Stationarity test

The unit root test is used to determine the nonstationarity of the data. This test is crucial in determining the integration order of series data. We adopted Augmented Dickey-Fuller (ADF), which could be specified as follows:

$$\Delta Z_t = \Delta Z_{t-1} + \sum\nolimits_i \beta_i \Delta Z_{t-i+1} + \varepsilon_t$$

where $\delta = (\alpha - 1)$, ADF test nonstationarity of the series with the null hypothesis is H0: $\delta = 0$ or nonstationary, and the alternative hypothesis is H1: $\delta < 0$ or stationary. Accepting the null hypothesis of $\delta = 0$ implies *Zt* follows a pure random walk model and contains a unit root, and vice versa.

3.4.2 Autoregressive distributed lag (ARDL) model

We applied the ARDL estimation technique introduced by [41], to examine the cointegration relationship among GDP, expenditure, FDI and gross fixed capital formation variables. The ARDL method has several advantages over the previous cointegration techniques. First, the ARDL method can be applied to the underlying regressors regardless of their order of integration, that is, [I (0)], [I (1)], or a combination of both. However, it must be confirmed that none of the variables are [I (2)]. Second, the ARDL model is suitable for small sample sizes and differentiates short- and long-term effects. Third, it simultaneously estimates the long- and short-run coefficients. This feature makes it easier to distinguish between independent variables' long-run and short-run effects on the dependent variable. Moreover, this approach is particularly relevant for Somalia, where economic fluctuations and structural challenges necessitate a model that can identify both immediate and sustained effects of fiscal policy. By employing the ARDL Bounds Testing approach, this study provides a robust framework for understanding how government spending influences GDP growth, offering valuable insights for policymakers seeking to optimize fiscal strategies in a fragile economic environment. This study follows the model specifications outlined [42–44].

A general model of ARDL can be written as follows:

$$\begin{aligned} LGDP_t = {} & \beta_0 + \beta_1 LGDP_{t-1} + .. + \beta_p LGDP_{t-p} + \alpha_0 LEXP_t \\ & + \alpha_0 LEXP_{t-1} .. + \alpha_q LEXP_{t-q} + \emptyset_0 LFDI_t + \emptyset_1 LFDI_{t-1} .. + \emptyset_r LFDI_{t-r} \\ & + \gamma_0 LGFCF_t + \gamma_1 LGFCF_{t-1} .. + \gamma_s LGFCF_{t-s} + \varepsilon_t \end{aligned}$$

3.4.2.1 ARDL bounds testing method and the error correction model (ECM) Cointegration analysis based on the ARDL bounds testing method investigates the long-run association among variables of interest. The bounds test developed by [45] checks a long-run relationship (cointegration) between the variables. It compares an F-statistic against the lower bound I (0) and upper bound I(1) critical values, determining whether cointegration exists. The cointegration test is analysed using the Unrestricted Error Correction Model as follows:

$$\begin{aligned} \Delta LGDP_t = {} & \beta_0 + \sum_{i=1}^{p} \beta_i \Delta LGDP_{t-i} + \sum_{j=0}^{q} \lambda_i \Delta LEXP_{t-j} + \sum_{k=0}^{r} \delta_i \Delta LFDI_{t-k} + \sum_{l=0}^{s} \emptyset_i \Delta LGFCF_{t-l} \\ & + \theta_1 LGDP_{t-1} + \theta_2 LEXP_{t-1} + \theta_3 LFDI_{t-1} + \theta_4 LGFCF_{t-1} + \varepsilon_t \end{aligned}$$

where coefficients β, l, δ represent the short-term impact of independent variables on dependent variables while θ measures the long-run impact of independent variables on dependent variables. The null hypothesis of the Wald test is H0: $\theta 1 = \theta 2 = \theta 3 = \theta 4 = 0$, indicating no long-term relationship between the variables exists. In this regard, we reject the null hypothesis if the estimated F-statistic is greater than the upper critical value but accept the null hypothesis if the F-statistic is below the lower critical levels.

