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Article

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Asymmetric modeling of the fiscal policy–economic growth nexus in Somalia

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ABSTRACT

Somalia has faced a prolonged challenge of high dollarization, which has limited the effectiveness of conventional monetary policy tools. In response, fiscal policy has taken center stage as the primary means of economic management by the government. This study aims to investigate the asymmetric impact of fiscal policy on Somalia's economic growth, utilizing annual time series data spanning from 1970 to 2019 and employing the Nonlinear Autoregressive Distributed Lag (NARDL) model. The results indicated the existence of cointegration among the variables. In the long run, both increases and decreases in government expenditure exhibited a significant positive effect on economic growth, with a more pronounced impact observed for decreases in public expenditure compared to increases in government spending. Furthermore, in the short run, both increases and decreases in government expenditure had a significant positive effect on economic growth, although an increase in government spending showed a stronger impact on economic growth compared to a decrease in government expenditure. Notably, the study surpassed various diagnostic tests, ensuring the robustness of the findings. Based on these results, we recommend that policymakers prioritize fiscal policy, particularly public spending, as a crucial channel for fostering economic growth. Additionally, directing public spending towards productive sectors of the economy and promoting fiscal transparency are suggested as means to achieve fiscal policy objectives effectively.

PUBLIC INTEREST STATEMENT

Somalia faces a persistent challenge of high dollarization, rendering conventional monetary policy tools ineffective. In response, fiscal policy has become the primary tool for economic management. The asymmetric impact of fiscal policy on economic growth in Somalia remains an underexplored area in the literature, particularly in the context of a least developed country. The research takes the initiative to investigate and understand the asymmetric impact of fiscal policy on Somalia's economic growth. By utilizing the NARDL model, it aims to provide policymakers with nuanced insights into the specific dynamics of fiscal policy in Somalia. The study evaluates both expansionary and contractionary fiscal policies to offer comprehensive recommendations for effective economic development in this unique and complex environment. Policymakers in Somalia benefit from tailored strategies derived from the study, enabling them to navigate the economic challenges effectively. Researchers and economists gain valuable insights into the asymmetric effects of fiscal policy in a least developed country, contributing to the broader understanding of economic dynamics. The government of Somalia can use the research findings to enhance the design and implementation of fiscal policies, particularly in the allocation of public spending, fostering more effective economic growth. The general population in Somalia stands to benefit from improved economic conditions resulting from more targeted and efficient fiscal policies. This may lead to increased employment opportunities and better living standards. The research contributes to the broader scientific understanding of fiscal policy dynamics in least developed countries. This understanding is crucial for the global community in shaping policies that address the unique challenges faced by such nations. Scholars and researchers focused on economic development, especially in least developed countries, gain from the study's methodology and findings. It adds a nuanced perspective to the existing literature on fiscal policy impacts.

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1. Introduction

Fiscal policy plays a significant role in the government's efforts to enhance economic performance and prosperity by adjusting the expenditure and revenue profiles of a country's economy. It encompasses various aspects such as tax policies, government spending, and debt management, all of which have significant impacts on the overall macroeconomy. This economic policy involves techniques for generating government revenue, usually through taxation, and plans for allocating the earned funds to achieve specific economic objectives (Yusuf & Mohd, 2021). Government expenditure is a key fiscal policy tool used by governments to achieve macroeconomic goals (Akaakohol et al., 2019).

There are two main types of fiscal policies: expansionary fiscal policy and contractionary fiscal policy. An expansionary fiscal policy aims to boost economic growth by increasing government spending, lowering taxes, or both, as per the basic Keynesian model. However, if this policy fails to achieve the expected growth rate, it may lead to insufficient funds to cover its expenditure through tax collections in the future (Al-Bataineh, 2012). On the other hand, a contractionary fiscal policy involves raising taxes, reducing government spending, or both to combat rising inflation. Changes in government expenditure (increase or decrease) directly influence economic performance in either direction, *ceteris paribus*. However, due to indirect effects on spending and other components of Gross Domestic Product (GDP), such changes can exacerbate economic decline (Obaidullah, 2019).

In recent years, the relationship between fiscal policy variables and economic growth has garnered significant attention as economists and policymakers seek to understand how government expenditure impacts economic growth. While existing studies in most developed and developing nations tend to reinforce the idea of asymmetry, there is a lack of scientific research on the topic of asymmetric impact of fiscal policy on economic growth in least developed countries like Somalia. The limited ability of governments in these nations to substantially influence inflation and interest rates amidst uncertainties can significantly influence the scope of asymmetries in fiscal policy (Hussain et al., 2020). Previous research in emerging nations anticipated a symmetric fiscal policy effect, likely due to the mismatch between macroeconomic theory and empirical methodology at the beginning of the 21st century (Hussain et al., 2020).

