Asian Journal of Economic Modelling
ISSN(e): 2312-3656
ISSN(p): 2313-2884
DOI: 10.55493/5009.v13i2.5450
Vol. 13, No. 2, 278-295.

URL: www.aessweb.com

Fiscal dynamics in fragile economies: A VAR analysis of revenue mobilization and government spending in Somalia

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Article History
Received: 28 April 2025
Revised: 6 June 2025
Accepted: 23 June 2025
Published: 3 July 2025

Keywords
Economic diversification
Fiscal dynamics
Fragile economies
Government spending
Grants
Indirect taxes
Revenue mobilization
Vector autoregression.

JEL Classification:
E62; H61; H71; H72; H80.

ABSTRACT

This paper aims to analyze the interplay of revenue mobilization and government spending in fragile countries, contrasting the case of Somalia with a focus on fiscal spending, revenue, grants, and tax strategies. The study used quarterly time series data sourced from the Somali Ministry of Finance. Preliminary diagnostic tests, including Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and KPSS, revealed mixed orders of integration, I(0) and I(1). The cointegration test showed the absence of cointegration, as confirmed by Johansen and bounds tests, justifying the application of the Vector Autoregression (VAR) model in analyzing short-run dynamics and interdependencies. The study found that indirect taxes serve as a key component of revenue generation, exhibiting a stable relationship with government spending. It also found that grants significantly affect government spending, indicating the dependency of fiscal operations on external support. Additionally, there is a strong, significant positive association between total revenue and government spending, highlighting the need for appropriate fiscal policy. Policy recommendations include strengthening tax administration and anti-corruption measures. Furthermore, reforms should focus on modernizing tax systems through digital initiatives and governance reforms, improving indirect taxes for greater coverage, and diversifying revenues to reduce dependency on external assistance.

Contribution/ Originality: Most previous studies used a mixed approach to analyzing tax revenues and grants, neglecting the distinction between direct and indirect taxes, particularly in Somalia. This study fills the gap by utilizing a VAR model with Somalia's disaggregated revenue data, thereby contributing to policy development in fragile contexts.

1. INTRODUCTION

Economic equilibrium and sustainable socio-economic growth, revenue mobilization serve as the primary pillars, especially for fragile economies similar to Somalia. When political instability, weak institutional frameworks, and economic vulnerabilities impede domestic resource mobilization, efficient financing is essential to foster self-sustainability and diminish reliance on foreign assistance while simultaneously elevating sovereignty over external aid (Eissa et al., 2023; Fakile, Adegbie, & Faboyede, 2014; Mpofu, 2022).

Weakened political frameworks and multifaceted socio-political conflicts render Somalia's fragile economy highly vulnerable to external shocks. Limited economic diversification and a shallow resource base due to long-standing conflict narrow the state's ability to produce or manage domestic resources. Under this context, the dynamics between

revenue mobilization and government spending become even more intricate. Somalia and other fragile economies face a dual burden: fiscal imbalance with chronically high public expenditure, predominantly fueled by low revenue generation, and inefficient or misaligned multisectoral spending, which reinforces dependency and underdevelopment (Behera & Dash, 2018; Mpofu, 2022).

While these aids provide relief in the short term, they significantly undermine long-term fiscal self-sufficiency. As Bird (2015) illustrates, aid-dependent regimes often lack the motivational framework necessary for imposing a tax effort or undertaking fiscal reforms that significantly improve public financing systems towards self-sustaining mechanisms. Furthermore, fragile states are exposed to an increased risk of public sector mismanagement, lack of budget clarity, and erosion of primary accountability, which constitutes the control system for efficient resource allocation (Anderson, 2017).

Government spending in fragile economies does not consider allocative efficiency due to a combination of technical and political-economic factors. Expenditure patterns or allocation of funds to different sectors are driven by donors or elite groups instead of developmental needs, leading to underinvestment in vital sectors such as education, healthcare, and critical infrastructure (Garrett & Mitchell, 2001). Besides, unstable revenue inflow, particularly from external sources, adds to planning unpredictability, which disrupts the execution of medium- to long-term development programs.

Somalia illustrates many of these structural and institutional challenges. Somalia is a country that has experienced years of conflict and a complete collapse of the state. As a result, the public financial management system in Somalia is still under reconstruction. The government of Somalia has made efforts to establish a functional fiscal system mainly through stabilization and reform agendas. However, fiscal operations remain too fragmented, with weak tax compliance and low administrative capacity (Roble & Ibrahim, 2024). These constructs aid in explaining the indirect taxation gap, as the bulk of revenue generated from indirect taxes, such as customs duties and sales taxes on imports, reflects the limited scope of formal economic activity and the enforcement of direct taxes within a largely informal economy (Ali, Mohamed, & Mohamed, 2024).

Behera and Dash (2018) and Roble and Ibrahim (2024) emphasized that raising revenue in fragile economies afflicted by fiscal imbalances, inefficient public spending, and overreliance on external grants may cause poor governance, disjointed systems, and shallow policy circulation. Therefore, the external grants may ease the situation in the short term but may undermine domestic attempts to generate revenue, compromising fiscal sustainability in the long run (Behera & Dash, 2018; Roble & Ibrahim, 2024). Furthermore, weak public financial management, lack of accountability, and inefficiencies in expenditures, while striving to meet sustainable development goals, deepen the gap (Alesina, Favero, & Giavazzi, 2019; Anderson, 2017).

Mobile revenue formation in fragile contexts is not new. The gap, however, lies in the empirical literature capturing the interdependence of revenue components and government spending. The existing body of literature primarily focuses on taxation and expenditures as individual problems, rather than the reciprocal interplay between the two, especially in fragile fiscal contexts influenced by shocks and institutional constrictions (Bird, 2015; Deléchat, Fuli, Mulaj, Ramirez, & Xu, 2018). However, previous studies lack of multidisciplinary analysis of the influence of revenue components like direct tax, indirect tax, and external grant on government expenditure in fragile economies.