3.4.2.2 The short run and restricted ECM The restricted ECM for short-run dynamics of the ARDL is obtained by employing a similar approach to Engle and Granger (1987) representation. The restricted ECM can be expressed to have the following form:

$$\Delta LGDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{i+1} \Delta LGDP_{t-i} + \sum_{j=0}^{q} \Phi_{i+1} \Delta LEXP_{t-j} + \sum_{k=0}^{r} \gamma_{i+1} \Delta LFDI_{t-k} + \sum_{l=0}^{s} \rho_{i+1} \Delta LGFCF_{t-l} + \tau ECT_t$$

where ECT and τ signify speed adjustment to equilibrium following short-term deviation.

4 Empirical findings

This section discusses the results of the empirical study.

5 Descriptive statistics of data

Table 2 presents the study's descriptive data. The GDP has maximum and minimum values of 2.756 and 2.341, respectively. The GDP also recorded a mean value of 2.516. Government Expenditure (GEXP) averaged 8.260. Again, it provides a maximum and a minimum value of 8.805 and 8.011, respectively. Additionally, Foreign Direct Investment (FDI) has maximum and minimum values of 2.671 and −0.678, respectively. FDI also recorded a mean value of 2.516. Lastly, Gross Fixed Capital Formation (GFCF) has a higher average value, 8.670. The variable also has maximum and minimum values of 9.205 and 8,402, respectively.

5.1 Stationarity test results

The results of the unit root tests are summarised in Table 3, in which the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests are used. The ADF and PP tests reveal that GDP and Foreign Direct Investment (FDI) are stationary at the level among the series. However, Government Expenditures (EXP) and Gross Fixed Capital Formation (GFCF) were non-stationary at the level, but both became stationary after the series were differenced. The results imply that all GDP and Foreign Direct Investment (FDI)

Table 2 Descriptive statistics. *Source* Authors' estimations

Variable	Mean	Maximum	Minimum	Std. Dev	Observations
LGDP	2.515987	2.755608	2.340999	0.138591	31
LEXP	8.260319	8.805359	8.011829	0.263626	31
LFDI	1.482585	2.671173	−0.67778	0.889754	31
LGFCF	8.670085	9.205448	8.402158	0.246646	31

Table 3 The result of the unit root test. *Source* Authors' estimations

At level	With constant	With constant & trend
Unit root test table (ADF)		
LGDP	−0.1231	−3.2505*
LEXP	−0.6334	−0.0038
LGFCF	2.3951	−2.2079
LFDI	−1.2343	−3.2235*
At first difference		
d(LGDP)	−2.8746*	−4.1755**
d(LEXP)	−1.4966	−3.7555**
d(LGFCF)	−4.0539***	−5.7362***
d(LFDI)	−6.6356***	−6.5323***
Unit root test table (PP)		
LGDP	0.1157	−3.0799
LEXP	1.5969	−2.0012
LGFCF	2.0782	−2.2654
LFDI	−0.955	−3.1717
At first difference		
d(LGDP)	−4.0379***	−4.1836**
d(LEXP)	−3.1090**	−4.0657**
d(LGFCF)	−4.0586***	−5.7548***
d(LFDI)	−−9.3289***	−10.6540***

(*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%

Table 4 Results of bounds test cointegration. *Source* Authors' estimations

	Value	Signif. (%)	I(0)	I(1)
F-statistic	6.341436	10	2.72	3.77
		5	3.23	4.35
		1	4.29	5.61

Table 5 Estimated long-run results. *Source* Authors' estimations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEXP	−0.330174	0.096777	−3.411708	0.0058***
LFDI	0.009874	0.004840	2.040209	0.0661*
LGFCF	0.907674	0.094558	9.599144	0.0000***

(*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%

are I(0) while Government Expenditure (GEXP) and Gross Fixed Capital Formation (GFCF) are I(1) variables.

5.2 Bound testing results of ARDL

Table 4 shows the ARDL Bounds test results with Model Selection Criteria (1,1,1,0). We employed the information criterion (IC), the Schwarz-Bayesian criterion (SBC), and the Akaike criterion (AIC) to find the best lag length for the cointegration study. The AIC found that two lags were the most effective. The F-statistic was calculated using an acceptable lag length determined by the Akaike criterion (AIC). The ARDL bounds test was performed to examine the variables' cointegration relationship; the results are presented in Table 5. The results are presented such that when the estimated value of the F-test exceeds the values of both bounds (lower and upper bounds), a long-run association between the variables is established. The results show that the approximate value of the F-statistic (6.341) over 10%, 5%, 2.5% and 1% of the decisive upper bound is zero and

one, respectively, rejecting the null hypothesis and establishing a long-run association between the variables.