Several studies have examined the nonlinear effects of fiscal policy on economic development in different countries. For instance, Abdel-Latif and Mishra (2016) analyzed data from Egypt using the nonlinear autoregressive distributed lag (NARDL) model and found that public spending has a non-linear effect on economic development at both aggregated and disaggregated levels. Afonso et al. (2018) utilized threshold Vector Autoregression (TVAR) to estimate the non-linear impulsive responses of production to fiscal policy in the United States, the United Kingdom, Germany, and Italy. During the economic crises of 2008–2009, the fiscal multiplier remained higher than normal, according to their results. In the case of Pakistan, Hussain et al. (2020) applied NARDL to yearly time series data from 1976 to 2017 and found a nonlinear effect of overall fiscal deficit in the short run, while no such effect was observed in the long run. Similarly, Yusuf and Mohd (2021) used the NARDL model and found evidence of nonlinear cointegration between fiscal policy variables and economic growth in Nigeria.

Somalia's fiscal policy has gained momentum recently, becoming the primary regulatory option for the government due to high dollarization in the economy and instability of the local currency (Somali shilling), rendering monetary policy ineffective. Consequently, fiscal policy has become the most relevant tool to enhance the performance of Somalia's economy. Despite its significance, there has been a lack of prior studies examining this subject matter in the Somali context. While there is empirical literature supporting the association between fiscal policy and economic growth, this study aims to bridge the gap by exploring the asymmetric impact of fiscal policy (expansionary and contractionary) on economic growth in Somalia. Specifically, we hypothesize that the effects of fiscal policy on economic growth in Somalia are nonlinear and asymmetric. To achieve these objectives, this study adopts the NARDL model as the econometric tool. The choice of this model in our study is justified due to Somalia's economic complexity, which necessitates capturing nonlinear relationships, accommodating short- and long-run dynamics, and considering asymmetric responses to fiscal policy changes. This approach enhances our ability to provide policymakers with nuanced insights for more effective and tailored economic development strategies in Somalia.

The following sections of the article are structured as follows: [Section 2](#) reviews the literature related to the nexus between fiscal policy and economic growth. [Section 3](#) provides information about the data sources, descriptions, and econometric methodology. [Section 4](#) presents the empirical analyses and discussions, while the final section concludes the study and offers policy implications for the concerned policymakers.

2. Literature review

2.1. Theoretical consideration

One way to approach the literature on the effects of fiscal policy on economic growth is to examine the predictions of the Theory of Fiscal Policy and the Pure Theory of Public Expenditure on this subject. The Theory of Fiscal Policy posits that the primary goals of fiscal policy involve income redistribution, resource reallocation, and economic stabilization. This theory was developed based on academic work by Musgrave (1959) and Johansen (1965). It is generally expected that policymakers aim to enhance the social well-being of the general public, contingent on various indicators depending on the governing administration (Tanzi, 2006). Thus, this theory asserts that fiscal policy can influence an increase or decrease in public spending, depending on the prevailing priorities, supporting hypothesis one. However, it does not explicitly state whether it favors pro-cyclical or countercyclical measures. Nevertheless, the theory underpins hypothesis two and three through its stabilization goal, which seeks to influence economic stability by altering public expenditure and revenue.

Musgrave (1959) and Johansen (1965) present several assumptions pertinent to this theory. Firstly, the public budgeting process involves public finance decisions formulated solely within the public budget. Secondly, the government's budgeting decisions are based on analysis supported by reliable data and objective forecasts. Thirdly, policymakers consider the best interests of the public when making decisions. Lastly, the government should exercise control over economic policies to make feasible decisions.

The Theory of Fiscal Policy has a few shortcomings, including skepticism regarding policymakers' detachment from their individual goals and the achievement of public welfare. To bolster its validity, stronger organizational systems need to be in place (Tanzi, 2006). In summary, this theory adopts a normative economic perspective, explaining the measures that should be implemented rather than focusing on the resulting effects when fiscal policy is put into action. Essentially, the theory has not explicitly explained the interaction of public revenue and public expenditure in an economy, unlike other theories. In conclusion, this theory supports hypothesis one and aligns with objective one, as fiscal policy aims to redistribute and reallocate resources in a country. Furthermore, the theory supports hypothesis two, as fiscal policy, through its goal of stabilization, seeks to influence economic stability and growth in an economy.

Fiscal policy is typically categorized as pro-cyclical or counter-cyclical, depending on the prevailing economic conditions in a country or region. Pro-cyclical fiscal policies have been more common in developing countries, while developed countries have been adopting counter-cyclical policies (Strawczynski & Zeira, 2007). These divergent results could be attributed to developing nations' experiences of limited borrowing potential, political factors, policy conditions imposed by international financial institutions, and the nature of implemented fiscal rules (Alesina & Tabellini, 2005). Counter-cyclical policies have been endorsed for enhancing macroeconomic stability. Strawczynski and Zeira (2007) emphasize that counter-cyclical fiscal policy would be optimal if certain conditions hold, such as perfect credit markets for all agents (individuals, firms, and government) and absence of credit constraints on firms and individuals.