The findings from developed economies suggest that well-structured fiscal frameworks with strong revenue collection systems and well-controlled expenditures correlate with macroeconomic stability and growth (Alshaib et al., 2023; Bergman, Hutchison, & Jensen, 2016). Fragile economies, such as Somalia, face specific constraints due to an amalgam of historical factors, weak institutional capacity, and geopolitical risk exposure (Bird, 2015; Garrett & Mitchell, 2001). This context implies that the models of fiscal policies crafted for more stable environments cannot simply be applied without a critical contextual layer, which emphasizes the need for focused research (Bird, 2015; Frankema, 2011).

Very few empirical studies seek to understand how effective resource mobilization through direct or indirect taxation improves institutional fragility and spending effectiveness simultaneously. Even fewer focus on incorporating dynamic econometric approaches that track short-term and long-term fiscal interactions within fragile contexts (Bird, 2015; Deléchat et al., 2018). This problem is most acute in Somalia, where foreign dependency on aid, security difficulties, and a highly decentralized governance system influence fiscal relations.

Somalia's fiscal architecture is characterized by a mixture of direct and indirect tax revenues, a large dependence on imports, and significant inflows of grants. Direct taxes, such as income, property, and corporate taxes, are crucial for autonomous taxation, but to date, they have been largely overlooked (Roble & Ibrahim, 2024). Somalia's revenues also include indirect taxes and direct taxes, which dominate the current revenue structure. This is largely due to Somalia being an import economy. Additionally, rampant inflation and instability of the exchange rate erode the real value of revenue, making fiscal planning very difficult (Ali et al., 2024). The efforts made towards federalism since 2012 have tried to streamline coherent fiscal governance, but lack of integration and inequitable revenue distributions continue to be major roadblocks (Roble & Ibrahim, 2024).

This study aims to address the gap by investigating the factors influencing the level of government expenditure in Somalia. It assesses the impact of indirect revenue, direct revenue, and external grants. The analysis will utilize the Vector Autoregression (VAR) model to examine the short-term and long-term relationships between government expenditure and the selected fiscal variables.

This study aims to fill the existing gaps in the literature by providing empirical evidence of Somalia's fiscal dynamics and is an attempt to analyze Somalia's public finance in the context of fragile economies. More specifically, it seeks to clarify the revenue-spending relationship using an appropriate regression technique for non-stationary time series data. This research aims to develop policy recommendations for Somalia and other fragile economies.

2. LITERATURE REVIEW

2.1. Revenue Mobilization in Fragile Economies

Revenue mobilization, as Fakile et al. (2014) remark, provides developing countries with a means to achieve predictable and sustainable financing while reducing the dependency on aid in the long run. In the context of weak economies, revenue mobilization refers to the weak economies' primary focus on seeking greater prospects and overcoming challenges. Revenue is computed and collected through internal and external sources. It may be classified into two categories: domestic sources and external sources. Internally, the sole source available is taxes. In something such as a fragile economy, there is greater reliance on documentable sources such as VAT or customs duties as opposed to income and corporate taxes, which fall under documentable sources (Eissa et al., 2023; Mullins, Gupta, & Liu, 2020). The lack of institutional capacity and low compliance issues limit taxes, which in turn restricts the economy. Such conditions weak compliance concerning taxes, a narrow tax base, and high levels of informal economic activity result in inadequate internal tax revenue. Alternatively, external revenue sources, such as foreign aid and grants, are crucial components of government spending. Externally sourced revenue generally provides a temporary respite from fiscal pressure; however, these funds can reduce the need for revenue reform and expose the economy to external shocks when aid inflows decrease. Although external funds are an essential fiscal resource, they have drawbacks, including dependency and compromising financial self-sustainability (Mullins et al., 2020).

Mobilizing revenue in fragile economies is challenging, as these types of economies face a range of problems. In such economies, weak institutional structures make revenue collection and management difficult. Considerable obstacles to revenue mobilization are caused by weak tax administration, ineffective governance, and corruption (Eissa et al., 2023). Research shows that Brautigam, Fjeldstad, and Moore (2008) how institutional fortification could improve revenue collection. For instance, Somalia's weak governance has severely restricted the implementation of tax regulation in the country's informal sector. This institutional weakness retards tax compliance by significantly undermining public services, as the state is unable to enhance tax collection; thus, public confidence is eroded.

Additionally, a lack of public confidence coupled with low tax compliance due to informality results in a lack of enforcement in fragile economies. Tax compliance in poorly governed countries with inadequate constitutions and public services is minimal, according to research by Moore, Prichard, and Fjeldstad (2018). Revenue non-compliance worsens these revenue shortages, leading to the drain of public services and lower state legitimacy, which creates a self-reinforcing cycle.

Funding from external sources and grants commonly finance budgets in delicate economies. Even though externally sourced funds are critical for meeting urgent requirements, they create challenges for long-term sustainability. Countries that overly depend on aid tend to ignore domestic revenue reforms because external sources usually fill the budget gaps without changing the tax system. This external dependency shifts the focus away from fundamental domestic revenue reforms (Besley, Ilzetzki, & Persson, 2013). This shifts the focus to finding the optimal blend of external aid, grants, and internal taxes. In fragile economies, for example, Besley (2020) argues that developing robust taxation systems can enhance spending elasticity and foster state-building. The collection of internal revenues, especially taxes, enhances fiscal autonomy but also increases responsiveness and the credibility of the government.