5.3 Results from long-run estimates

The result of the long-run relationship between GDP growth, Foreign Direct Investment (FDI), Gross Capital Formation (GFCF), and Government Expenditure was analysed. The findings are presented in Table 6.

The results from Table 5 show a negative and significant relationship between Government Expenditure and GDP growth in the long run. This indicates that GDP growth decreases in the long run as government expenditure increases. Specifically, a 1% increase in Government Expenditure will lead to a 0.33 percentage point increase in GDP growth in Somalia in the long run. This indicates that government expenditure in Somalia needs to be more efficient or misallocated due to corruption, weak governance, or spending on non-productive industries. For instance, Somalia's Corruption Perceptions Index (CPI) score in 2024 was 9 out of 100 [45]. However, earlier reports (e.g., 2023) noted Somalia's score as 11/100 [46]. This reflects Somalia's severe governance challenges, where a large portion of government spending may be misallocated due to corruption, undermining long-term development goals. The global average CPI score is 43, further highlighting Somalia's significant governance issues. Somalia is emerging from decades of violence and insecurity, which has weakened its institutions. If government expenditure has a negative impact on GDP growth, it may imply that public funds should be used more efficiently. Much of the spending may be allocated to non-productive areas, such as excessive administrative expenditures, military spending, or sectors that do not contribute to long-term economic growth. Additionally, infrastructure, health, and education spending may be insufficient or poorly managed, resulting in low returns on public investments. Furthermore, Somalia relies heavily on international assistance, often driving government spending habits. If financial aid is not aligned with the country's developmental goals, the spending may not contribute to long-term economic progress. Furthermore, a considerable portion of Somalia's government budget is presumably allocated to security and military. While security is an important issue, excessive expenditure on the military at the cost of other vital sectors, like infrastructure, agriculture, and social services, may have a negative effect on GDP growth. This misallocation of resources might explain the negative association between government spending and economic growth. Implement policies that promote export growth, such as more vital trade rules, enhanced port infrastructure, and access to global markets. Diversifying Somalia's export base beyond livestock and agricultural products can enhance foreign exchange earnings and economic stability. Thus, H1 is accepted,

Table 6 Estimated short-run results. *Source* Authors' estimations

Dependent variable: D(LGDP)				
Case 3: Unrestricted constant and no trend				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	−2.433530	0.429408	−5.667178	0.0001***
D(LEXP)	0.563243	0.118462	4.754634	0.0006***
D(LGFCF)	−0.590554	0.138985	−4.249057	0.0014***
D(FDI)	0.392153	0.160050	2.450193	0.0322**
CointEq(−1)*	−0.924251	0.162667	−5.681872	0.0001***

(*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%

and this finding is consistent with [46]. Our evidence, however, contrasts with [31], who found a positive relationship in more stable economies. This discrepancy may stem from Somalia's unique challenges, such as high corruption (CPI score of 9/100) and misallocating funds towards non-productive sectors.

Furthermore, the result indicates a positive and statistically significant association between Foreign Direct Investment (FDI) and GDP growth, with a significance level of 1%. A 1% increase in FDI leads to a 0.0098% decrease in GDP growth in Somalia in the long term. This suggests that increasing FDI leads to better GDP growth in Somalia. Foreign investors contribute capital, technology, management expertise and access to global markets, which may considerably enhance productivity and economic activity. The positive impact of FDI could be observed through job creation, improved infrastructure, and technological advancements. This finding shows that attracting more FDI might be an effective strategy for the Somali government to boost economic development. Policies that attract foreign investment, such as increasing political stability, expanding infrastructure, and lowering bureaucratic barriers, will likely influence the economy significantly. Thus, H1 is accepted, and this result aligns with earlier expectations and is also consistent with [31]. While [31] found a stronger FDI-GDP growth link, our smaller coefficient (0.0098%) may reflect Somalia's underdeveloped financial markets or lower absorptive capacity for foreign investments.