The increased focus on this theory arose from the adoption of the laissez-faire philosophy and the free market mechanism. Samuelson (1954) argued that there is a significant distinction between private goods and public goods. While private goods can be consumed by different individuals, public goods are not depleted when one person consumes them. However, other researchers have contributed to the understanding of the various differences between private goods and public goods, especially regarding the extent to which they provide collective benefits.

Building on Samuelson's work, Musgrave (1959) laid the foundation for present-day descriptions of pure or impure public goods and private goods. According to Musgrave (1959), a pure public good is entirely non-rivalrous and non-excludable, meaning that once the good is provided to one individual, additional people can use it at no extra cost, while also being challenging to prevent others from using it. Samuelson's (1954) main argument is that the value of public goods and private goods depends on the economic conditions in a nation and can vary across continents globally. Notably, Samuelson's contribution does not appear to support the Keynesian economic assertion that public expenditure is countercyclical to economic growth. This indicates that the theory seems to support pro-cyclical policy measures, where it is expected that public expenditure would increase during economic booms and decrease during recessions. However, the theory does not clearly indicate the effect of economic policy on spending levels. In conclusion, this theory supports hypothesis two in the context of economic growth and public expenditure. The theory contends that the value of public goods is dependent on the economic conditions prevailing in an economy.

2.2. Empirical evidence from the literature

Fournier (2016) examined the positive effect of public investment on potential growth. The study used an estimated baseline convergence model that included public investment and its components to capture the long-term impact of human capital and physical investment on the potential output of a panel of OECD nations. The estimates indicated that public investment has a beneficial impact on long-term growth and labor productivity. It was also observed that investing public funds can accelerate convergence in nations that are currently catching up. However, the impact of public investment varies across different areas of the country. For instance, public investment in health and research and development was found to be particularly advantageous. Nevertheless, the study also suggested that growth advantages from increasing public investment may diminish at large levels of public capital stock due to diminishing returns.

Fournier and Johansson (2016) conducted a study on the effect of the size and mix of public spending on growth and inequality in OECD nations. The estimated baseline convergence model incorporated the long-term impact of human capital and total investment on potential output. The results indicated that certain public expenditure items, such as education and investment, have a positive effect on growth, while others like pension and subsidies have a negative effect. The study warned that having large governments, unless exceptionally effective, could reduce economic development potential. Additionally, the research examined the impact of public expenditure on income disparity, suggesting that increasing the size of government, family benefits, and other forms of public assistance could help reduce inequality. The study also found that government reforms and initiatives to promote secondary education completion could contribute to reducing economic disparity. Overall, the simulated growth and distributional consequences showed that most changes could generate substantial economic benefits while also benefiting the poor.

Adegboyo et al. (2021) analyzed the impact of government policies, including fiscal, monetary, and trade policies, on Nigeria's economic growth using the endogenous growth (AK) model as the theoretical foundation. The findings from unit root tests indicated that the variables had different degrees of stationarity, while the bound test results suggested cointegration among the variables. The long-term results of the ARDL study revealed that fiscal policies were encouraging economic development, while trade policies were impeding it in Nigeria. Regarding short-term economic development, fiscal measures had a mixed influence, with government expenditure continuing to fuel growth, while tax collection had limited effects on the country's economy. The study also found that interest rates had a positive effect on Nigeria's economy, while the money supply hindered growth. The research recommended an overhaul of the country's export policy to reduce imports and promote the refining of raw materials before export.

Oo (2019) examined the effect of fiscal policy on economic growth in Myanmar using the ordinary least squares (OLS) approach with data from 1979 to 2016. The findings showed that the country's budget imbalance had a statistically significant impact on economic growth, with deficit spending having a multiplier effect on growth in line with Keynesian theory. The study suggested that greater governmental expenditure was needed due to a lack of private involvement in infrastructure projects. It emphasized the importance of keeping fiscal policy at a reasonable level in the medium term.

Furthermore, the study recommended prioritizing public funds allocation to infrastructure, health and education, and poverty reduction initiatives. The researchers also highlighted the risk of unsustainable macroeconomic instability resulting from high and persistent deficits.

Onifade et al. (2020) conducted a study on the impact of government expenditures on economic growth in Nigeria. The empirical evidence indicated a level connection between Nigeria's economic growth and public expenditure metrics. The analysis found that government recurrent spending had a large negative influence on economic growth, whereas public capital expenditures had a marginally beneficial effect during the period under consideration. The Granger Causality Test results revealed that government fiscal expansion based on debt financing significantly increased public spending and domestic investment, with the latter also boosting economic growth significantly.

Yan and Gong (2009) explored the relationship between government expenditure, taxation, and long-run growth. Their research suggested that the structure of taxes and government spending could impact the long-term growth rate by influencing labor-leisure choices, saving-consumption preferences, and the percentage of government expenditure to GDP. The study found that productive spending did not necessarily boost growth and that its impact varied across different areas. It pointed out that China's government productive spending was either too high or too low, resulting in sluggish GDP growth.