2.2. Government Spending and Its Drivers

The drivers of government spending in fragile economies are sophisticated and multifaceted. Spending in these economies seems to depend primarily on the availability of resources, thus making spending decisions in fragile economies linked to external factors due to a narrow tax base or low tax payment compliance. For basic public expenditures like healthcare and education, fragile economies are heavily dependent on donors. Therefore, government spending is limited by revenue inflow. According to Balima, Combes, and Minea (2021), studying the performing moving aid funnel domestic revenue gaps for fragile economies, those relying more on mobilizing domestic revenue tend to experience fewer constraints in government spending because the spending is less conditioned by external aid.

According to Fakile et al. (2014), taxation is important in reinforcing the proper functioning of the state and the social contract between the state and citizens. Tax revenue is perceived to be a stable and predictable source of funding. When domestic tax revenue is mobilized, it increases the fiscal capacity of the government, thereby making it possible to invest in health, education, and infrastructure (Besley, 2020). On the other hand, external grants, due to the conditionalities attached to them, could constrain a government's fiscal capacity. Although grants provide fiscal support in the short run, they could lead to misallocation of spending priorities. For instance, donor-driven funds could enhance social sector spending while neglecting funding in critical areas such as infrastructure development, which leads to imbalanced fiscal expenditure. Moreover, the ease of access to external funding could reduce the urgency for tax reforms, undermining efforts toward domestic revenue generation (Diaz-Sanchez, Tagem, & Mota, 2022; Gwaindepi, 2021).

2.3. Analyzing Fiscal Policy

The implementation of the Vector Autoregression (VAR) model is now commonplace in empirical research examining the relationship between fiscal and macroeconomic variables due to its flexibility. Unlike structural models, the VAR framework considers all variables as endogenous, enabling an unrestricted assessment of the relationships among government expenditures, taxation, and macroeconomic performance captured by GDP growth, inflation, and interest rates.

Granger causality tests within the VAR context are important for identifying predictive causality among variables, which is crucial for policy design. For example, Mabugu and Chitiga-Mabugu (2014) reported a unidirectional Granger causation from government expenditures to economic growth within South Africa, vindicating the Keynesian stance on public spending driving economic activity. The application of impulse response

functions (IRFs) to VAR models enhances their ability to measure the impact of a specific fiscal shock on other macroeconomic indicators over time. Fadol (2024) used a Structural VAR (SVAR) model for the Sudanese economy and showed that government spending shocks had significant impacts on output and inflation, evidencing the salience of fiscal shocks in driving economic volatility. Another analytic tool derived from VAR models, variance decomposition (VD), evaluates the proportion of forecast error variance in an endogenous variable that is explained by innovations in other variables. In his study of the Brazilian economy, Hsing (2024) showed the significance of fiscal and monetary variables, such as external debt and interest rates, in explaining the variance in real GDP, thereby demonstrating the need for coordinated policy responses. These time-varying features in VAR models in conjunction with the Granger causality test have been shown to further enhance these methodologies. The work of Yan, Gao, and Peng (2021) provided new methodologies for estimating impulse responses under non-stationarity and structural breaks, while Shojaie and Fox (2022) highlighted advances in causal Granger causality testing, particularly in high-dimensional settings and weak-signal environments, improving the inference of causation in macroeconomic research.

It is important to highlight the significance of short-run and long-run divergences in conjunction with formulating effective fiscal policies. Note the work done by Afonso and Jalles (2011), whose claims support a policy that prudently extends revenue and spending in the long run; a policy that promotes sustainable long-term spending policies.

2.4. Revenue-Grants-Spending Nexus

The revenue derived from taxes and grants has a significant impact on the spending patterns of governments relying heavily on external aid. Fragile economies are no different in this context. However, the channels through which grants and taxes affect the spending patterns of governments are different.

Taxes play a crucial role in providing necessities to citizens. When social amenities are offered to taxpayers, it fosters voluntary compliance and stimulates business activities, which pay taxes and generate revenue for the government. As a fiscal instrument, it reduces private spending while transferring resources to the government for economic development by paying for public utilities, carrying out social obligations, and supporting the government's administrative functions. Ndubuisi, Ezeokwelume, and Maduka (2020) find that the government revenue changes the spending pattern of the government also changes. In their study, it was visible by the long-run or equilibrium relationship between government revenue and government expenditure shown in the study. The direction of causation runs from government revenue to government expenditure, supporting the revenue-spend or tax-spend hypothesis for Nigeria. Sere and Choga (2017) indicating that there is a long-term relationship between government revenue and expenditure in South Africa. However, no causality was found between the two fiscal variables in the short term.

In contrast, grants are key financial instruments that play a vital role in bridging the fiscal gap in economies with limited domestic revenue sources. They provide immediate funding for essential services and developmental projects. However, excessive reliance on grants could disrupt spending patterns and introduce fiscal vulnerabilities. This is due to the volatility of aid inflows, which are mostly subject to donor conditionalities. Kaya and Kaya (2020), upon examining the link between foreign aid and government spending sustain that the latter is more responsive to the increase in the former. Mascagni and Timmis (2017) also reveal that in Ethiopia, aid is positively associated with government spending, indicating that aid proves to be beneficial for the country.

2.5. Conclusion

The relationship between income mobilization and government expenditure is a crucial focus of fiscal policy study, especially in unstable economies where resource limitations and external dependence impede fiscal sustainability. Although current research has enhanced our understanding of this link, notable deficiencies remain that necessitate further inquiry to formulate effective fiscal solutions suited to the intricacies of fragile governments.