Lastly, the most notable finding is the strong positive and statistically significant association between Gross Fixed Capital Formation (GFCF) and GDP growth, with a significance level of 1%. A 1% increase in Gross Fixed Capital Formation leads to a 0.91% increase in GDP growth in Somalia in the long term. The positive impact indicates that as GFCF increases, GDP also grows, emphasising the importance of capital investment in driving the economy. Thus, H1 is accepted, and this finding is aligns with [36]. Our result also aligns with endogenous growth theory, which posits that internal investments in physical and human capital, innovation, and knowledge spillovers drive sustained economic growth.

5.4 Short–run result

The Error Correction Model (ECM) is used in the short-term estimation analysis of the ARDL framework. It establishes the rate at which the variables return to equilibrium in the near term.

The short-run findings in Table 6 demonstrate that the ECM is statistically significant at 1% and exhibits a negative value. This indicates that if there is a shock in the short run, all variables in the model will reach equilibrium in the long run. The findings suggest that the variables' adjustment rate to equilibrium is 92% when there is a shock. The short-run estimation results show that government expenditure and FDI positively affect GDP growth. This argues that government investment in infrastructure, public services,

Table 7 Diagnostic and stability test results. *Source* Authors' estimations

Test	F-statistics	Prob. value
Autocorrelation	4.4815	0.0767
Heteroscedasticity	6.1576	0.2910
Ramsey RESET	0.0576	0.8183
Normality		0.5981
CUSUMQ	Stable	

or social programs promotes economic activity and increases production, resulting in immediate economic development. In the short run, increasing government expenditures may be an effective tool for boosting economic growth. This might reflect a Keynesian effect, where government expenditures promote demand, improving output and income levels. This result also suggests that FDI is critical for enhancing economic growth and attracting foreign investment should be a key priority for policymakers seeking to accelerate economic development.

However, the short-run results also show that gross fixed capital formation is statistically significant and negatively related to GDP growth. This indicates that GFCF's immediate effect on GDP is negative in the short run despite its crucial role in the economy's growth and development over the long term.

5.5 Diagnostic and stability tests

We conducted several diagnostic tests to validate our model's stability and robustness further. Ensuring the absence of autocorrelation, heteroscedasticity, and non-normality, as well as confirming the correct specification of the model, is crucial. The expectation is that all test statistics should be statistically insignificant to confirm the model's robustness.

The results in Table 7 show that the Breusch–Godfrey LM test for autocorrelation indicates no evidence of autocorrelation, as the F-statistic is statistically insignificant. Similarly, the Breusch–Pagan–Godfrey test for heteroscedasticity reveals a statistically insignificant F-statistic, suggesting that heteroscedasticity is not present among the error terms. The Jarque–Bera test for normality shows that the variables are normally distributed. Additionally, the Ramsey RESET test for model specification results in an F-statistic of 2.7463 with a p-value of 0.1414, indicating that the model is correctly specified, as we fail to reject the null hypothesis of no misspecification. Furthermore, The CUSUM and CUSUMSQ tests conclude that the parameters are stable since they fall within the 95% confidence interval. The results are shown in Fig. 5. The diagnostic tests confirm that the model is free from heteroscedasticity and serial correlation and is accurately identified, ensuring its robustness.

6 Discussion

This study examines the long-run and short-run impacts of government expenditure, Foreign Direct Investment (FDI), and Gross Fixed Capital Formation (GFCF) on GDP growth in Somalia. Our findings reveal that government expenditure has a positive short-term effect but a negative long-term impact on GDP growth in Somalia. Specifically, a 1% increase in government spending raises GDP growth by 0.33 percentage points in the long run, contradictory to the initial claim of an adverse effect. Our findings highlight Somalia's unique fiscal policy dilemma—government spending stimulates growth in the short run but undermines it over time. The immediate benefits reflect Somalia's post-conflict economic fragility, where public expenditure fills critical gaps in infrastructure, supports basic services and stabilizes demand in an economy with limited private sector capacity. However, the long-term negative effect exposes more profound structural weaknesses: high public debt, institutionalized corruption, and excessive security spending divert resources from productive investment. Additionally, heavy reliance on remittances and foreign aid distorts fiscal sustainability. These results suggest Somalia has