Johansson (2016) conducted a survey of the evidence on public finance, economic growth, and inequality. The research indicated that a big government could have a negative impact on long-term growth due to increased funding costs of public expenditures. While spending on public infrastructure and education could enhance income over the long term, certain types of public expenditure, such as social assistance, could help decrease inequality by improving redistribution and risk sharing. The study also found that income taxes had a greater negative impact on economic growth compared to consumption or property taxes, although income taxes tended to be more progressive. A shift from income taxes to consumption taxes could have fairness consequences depending on the country's specific features.

Kim et al. (2021) investigated the relationship between fiscal policy and economic growth in China. The evidence suggested that an increase in local spending had a greater influence on output growth compared to central expenditure growth. The study also revealed that expected tax reform faced challenges due to tight liquidity. Public investment in manufacturing accounted for the most significant rise in production during the implementation of market-oriented reforms, while R&D funding played a significant role in more recent times. Long-term debt was shown to have a considerable impact on China's fiscal system, particularly in terms of government income.

Olaoeye et al. (2020) examined the asymmetric effect of government spending on economic growth in Nigeria from 1980 to 2017. The study found evidence of an asymmetric relationship between government expenditure and economic development in Nigeria over the analyzed period. Economic growth's response to government expenditure shocks varied depending on the nature of the shocks. The research concluded that fiscal measures' ability to stabilize the economy depended on the current economic cycle.

Abdon et al. (2015) revealed that sound fiscal policy could aid economic development. Fiscal expansion that is counter-cyclical can provide short-term support to aggregate demand and growth during cyclical downturns. However, fiscal contraction could help stabilize an economy that is growing at an unsustainable rate. Public investment in physical infrastructure and education can have a significant impact on long-term economic growth, especially in developing countries with weak private sectors. Taxes, such as corporate income taxes, may distort incentives and behavior, negatively affecting investment. The effect of various taxes on the economy varies, and the impact of reallocated expenditure and taxation depends on a country's unique features in relation to growth and inequality.

This study contributes to the existing literature by focusing on the asymmetric impact of fiscal policy on Somalia's economic growth, filling a crucial gap in empirical research on fiscal policy dynamics in least developed countries. While prior studies have primarily explored fiscal effects in developed and emerging nations, the scarcity of research on asymmetric fiscal impacts in least developed contexts, such as Somalia, has limited the understanding of unique economic challenges. By employing the Nonlinear Autoregressive Distributed Lag (NARDL) model, this study provides nuanced insights into the specific dynamics of fiscal policy in Somalia, offering policymakers tailored strategies for effective economic development in a distinctive and complex environment.

Table 1. Description of variables and sources.

Variable	Code	Description	Source
Gross domestic product	GDP	USD (current prices)	OIC statistics
General government final consumption expenditure	GGFCE	USD (current prices)	OIC statistics
Domestic investment	DI	Gross fixed capital formation, constant 2015 prices (USD)	OIC statistics
Household consumption	HC	USD (current prices)	OIC statistics
Export	EX	USD (millions)	OIC statistics

3. Data and methodology

3.1. Data

This section describes the data used to investigate the impact of fiscal policy on economic growth in Somalia. The main variables of the study (Table 1) were the annual time series of general government final consumption expenditure (GGFCE) (as a proxy for fiscal policy) and gross domestic product (RGDP) as a measure of economic growth. Additionally, household consumption (HC) and domestic investment (DI), measured by gross fixed capital formation, along with exports (EX), were included as control variables to improve internal validity. The data covered the period from 1970 to 2019, providing a total of 50 observations. All the data were sourced from the Organization of Islamic Cooperation Statistical, Economic, and Social Research and Training Centre for Islamic Countries (SESRIC).

3.2. Econometric modelling

The study employs the NARDL model, as introduced by Shin et al. (2014), to examine the asymmetric impact of government expenditure on economic growth in Somalia. This modeling choice extends the conventional Autoregressive Distributed Lag (ARDL) model developed by Pesaran et al. (1999) and Pesaran et al. (2001) by incorporating asymmetry, cointegration, and error correction terms within a single equation. Moreover, it effectively addresses multicollinearity concerns through appropriate lag selection. The NARDL model offers greater flexibility in simultaneously testing cointegration and asymmetric effects while accommodating variables that may possess mixed order of integration (I(0) and I(1)).

The core long-run equation capturing the relationship between fiscal policy and economic growth is defined as follows:

$$\ln GDP_t = \alpha_0 + \alpha_1 \ln GGFCE_t^+ + \alpha_2 \ln GGFCE_t^- + \alpha_3 \ln DI_t + \alpha_4 \ln HC_t + \alpha_5 \ln EX_t + u_t \quad (1)$$

where α_0 represents the intercept and $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ and α_5 denote the long run coefficients of the explanatory variables, with u_t as the error term. α_1 reflects the impact of an increase in government expenditure on GDP, while α_2 signifies the influence of a decrease in government expenditure. $GGFCE_t^+$ and $GGFCE_t^-$ are partial sum of positive and negative shocks in $GGFCE_t$:

$$GGFCE_t^+ = \sum_{i=1}^t \Delta GGFCE_i^+ = \sum_{i=1}^t \text{MAX}(\Delta GGFCE_i, 0) \quad (2)$$

$$GGFCE_t^- = \sum_{i=1}^t \Delta GGFCE_i^- = \sum_{i=1}^t \text{MIN}(\Delta GGFCE_i, 0) \quad (3)$$