The intricate impacts of various income sources, including taxes and grants, on expenditure patterns remain little examined. The existing research offers few comparative assessments of these sources. Taxes are typically linked to enhanced fiscal responsibility and alignment with public preferences, whereas handouts are commonly viewed as undermining domestic resource mobilization initiatives. The absence of thorough research on the financial trade-offs and long-term consequences of depending on either source results in insufficient support for policymakers in maximizing income sources for fiscal stability.

Secondly, current research mostly emphasizes the short-term effects of taxes and grants on government expenditure, overlooking their long-term repercussions. For instance, whereas grants may offer a temporary financial cushion, their long-term implications for domestic tax policies and comprehensive revenue mobilization methods are uncertain. This dynamic viewpoint is essential, particularly in vulnerable economies, because immediate inflows can contradict long-term budgetary objectives. Furthermore, there is limited understanding of how the mix of income sources affects the sectoral distribution of government expenditure. The question of whether taxes predominantly finance infrastructure investments while grants underwrite social services remains unresolved. This information deficiency obstructs the alignment of income production strategies with specific development goals.

The influence of grants on budgetary discipline in unstable economies remains underexplored. Grants can serve as a safeguard against revenue deficits, although they may also promote expansionary fiscal policies that compromise long-term fiscal prudence. The lack of concrete evidence on this matter, especially in vulnerable economies, hinders the formulation of policies that reconcile immediate needs with long-term viability.

3. METHODOLOGY

3.1. Theoretical Framework

The study will employ the following fiscal policy theories: According to Keynes's (1937) developed theory, higher government spending is required during the recession to boost overall demand and reduce unemployment. Barro's (1974) observations imply that people understand future tax obligations stemming from government debt. This assumption encourages individuals to save more, therefore countering the projected stimulating effect of government spending.

Moreover, Buchanan and Tullock (1965) identified how often political incentives affect choices on government expenditure. According to this view, politicians' self-serving actions could lead to expenditure more in line with political advantage than in line with economic effectiveness.

Furthermore, Blanchard and Johnson (2013) found that variations in tax receipts had a major impact on the funding distribution among several sectors. Wagner's Law states that as economies grow, the demand for public goods and services increases. This effect leads to higher government expenditures, thereby strengthening the relationship between government spending and tax revenue (Wagner, 1958). Musgrave's Theory of Public Finance provides an econometric model in which balanced fiscal federalism demonstrates itself as a form of facilitative revenue sharing, whereby the aim is to redistribute resources across governments, which may result in some degree of economic equity and efficiency. Finally, this model represents the long-run equilibrium and short-run adjustments of component revenues, including direct taxes and indirect taxes, that are in line with Musgrave's principles of public revenue distribution (Musgrave & Musgrave, 1989). The model captures the cross-effects of these elements and shows how fiscal policies may respond when there is a divergence from fiscal equilibrium via error correction dynamics.

$$A_i = T_i + S_i \qquad (1)$$

This equation expresses the total outlay Ai for state i as the sum of taxes collected Ti and subsidies Si received from the central government.

$$S_i = t(B - B_i) \qquad (2)$$

This equation defines grants Si as a function of the difference between the average tax base B and the individual state tax base Bi.

$$\sum_{i=1}^{n} S_i = 0 \quad (3)$$

This equation states that total subsidies must balance across all states, ensuring that the total outlays equal the total revenues collected.

The general structure of the VAR model is:

$$Y_t = A_0 + \sum_{i=t}^{p} A_i Y_{t-l} + u_t \quad (4)$$

Where Y_t is the vector of the endogenous variables $[GS_t, TR_t, GR_t, DT_t, IT_t]$. A_0 is vector intercept, A_i are matrices of coefficients for lag i. p is the optimal lag length. u_t is the vector white noise error terms.

$$TR_{t-1} = \beta_1 GR_{t-1} + \beta_2 DT_{t-1} + \beta_3 IT_{t-1} + \mu_t \quad (5)$$

From Equations 1 and 2, we can express government spending as a function of total revenue, grants, direct taxes, and indirect taxes.

$$LGS_t + \alpha + \sum_{i=1}^{p} \beta_i lGS_{t-1} + \sum_{i=1}^{p} \gamma_i lTR_{t-1} + \sum_{i=1}^{p} \delta_i lGR_{t-1} + \sum_{i=1}^{p} \epsilon_i lDT_{t-1} + \sum_{i=1}^{p} \varphi_i lIT_{t-1} + u_t \quad (6)$$

This equation shows the liner combination of total revenue, grants, direct tax and indirect taxes in generating government spending, reflecting the elasticities represented by $\beta_i, \gamma_i, \delta_i, \epsilon_i$ *and* φ_i.

3.2. Data Source

The data on revenue mobilization consisted of quarterly time series data from 2013Q1 to 2024Q2, measured in millions of dollars within each fiscal year. The data was sourced solely from the Somali Ministry of Finance to ensure credibility and relevance of the analysis.

3.3. Data Estimation Methods

The study employed ADF, PP, and KPSS unit root tests to identify the stationarity of the variables and found that the variables possess a mixed integration order of I(0) and I(1), with most variables becoming stationary at level. The Johansen and Bounds tests did not provide evidence of cointegration and confirmed the long-run absence of cointegration among the variables. Therefore, the mixed integration results from the unit root tests and the absence of cointegration suggest that the Vector Autoregressive (VAR) model is appropriate, as it allows for the analysis of time series even in the absence of cointegration, focusing on short-run dynamics. The Granger causality test supports the suitability of this model and indicates relationships that can be modeled using the VAR approach. The VAR model aligns well with the data structure, enabling analysis of short-run dynamics without requiring a long-run equilibrium relationship.