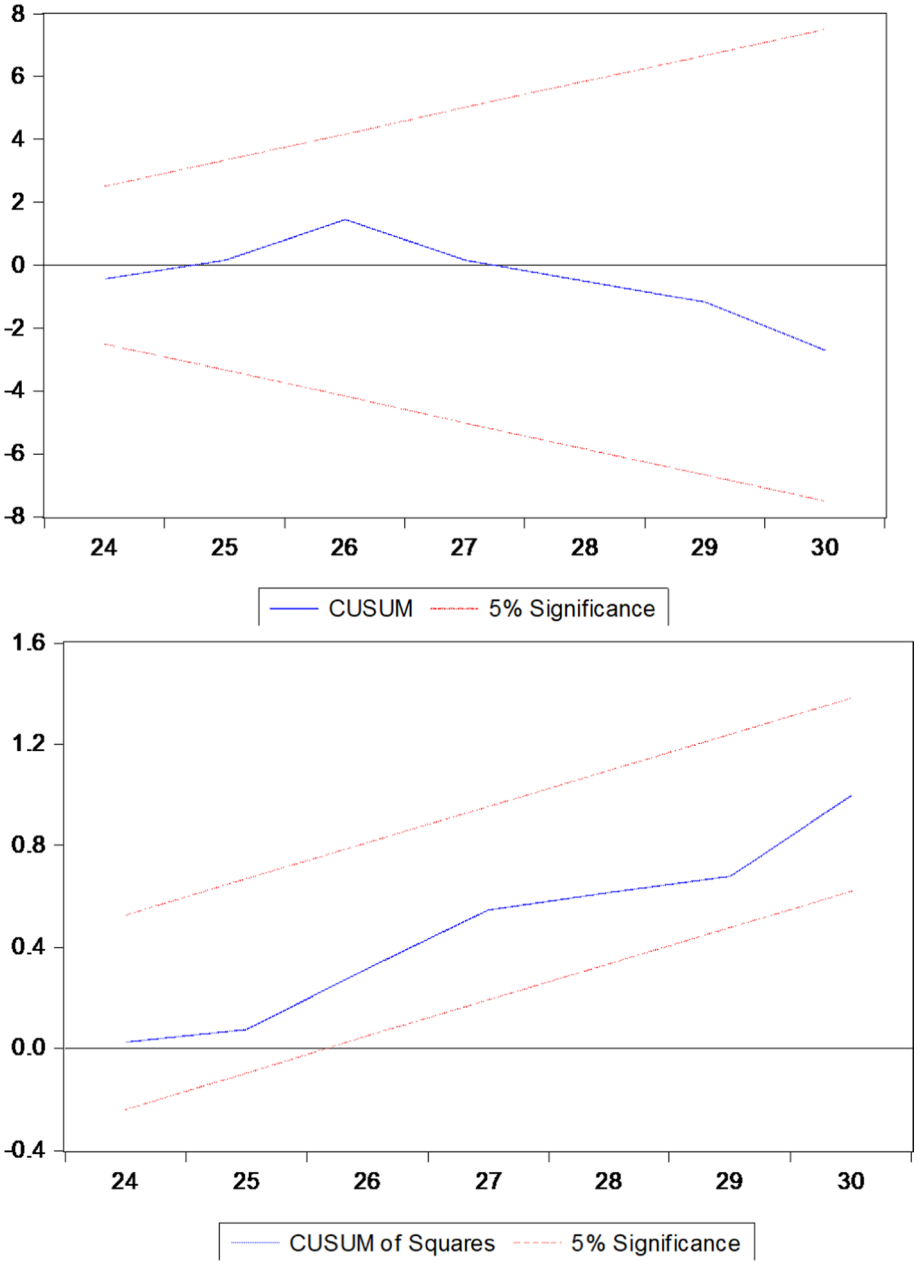

Fig. 5 Stability test (CUSUM & CUSUMSQ)

reached a tipping point; further indiscriminate spending risks exacerbating inefficiencies rather than spurring development. Policy must shift from expanding expenditure to improving quality, prioritizing institutional reforms, targeted infrastructure, and private sector development to sustain growth. Our analysis also finds that Gross Fixed Capital Formation (LGFCF) has a positive long-term effect but a negative short-term impact on GDP growth. This aligns with theories suggesting that while capital formation is crucial for long-term growth, transitional frictions (especially in fragile states like Somalia) can create short-term drags. On the other hand, Foreign Direct Investment (FDI) positively influences GDP growth in both the short and long run. In the short run, FDI stimulates economic activity through direct capital injections, job creation, and enhanced aggregate demand, particularly in high-impact sectors such as telecommunications, port

infrastructure, and financial services. These investments address critical infrastructure gaps and foster immediate productivity improvements and foreign exchange inflows, mitigating some of Somalia's structural constraints. Over the long term, FDI contributes to sustainable growth by facilitating technology transfer, industrial diversification, and institutional strengthening, thereby enhancing the economy's productive capacity.