This formulation is then translated into the ARDL framework akin to Pesaran et al. (1999) and Pesaran et al. (2001):

$$\begin{aligned} \Delta \ln GDP_t = & \beta_0 + \beta_1 \ln GGFCE_{t-1}^+ + \beta_2 \ln GGFCE_{t-1}^- + \beta_3 \ln DI_{t-1} + \beta_4 \ln HC_{t-1} + \beta_5 \ln EX_{t-1} + \sum_{i=1}^p \gamma_1 \Delta \ln GDP_{t-i} \\ & + \sum_{i=1}^q \gamma_2 \Delta \ln GGFCE_{t-i}^+ + \sum_{i=1}^q \gamma_3 \Delta \ln GGFCE_{t-i}^- + \sum_{i=1}^q \gamma_4 \Delta \ln DI_{t-i} + \sum_{i=1}^q \gamma_5 \Delta \ln HC_{t-i} + \sum_{i=1}^q \gamma_6 \Delta \ln EX_{t-i} \\ & + u_t \end{aligned} \quad (4)$$

where, p and q denote lag orders. α_1 is determined by β_1/β_0 , while α_2 corresponds to β_2/β_0 capturing the impact of government expenditure increase and decrease on economic growth, respectively. Moreover, $\sum_{i=1}^q \gamma_2 \Delta \ln GGFCE_{t-i}^+$ and $\sum_{i=1}^q \gamma_3 \Delta \ln GGFCE_{t-i}^-$ measure the short-run impact of government expenditure increase and reduction on economic growth.

To assess the presence of long-run asymmetric effects, the study employs a Wald-F test, comparing the null hypothesis, $\beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$, and the alternative hypothesis, $\beta_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$. Additionally, the BDS test of Broock et al. (1996) is adopted to check the presence of nonlinearity in the time series. This is done by comparing the null hypothesis of $\beta^+ = \beta^-$ (no asymmetric effect) and the alternative hypothesis of $\beta^+ \neq \beta^-$ (there is asymmetric effect). Finally, the study calculates asymmetric cumulative dynamic multiplier effects of one percent changes in $GGFCE_{t-i}^+$ and $GGFCE_{t-i}^-$, respectively as specified below:

$$m_h^+ = \sum_{j=0}^h \frac{\partial GDP_{t+j}}{\partial GGFCE_{t-1}^+}$$

$$m_h^- = \sum_{j=0}^h \frac{\partial GDP_{t+j}}{\partial GGFCE_{t-1}^-}$$

where $h = 1, 2, 3, \dots$, $m_h^+ \rightarrow \alpha_1$ and $m_h^- \rightarrow \alpha_2$.

4. Empirical results and discussion

Table 2 provides descriptive statistics for the variables used in this study in natural logarithm form, offering valuable insights into the dataset and potential relationships among the variables.

Among the variables, RGDP stands out with the highest mean value of 20.7556, followed by HC (20.4916), DI (19.3264), GGFCE (18.5007), and EX, which has the lowest mean of 2.4293. Interestingly, the mean of GGFCE, DI, and EX exceeds their respective medians, indicating right-skewness in their data distributions. Conversely, RGDP and HC have medians greater than their means, suggesting left-skewness in their distributions. Notably, all variables exhibit a high degree of consistency, with their means and medians falling between the minimum and maximum values.

The data also reveals that EX has the highest deviation from its mean, while DI exhibits the lowest deviation from its mean value. Furthermore, the data distribution analysis shows that EX and DI are positively skewed towards normality, while RGDP, GGFCE, and HC are negatively skewed. Overall, the variables demonstrate fairly symmetrical or normally skewed distributions. All variables are characterized as platykurtic since their kurtosis values are less than the normal distribution benchmark of 3, except for GGFCE, which is leptokurtic with a kurtosis of 3.6, indicating a more peaked distribution relative to the normal distribution. The Jarque-Bera statistics confirm that all variables follow a normal distribution at a significance level of 5%.

Table 2. Descriptive statistics and correlation matrix.