3.4. Study Rationale

The current research leverages quarterly data from the first quarter of 2013 to the second quarter of 2024, including Somalia's core fiscal activities, reconstruction, and institutional reforms. Government spending, total revenue, grants, and direct and indirect taxes are included, as these factors have both theoretical and policy relevance because they are the predominant dimensions of fiscal activities in fragile and developing economies. Supervision of these elements ensures proper tracking of the economy, the impact of policies, and the analysis of economic management.

The selected model is Vector Autoregression (VAR) because it can effectively demonstrate how a group of related domestic fiscal variables interact with each other without needing to impose arbitrary structural limits. This principle also applies to Somalia, where the relationships among economic variables tend to be complex and fluid. Unit root tests were conducted, including the Augmented Dickey-Fuller test (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS), which showed a mixed order of stationary levels of I(0) and first differences I(1), supporting the use of an unrestricted VAR system. This approach allows for a better understanding and interpretation of policy implications. It is narrower than the system-wide approach, which focuses only on the interactions of a few selected variables and the constraints imposed on the behavior of the data.

4. EMPIRICAL RESULTS

4.1. Descriptive of Statistics

Table 1 shows a summary of the descriptive statistics, which is very important to understand the central tendency and the spread of the fiscal data studied and its economic relevance. The mean values of government spending (GS) and total revenue (TR) are the highest, followed by grants (GR), direct taxes (DT), and indirect taxes (IT). The highest standard deviations reported for GS, TR, and GR indicate significant variability, demonstrating their responsiveness to changes in fiscal policy. The skewness and kurtosis suggest that the data are likely skewed in their distribution and will be sharply peaked at the center. Evidence from the Jarque-Bera test results indicates the distributions are non-normal.

Table 1. Descriptive summary of statistics.

Variables	GS	TR	GR	DT	IT
Mean	92.49	91.42	44.79	33.88	12.78
Median	63.69	68.48	25.25	33.20	12.95
Maximum	314.55	305.81	208.69	66.29	34.97
Minimum	25.83	24.38	4.49	14.30	0.90
Std. dev.	69.01	69.37	51.71	14.29	9.02
Skewness	1.68	1.67	1.90	0.68	0.56
Kurtosis	5.61	5.01	5.40	2.73	2.39
Jarque-Bera	34.61	29.03	38.68	3.68	3.12
Probability	0.00	0.00	0.00	0.16	0.21
Sum	4254.54	4205.52	2060.56	1558.29	587.72
Sum sq. dev.	214309.80	216526.80	120334.00	9191.63	3659.69
Observations	46.00	46.00	46.00	46.00	46.00

4.2. Unit Root Test

Table 2 shows the unit root test results. The variables, such as GS, TR, GR, and DT, are stationary at I(0) at the 1% significance level, as confirmed by the ADF, PP, and KPSS tests. The null hypothesis of a unit root at the 1% significance level is rejected, indicating no need for differencing. However, the IT variable fails to reject the null hypothesis of a unit root at the ADF level, suggesting non-stationarity, while the PP and KPSS tests confirm stationarity. At the first difference, GS, TR, GR, DT, and IT reject the null hypothesis in the ADF and PP tests, and with the support of KPSS tests at I(1), they are confirmed to be stationary.

Table 2. Unit root test results.

Variable	Level			First difference			Int. order
	ADF	PP	KPSS	ADF	PP	KPSS	
GS	-7.64***	-7.64***	0.22***	-5.18***	-35.29***	0.18**	I(0)
TR	-5.76***	-5.68***	0.19**	-8.65***	-18.64***	0.16**	I(0)
GR	-5.94***	-5.87***	0.16**	-8.05***	-5.87***	0.16**	I(0)
DT	-4.38***	-4.32***	0.11	-6.77***	-4.33***	0.29***	I(0)
IT	-2.99	-5.39***	0.07	-7.98***	-5.39***	0.23***	I(1)

Note: *** indicates significance at the 1% level, ** at the 5% level.

4.3. Correlation Test

Table 3 presents the correlation matrix of the data and shows that correlations exist between the variables in the matrix, such as GS and TR (r = 0.94), TR and GR (r = 0.971), and DT and IT (r = 0.915), indicating a high level of dependence. Additionally, there are moderate to strong correlations, including between GR and GS (r = 0.89) and TR and IT (r = 0.831), which suggest a lesser degree of relation but still indicate an association. Conversely, GR and DT (r = 0.658) show the weakest correlation among the variables examined.

Table 3. Correlation matrix test results.

Variables	GS	TR	GR	DT	IT
GS	1.00				
TR	0.94	1.00			
GR	0.89	0.97	1.00		
DT	0.82	0.82	0.66	1.00	
IT	0.85	0.83	0.69	0.92	1.00

4.4. Lag Length Criteria

Table 4 presents the lag order selection criteria. The optimal lag is identified as lag 3, supported by the smallest final prediction error (FPE) of 0.00, the Akaike information criterion (AIC) value of -1.344, and the Hannan-Quinn information criterion (HQ) of -0.136. Additionally, it has the highest likelihood ratio (LR) statistic of 50.76. Conversely, the Schwarz information criterion (SC) suggests lag 1, indicating some discrepancy. Nonetheless, for the purpose of ensuring the model's accuracy and predictive capabilities, lag 3 is considered the most appropriate choice.

Table 4. Lag length criteria result.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-23.29	NA	0.00	1.32	1.52	1.4
1	32.27	95.61	0.00	-0.11	1.12*	0.3
2	68.48	53.89	0.00	-0.63	1.63	0.2
3	108.90	50.76*	0.00*	-1.34*	1.93	-0.14*

Note: * indicates the lag order chosen based on the applied criterion.

4.5. Johansen Cointegration Test

Table 5 presents the trace and the maximum eigenvalue statistic test results; both tests fail to reject the null hypothesis of no cointegration at the 0.05 significance level. This indicates that the variables LGS, LTR, LGR, LDT, and LIT do not have a long-term equilibrium relationship.