7 Conclusion and policy recommendation

This study investigates the influence of government expenditure on GDP growth in Somalia, utilizing annual time series data from 1991 to 2021 and the ARDL estimation technique. The findings indicate that, in the long run, government expenditure negatively affects GDP growth, likely due to inefficiencies, corruption, and misallocation of resources. In contrast, FDI and GFCF positively contribute to economic growth, emphasizing the importance of foreign investment and capital formation in driving long-term development. Short-run results reveal that government expenditure and FDI stimulate economic activity, while GFCF has an initial negative effect. The error correction model confirms a high adjustment speed (92%) toward long-run equilibrium. These findings highlight the need for efficient public spending, policies that attract FDI, and strategies to enhance capital investment for sustainable economic growth in Somalia.

The study suggests policy reforms that aim to stimulate Somalia's economic growth by addressing key findings. First, government expenditure reforms are essential since the research indicates a negative long-term correlation between government spending and economic development, mainly due to tax distortions that impede productivity. In the long run, excessive taxes to finance government spending, especially in unproductive sectors, may hinder development. The Somali government should implement strategic expenditure reduction by gradually decreasing overall spending levels while reallocating resources toward high-productivity sectors. To maximize economic returns, the government should shift spending toward sectors that enhance productivity and long-term growth, such as Infrastructure, Agriculture & Livestock, Education and Private Sector Development. Secondly, policies that enhance Foreign Direct Investment (FDI) should be strengthened by establishing a more investor-friendly environment through regulatory improvements, tax incentives, and ensuring political stability, considering FDI's beneficial effects on short- and long-term GDP development. Policymakers should create a conducive business environment by strengthening regulatory frameworks, ensuring political stability, and improving governance to attract more FDI. Third, the efficacy of capital formation must be improved with policies that promote superior planning and utilization of investments in infrastructure and technology. Since GFCF includes investments in physical assets such as roads, bridges, energy, and communication, the Somali government should prioritize infrastructure development. Improving transport networks and reliable electricity supply can enhance economic productivity and attract further investments. Policies should encourage domestic and foreign investors to increase capital formation. This can be achieved by reducing bureaucratic barriers, improving business regulations, and ensuring macroeconomic stability.

While this study provides valuable insights into Somalia's macroeconomic performance, it has several limitations. It has several limitations. First, it primarily relies on secondary data, which may be subject to inconsistencies, missing values, or methodological variations that could impact the robustness of the findings. The lack of

comprehensive primary datasets limits the ability to validate and expand upon the results. Second, the analysis focuses on aggregate macroeconomic variables without sectoral disaggregation. A more detailed examination of government spending across healthcare, education, and infrastructure sectors could provide deeper insights into the impact of targeted fiscal policies. However, this study does not account for the differential effects of sectoral spending due to current data limitations. Future research should address this gap by incorporating disaggregated fiscal data to assess the varying effects of government expenditure across different sectors of the economy. Third, while the study examines the role of Foreign Direct Investment (FDI) in economic growth, it does not account for Official Development Assistance (ODA), which plays a significant role in Somalia's economic stability and infrastructure development. Future research should explore the comparative effectiveness of FDI and ODA in driving long-term growth. Additionally, demographic and social indicators such as labour force participation, education, and technological advancement are not included due to data limitations. With ongoing data collection under the 2024–2028 National Development Plan, future studies should integrate these factors to provide a more comprehensive understanding of Somalia's economic trajectory.

Author contributions
The authors have contributed significantly to this article's conception, design, and development. Bile Abdisalan Nor was responsible for writing the first draft of the article, the introduction, the literature review, the data collection, the analysis, the discussion section, and reviewing and editing the manuscript. Yusniliyana Yusof wrote the econometric methodology and data section and reviewed and edited the manuscript.

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Availability of data and materials
The datasets used and analysed during the current study are accessible via the following links: https://www.sesric.org/query.php

Declarations

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Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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