	LRGDP	LGGFCE	LHC	LEX	LDI
Mean	20.7556	18.5007	20.4916	2.4293	19.3264
Median	20.8253	18.4984	20.5123	1.9400	19.2948
Maximum	21.6788	19.2374	21.3580	4.7962	19.8532
Minimum	19.6475	17.3672	19.4331	1.1522	18.9965
Std. Dev.	0.5370	0.4148	0.4895	1.1465	0.1976
Skewness	-0.2164	-0.6599	-0.2703	0.6175	0.4535
Kurtosis	2.1401	3.6257	2.4103	1.8962	2.6933
Jarque-Bera	1.9309	4.4451	1.3335	5.7151	1.9095
Probability	0.3808	0.1083	0.5134	0.0574	0.3849
Sum	1037.780	925.0333	1024.580	121.4662	966.3192
Sum Sq. Dev.	14.1300	8.43202	11.7394	64.4034	1.9125
Observations	50	50	50	50	50
LRGDP	1				
LGGFCE	0.8243	1			
LHC	0.9864	0.81605	1		
LEX	-0.6607	-0.2364	-0.6101	1	
LDI	0.1275	-0.0165	0.1543	-0.1313	1

Table 3. Results from unit root test.

Variable	level			
	Augmented Dickey Fuller (ADF)		Phillips Perron (PP)	
	Constant Without Trend	Constant With Trend	Constant Without Trend	Constant With Trend
LRGDP	−2.1401	−3.6047**	−2.0466	−2.7297
LGGFCE	−3.563**	−3.7969**	−3.563**	−3.8616**
LHC	−2.2596	−3.814**	−2.1825	−2.6025
LDI	−2.1498	−2.1817	−2.0957	−2.137
LEX	−1.3395	−2.0312	−1.3395	−2.2229
Variable	First difference			
	Constant Without Trend	Constant With Trend	Constant Without Trend	Constant With Trend
	Constant Without Trend	Constant With Trend	Constant Without Trend	Constant With Trend
LRGDP	−6.1337***	−5.721***	−7.2461***	−8.8169***
LGGFCE	−6.8209***	−6.8314***	−6.9787***	−6.9754***
LHC	−5.5784***	−5.574***	−5.9751***	−6.6687***
LDI	−8.3979***	−8.3108***	−8.39***	−8.3027***
LEX	−6.2556***	−6.2077***	−6.2339***	−6.1756***

Note: ***, **, and * indicate significance level of 1%, 5% and 10% respectively.

Regarding the relationships among the variables, a strong positive correlation exists between RGDP and GGFCE. Strong positive correlation is observed between HC and RGDP, while a strong positive association is detected between HC and GGFCE. EX demonstrates a strong negative correlation with RGDP and HC and a weak negative association with GGFCE. Additionally, DI shows a weak positive correlation with RGDP, a weak negative association with GGFCE, a weak positive relationship with HC, and a weak negative correlation with EX.

The study performed stationary tests on the data series to assess the presence of unit roots within them. This step is crucial because the existence of unit roots in the data series can lead to spurious regression results, meaning high R-squared values even in the absence of genuine correlations among the variables. Additionally, unit roots can render the series unpredictable since t-ratios would not adhere to the t-distribution. To address this concern, we employed both the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests, as summarized in Table 3.

The results reveal that GGFCE exhibits stationarity at the level, a finding supported by both the ADF and PP tests. On the other hand, GDP is deemed stationary at the level according to the ADF results, but it does not exhibit stationarity at the level in the PP results. However, other variables, such as HC, DI, and EX, do not display stationarity at the level, as indicated by the results of both the ADF and PP tests.

Nevertheless, it's noteworthy that variables like RGDP, HC, DI, and EX exhibit stationarity when first differenced at the 1% significance level. In this scenario, the variables exhibit a combination of integrated order zero, denoted as $I(0)$, and integrated order one, denoted as $I(1)$, characteristics, indicating varying degrees of stationarity within the dataset.

Public spending, as a representation of fiscal policy, plays a significant role in influencing GDP. Fiscal policy, as a regulatory tool, often necessitates adjustments, whether it is expansionary or contractionary, to respond to the current state of the economy. Consequently, it is pertinent to consider the asymmetric impact of fiscal policy on GDP.

To assess the nonlinearity in the time series, we employed the Brock–Dechert–Scheinkman (BDS) test, as proposed by Broock et al. (1996). This technique tests the null hypothesis (H_0) that time series are independent and identically distributed (iid) or linearly dependent, against the alternative hypothesis (H_1) that time series are not identically distributed or are not linearly dependent.

As presented in Table 4, the BDS test results indicate that the null hypothesis of linear dependency is rejected at the 1% significance level for dimensions 2–6 for all the variables. Conversely, the test fails to reject the alternative hypothesis of nonlinear dependence. This finding strongly suggests the presence of nonlinearity within the time series, thereby confirming the applicability of the NARDL model in our analysis.

Table 5 displays the results of the bound test for cointegration, revealing that the F-statistic of 9.3 exceeds the upper bound critical value of 4.15 at the 1% significance level. This observation signifies the existence of a long-run asymmetric relationship among the variables. In other words, asymmetric cointegration is evident in the dataset.

Table 4. Results from BDS test for nonlinearity.

Dimension	LRGDP	LGGFCE	LHC	LDI	LEX
2	0.1516***	0.1004***	0.1453***	0.1119***	0.1349***
3	0.2487***	0.1540***	0.2393***	0.1884***	0.2316***
4	0.3112***	0.1702***	0.2956***	0.2326***	0.2987***
5	0.3529***	0.1640***	0.3276***	0.2536***	0.3411***
6	0.3782***	0.1517***	0.3435***	0.2677***	0.3639***

Note: ***, **, and * indicates significance level of 1%, 5% and 10% respectively. In addition, all variables are based on natural logarithm.