Table 5. Johansen cointegration test results.

Panel A: Trace statistic				
Null hypothesis (H_0)	**Eigenvalue**	**Trace statistic**	**5% critical value**	**P-value**
$r = 0$	0.52	67.85	69.82	0.07
$r \leq 1$	0.41	36.65	47.86	0.36
$r \leq 2$	**0.22**	14.00	29.80	0.84
$r \leq 3$	0.08	3.49	15.49	0.94
$r \leq 4$	0.00	0.05	3.84	0.83
Panel B: Maximum eigenvalue statistic				
Null hypothesis (H_0)	Eigenvalue	Max-eigen statistic	5% critical value	P-value
$r = 0$ *	0.52	31.20	33.88	0.10
$r \leq 1$ *	0.41	22.65	27.58	0.19
$r \leq 2$	0.22	10.51	21.13	0.70
$r \leq 3$	0.08	3.44	14.26	0.91
$r \leq 4$	0.00	0.05	3.84	0.83

Note: * indicates the selected rank.

4.6. Bound Test

Table 6 presents the Bounds test to identify if there is a long-run relationship between the variables. The result generated an F-statistic of 1.301, which is below the critical values for both I(0) and I(1) at all levels of significance (10%, 5%, 2.5%, and 1%). Therefore, we fail to reject the null hypothesis of no long-run relationship between the examined variables. This indicates that, in this particular model, there were no significant associations between any of the variables across the studied periods.

Table 6. Bound test result.

Test statistic	Value	Significance	I(0) Asymptotic: n=1000	I(1)
F-statistic	1.30	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06

4.7. Pairwise Granger Causality Tests

Table 7 presents the pairwise Granger causality tests to determine causality directionality across the examined variables. The findings indicate that there are significant causal relationships in certain pairs of variables, whereas in other pairs, there is no causality. LGR and LGS rejected the hypothesis of no Granger causality, where both variables bidirectionally cause each other with occurrence (P = 0.0333 for LGR → LGS and P = 0.0012 for LGS → LGR). The same case also illustrates LTR and LGR pairs in the sense that there is also a two-way Granger causation between the two variables (LTR→ LGR p = 0.0050, LGR→ LTR p = 0.0056). Non-causative relationships are displayed using the pairs LTR and LGS and LDT and LGS; we fail to reject the null hypothesis (p > 0.05).

Table 7. Pairwise granger causality tests results.

Null hypothesis:	Obs.	F-statistic	Prob.
LTR does not granger cause LGS	44	2.253	0.119
LGS does not granger cause LTR		2.384	0.105
LGR does not granger cause LGS	44	3.716	0.033
LGS does not granger cause LGR		7.980	0.001
LDT does not granger cause LGS	44	0.406	0.669
LGS does not granger cause LDT		1.783	0.182
LIT does not granger cause LGS	44	1.688	0.198
LGS does not granger cause LIT		0.413	0.665
LGR does not granger cause LTR	44	6.096	0.005
LTR does not granger cause LGR		5.937	0.006
LDT does not granger cause LTR	44	4.420	0.019
LTR does not granger cause LDT		0.410	0.666
LIT does not granger cause LTR	44	4.172	0.023
LTR does not granger cause LIT		0.751	0.479
LDT does not granger cause LGR	44	4.366	0.019
LGR does not granger cause LDT		0.365	0.697
LIT does not granger cause LGR	44	6.762	0.003
LGR does not granger cause LIT		0.369	0.694
LIT does not granger cause LDT	44	0.819	0.448
LDT does not granger cause LIT		2.018	0.147

4.8. Granger Causality/Block Exogeneity Wald Tests

Table 8 presents VAR Granger Causality/Block Exogeneity Wald tests and provides limited evidence of causality among the variables. Regarding LGS, no excluded variable Granger causes it significantly, as the null hypothesis of no causality cannot be rejected both individually and collectively (p = 0.30). For LTR, no single variable causes it significantly; however, all variables together reject the null hypothesis for causality at (p = 0.04), indicating a possible joint influence. The null hypothesis for LDT is rejected only in the case of LGS at borderline significance, at (p = 0.05), but it fails to reject other variables and collectively, at (p = 0.25). The LGR demonstrates joint significant causality at (p = 0.02), whereas the other variables analyzed do not exhibit significant causality. The LIT fails to reject the null hypothesis for any of the omitted variables, either individually or in groups, at (p = 0.78). The overall results of this test imply weak collective Granger causality on the LGR and LTR.

Table 8. Granger causality/Block exogeneity Wald tests results.

Dependent variable: LGS				Dependent variable: LTR				Dependent variable: LDT			
Excluded	**χ^2**	**df**	**Prob.**	**Excluded**	**χ^2**	**df**	**Prob.**	**Excluded**	**χ^2**	**df**	**Prob.**
LTR	1.04	2	0.59	LGS	2.81	2	0.25	LGS	5.90	2	0.05
LDT	0.81	2	0.67	LDT	0.13	2	0.94	LTR	1.16	2	0.56
LGR	1.26	2	0.53	LGR	1.73	2	0.42	LGR	2.75	2	0.25
LIT	0.77	2	0.68	LIT	0.52	2	0.77	LIT	2.17	2	0.34
All	9.48	8	0.30	All	16.53	8	0.04	All	10.23	8	0.25

Dependent variable: LGR				Dependent variable: LIT			
Excluded	χ^2	df	Prob.	Excluded	χ^2	df	Prob.
LGS	2.90	2	0.24	LGS	0.61	2	0.74
LTR	0.53	2	0.77	LTR	0.48	2	0.78
LDT	1.62	2	0.44	LDT	2.92	2	0.23
LIT	0.90	2	0.64	LGR	0.92	2	0.63
All	18.27	8	0.02	All	4.79	8	0.78