Table 5. Results from Bound test for NARDL.

Model	F-statistic	Significance	Bound test critical value	
			K = 5	
			I(0)	I(1)
LGDP = f(LGGFCE, LHC, LDI, LFDI, LEX)	9.287387	1%	3.06	4.15
		5%	2.39	3.38
		10%	2.08	3.00

The critical values are based on Narayan (2004), while K presents the number of parameters in the model.

Table 6. Short-run and long-run results from NARDL.

Dependent variable is RGDP: NARDL (1,3,3,3,0,0) selected automatically using EViews		
Coefficients for long run elasticity		
Regressor	Coefficient	T-statistic
Constant	0.0785	1.8324*
LGGFCE_POS	0.5026	4.3147***
LGGFCE_NEG	0.5130	4.3951***
LHC	0.4370	3.0256***
LDI	−0.0836	−1.1700
LEX	0.0454	1.2868
Short term coefficients and error correction model		
ΔLGGFCE_POS	0.2442	5.8116***
ΔLGGFCE_NEG	0.1920	5.6086***
ΔLHC	0.8202	21.7127***
ECT(-1)	−0.9999	−8.8579***

Note: ***, **, and * indicates significance level of 1%, 5% and 10% respectively.

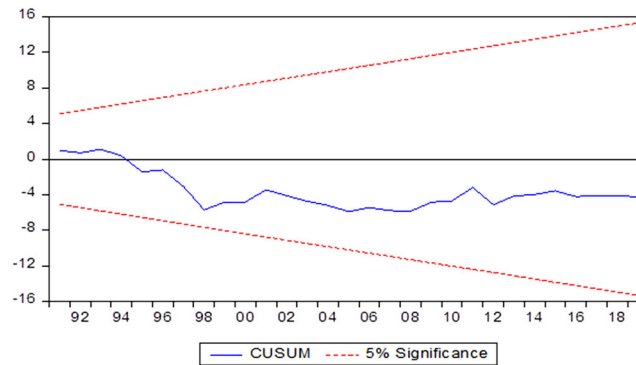
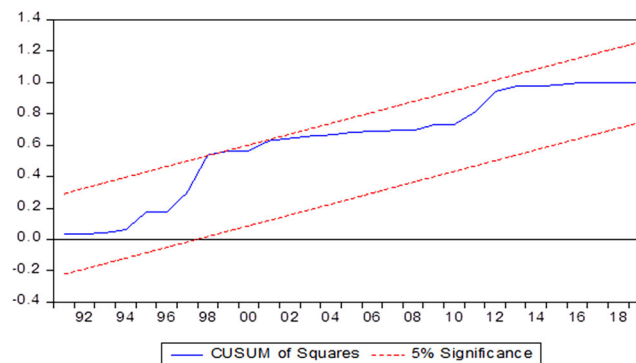
Table 6 illustrates the nonlinear findings from both long-run and short-run models regarding the impact of fiscal policy on economic growth. The results reveal that GGFCE, as a representation of fiscal policy, has a significant positive effect on GDP in both contractionary (LGGFCE_NEG) and expansionary (LGGFCE_POS) scenarios at the 1% significance level in the long run. Specifically, a 1% increase in government expenditure during expansionary fiscal policy is associated with a 0.50% increase in GDP. Conversely, a 1% decrease in GGFCE leads to a 0.51% increase in GDP in the long run, highlighting that contractionary spending has a more substantial impact than expansionary spending.

The expansion of public spending typically leads to an increase in GDP, while the contraction of public spending has the opposite effect. This could be attributed to two possible scenarios. Firstly, a reduction in public spending may lead to a decline in inflation, subsequently boosting economic growth through an expansion of aggregate demand. Secondly, the reduction in GGFCE might free up resources that can be channeled into more productive sectors of the economy, thereby enhancing economic growth, as proposed by Oo (2019). These findings align with the evidence from previous studies (Adegboyo et al., 2021; Agu et al., 2015).

Similarly, in the short run, both expansionary and contractionary GGFCE (ΔLGGFCE_POS and ΔLGGFCE_NEG) have a positive impact on GDP and are significant at the 1% level. This indicates that a 1% increase in general government expenditure leads to a 0.24% increase in GDP, while a 1% decrease in government expenditure results in a 0.19% increase in GDP in the short run. Although the sign of the effect remains consistent with the long-run results, the magnitude of the effect differs, with positive shocks having a greater impact than negative shocks in the short run.

Table 7. Results from various diagnostic checks.

Adjusted R-square	0.9879
LM Test	0.1438 (0.8667)
Reset Test	1.3868 (0.2489)
Normality Test	0.5850 (0.746398)
Heteroscedasticity Test	1.0887 (0.3027)
CUSUM Test	Stable
CUSUM of squares	Stable

**Figure 1.** CUSUM Test.**Figure 2.** CUSUM of Squares.

The error correction term (ECT) is negative and significant, confirming the existence of a long-run relationship among the variables included in the model. It also signifies that any short-run disequilibrium will be corrected to reach the long-run equilibrium at a speed of 99%.

Various diagnostic checks were meticulously conducted, as summarized in Table 7, to ensure the accuracy of the time series data and the proper specification of the model, ultimately bolstering the reliability of the results. Notably, the probability values obtained from the serial correlation LM test, Ramsey reset test, Jarque-Bera normality test, and ARCH heteroscedasticity test all exceed the 5% significance level. Consequently, the null hypotheses for all these tests are not rejected, indicating the absence of serial correlation, heteroscedasticity, and model misspecification, while affirming the normal distribution of the data.

Furthermore, the adjusted R-squared value reveals that a remarkable 99% of the variations in RGDP can be accounted for by the model's regressors. Additionally, the CUSUM and CUSUM of squares plots, illustrated in Figures 1 and 2, provide compelling evidence of the stability of the model's coefficients throughout the estimation period, thus assuring the absence of econometric issues.

Figure 3 presents a dynamic multiplier effect, demonstrating how GDP responds to both increases and decreases in GGFCE. The positive and negative lines on the graph depict an asymmetric curve, offering insights into the adjustments of GDP to positive and negative movements in GGFCE at specific forecasting horizons. Moreover, it's worth noting that while the gap between the effects of rising and falling GGFCE narrows, the asymmetric impact remains statistically significant.

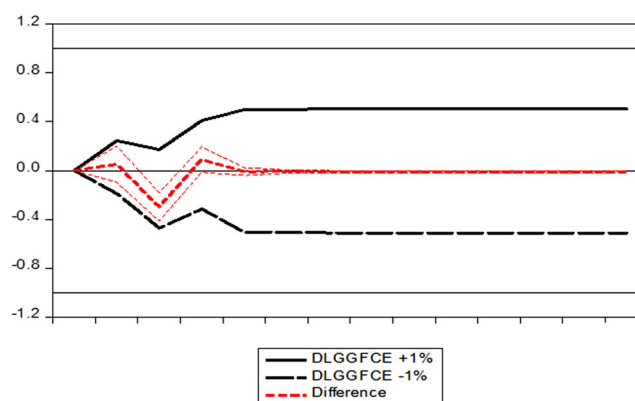


Figure 3. Dynamic multiplier.

5. Conclusion and policy recommendation

In conclusion, this study sheds light on the paramount role that fiscal policy, particularly public spending, plays in shaping economic growth in Somalia. Given the challenges posed by the country's high dollarization, which limits the effectiveness of monetary policy, fiscal policy emerges as the primary regulatory tool for the Somali government. With the aim of understanding this dynamic, we conducted a comprehensive investigation using annual time series data spanning from 1970 to 2019, employing the NARDL approach to scrutinize the asymmetric impact of fiscal policy on economic growth.

Our findings underscore the significant positive effect that both increases and decreases in government expenditure have on economic growth, and this impact is observable in both the short-run and long-run. Intriguingly, while reductions in government expenditure exhibit a stronger influence on economic growth over the long term, increases in government spending have a more pronounced effect in the short term. Consequently, fiscal policy, with an emphasis on public spending, emerges as a pivotal driver of economic growth in Somalia, and these results have withstood rigorous diagnostic testing, affirming their robustness.

Building upon these insights, we offer several recommendations for the government of Somalia. First and foremost, we advocate for the strategic utilization of fiscal policy, with a particular focus on the public spending channel, as a means to bolster economic growth. Furthermore, we advise the government to channel public spending towards sectors known for their productivity, as this approach promises to deliver swifter and more potent positive impacts on economic growth. Additionally, fiscal transparency emerges as a key priority for Somalia's government. Given that fiscal policy stands as the nation's primary and most effective economic management tool, enhancing transparency in public financial management becomes crucial. This will not only facilitate the efficient allocation of public resources but also contribute to the realization of fiscal policy objectives, ultimately fostering sustainable economic growth for Somalia. In an era where economic stability is paramount, these recommendations offer a pathway towards achieving positive and enduring economic outcomes for the nation.

Author contributions

Abdullahi Osman Ali has the conceptualization, wrote the methodology, undertake data analysis, wrote conclusion, policy recommendation and abstract and compiled the manuscript.

Jama Mohamed also contributed the manuscript by writing introduction and reviewing/editing of the whole manuscript.

Mohamed Osman contributed to the manuscript by writing the literature review.

Availability of the data and materials

All the data are sourced from Organization of Islamic Cooperation Statistical, Economic, and Social Research and Training Centre for Islamic Countries (SESRIC) (<https://www.sesric.org/oicstat-download-by-category.php?id=4>). It can also be found from the corresponding author upon a reasonable request.

Disclosure statement

The authors report there are no competing interests to declare.

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