4.9. Empirical Estimation

Table 9 provides insights into the analysis of the VAR model, which examines the relationships among logged government expenditure and key macroeconomic variables in logs: TR, GR, DT, and IT. The study revealed that, in such a dynamic correlation with government spending, LTR and LGR positively indicate their predictive roles in terms of revenue and grant distribution. The lagged coefficients of LGR(-1) and LGR(-3) are negative, suggesting that grants are extended out of line with the economy. The study found mixed results for logged direct tax (LDT), with its lagged value (-3) positively affecting government spending, while LDT(-1) showed a negative effect. Conversely, indirect tax (LIT) has a high significance level with both LGS and LGR, indicating its role in taxation. The fitted model demonstrated a high R-squared value of 85%, with an F-statistic of 19.77 for government spending, confirming its adequacy. A low residual sum of 1.39 indicates that the model effectively captures the dynamics of spending. However, the average (4.38) and standard deviation (0.63) of LGS reflect the stability of fiscal policy. The AIC and SC criteria support the goodness of fit of the residuals.

Table 9. Vector autoregression (VAR) model results.

Variables	LGS	LTR	LGR	LDT	LIT
LGS(-1)	0.37 [1.32]	0.55 [1.51]	0.52 [0.67]	0.59 [3.27]	0.31 [0.76]
LGS(-2)	1.16 [5.29]	0.77 [2.69]	1.55 [2.53]	0.08 [0.56]	0.13 [0.39]
LGS(-3)	-0.18 [-0.69]	-0.35 [-1.02]	-0.11 [-0.15]	-0.35 [-2.02]	-0.15 [-0.38]
LTR(-1)	-0.20 [-0.34]	-0.56 [-0.72]	-1.91 [-1.16]	0.26 [0.68]	-0.25 [-0.28]
LTR(-2)	-0.63 [-1.16]	-0.27 [-0.39]	0.04 [0.02]	-0.48 [-1.36]	-0.60 [-0.75]
LTR(-3)	0.16 [0.31]	-0.51 [-0.77]	-1.50 [-1.07]	0.60 [1.84]	0.81 [1.09]
LGR(-1)	0.13 [0.50]	0.20 [0.57]	0.88 [1.18]	-0.25 [-1.42]	-0.04 [-0.10]
LGR(-2)	-0.04 [-0.19]	-0.22 [-0.77]	-0.62 [-0.99]	0.10 [0.65]	0.26 [0.78]
LGR(-3)	-0.21 [-0.99]	0.12 [0.41]	0.30 [0.50]	-0.19 [-1.32]	-0.49 [-1.54]
LDT(-1)	-0.51 [-1.19]	-0.01 [-0.02]	0.20 [0.17]	0.06 [0.20]	-0.21 [-0.33]
LDT(-2)	-0.54 [-1.32]	-0.22 [-0.41]	-1.95 [-1.71]	0.35 [1.30]	0.63 [1.04]
LDT(-3)	1.76 [4.45]	1.91 [3.70]	4.07 [3.68]	0.24 [0.91]	0.34 [0.58]
LIT(-1)	-0.15 [-0.81]	-0.12 [-0.52]	-0.16 [-0.32]	-0.23 [-1.95]	0.37 [1.37]
LIT(-2)	0.15	0.13	0.50	0.19	-0.02

Variables	LGS	LTR	LGR	LDT	LIT
	[0.83]	[0.55]	[1.01]	[1.62]	[-0.09]
LIT(-3)	-0.04 [-0.27]	0.04 [0.19]	-0.19 [-0.43]	-0.05 [-0.46]	0.21 [0.88]
C	-0.40 [-0.52]	-0.19 [-0.19]	-0.59 [-0.28]	-0.42 [-0.84]	-1.62 [-1.42]
R-squared	0.92	0.85	0.68	0.91	0.89
Adj. R-squared	0.87	0.77	0.50	0.86	0.83
Sum sq. resids	1.39	2.36	10.78	0.59	3.04
S.E. equation	0.23	0.30	0.63	0.15	0.34
F-statistic	19.77	10.55	3.84	18.87	14.58
Log likelihood	12.82	1.40	-31.28	31.06	-4.06
Akaike AIC	0.15	0.68	2.20	-0.70	0.93
Schwarz SC	0.80	1.33	2.85	-0.05	1.59
Mean dependent	4.37	4.36	3.41	3.48	2.35
S.D. dependent	0.63	0.62	0.90	0.40	0.81

4.10. Impulse Response

Figure 1 presents the analysis of the impulse response trajectories, providing valuable information regarding the temporal patterns of fiscal variables' interrelations following a one-standard-deviation shock. The effects of government spending (LGS) are evident almost instantly and reach their peak within a relatively short period, demonstrating their temporary contribution to short-term changes in the economy.

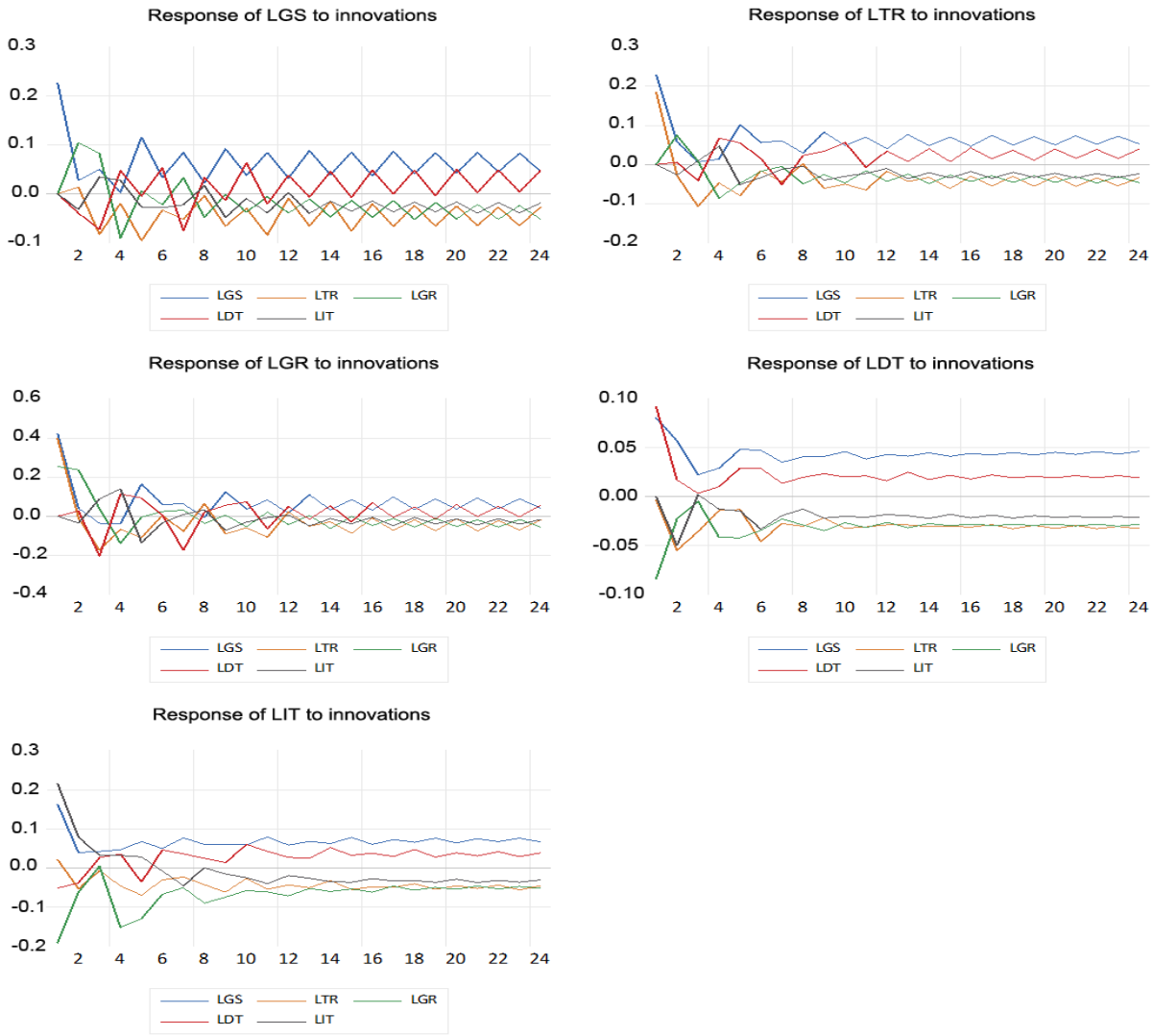

Figure 1. Response to Cholesky *one* S.D. (d.f. adjusted) *innovations*.

Total revenue collection (LTR) remains high initially, reflecting the possibility of economic growth, but stabilizes later, indicating that fiscal policy will no longer have a significant impact. Due to the crisis of responsibility, grants (LGR) exhibit weak and lagged movements, suggesting that their influence is likely to diminish soon. Since taxes relate to consumption and the political economy of taxation, both direct and indirect taxes (LDT and LIT) tend to decrease first, with LIT decreasing more significantly than LDT. These results highlight the complexity of spending and revenue processes, emphasizing the need for coordinated fiscal policies to enhance economic stability and revenue efficiency. This approach assists authorities in designing appropriate policies during fiscal shocks to maximize their economic impact.

4.11. Variance Decomposition

Table 10 presents variance decomposition, revealing an evolutionary relationship between the variables over time. It is entirely self-explanatory in the first period, accounting for 100%, with no other variables involved. In subsequent periods, LGR and LDT primarily influence the variance of LGS, while LGS remains a key determinant of variance for other variables such as LTR and LIT. For example, LTR is most likely to explain its own variance when shocks are applied, contributing 40% in the first period. Over time, LGS and LTR increasingly contribute to the variance of LGR. This relationship is observed for LGR, where its variance exceeds that of LGS and LTR, but over time, the variances of LGS and LTR significantly impact LGR's variability. The relationships become more complex with LDT and LIT; for instance, LDT depends on LGS and LTR, while LIT is predominantly influenced by itself, with a 41% contribution in the first period. Overall, the results suggest that each variable has a time-dependent, substantial effect, indicating a series that plays a positive and significant role in the involved economic processes.

Table 10. Variance decomposition results.

Variance decomposition of LGS:						
Period	**S.E.**	**LGS**	**LTR**	**LGR**	**LDT**	**LIT**
1	0.227	100.000	0.000	0.000	0.000	0.000
2	0.257	79.083	0.291	16.716	2.391	1.519
3	0.298	61.699	7.993	20.126	7.706	2.476
4	0.316	54.570	7.445	25.950	9.117	2.917
Variance decomposition of LTR:						
Period	S.E.	LGS	LTR	LGR	LDT	LIT
1	0.296	60.499	39.501	0.000	0.000	0.000
2	0.313	57.504	36.091	5.664	0.028	0.714
3	0.333	50.636	42.047	5.044	1.574	0.698
4	0.357	44.214	38.294	10.227	4.916	2.349
Variance decomposition of LGR:						
Period	S.E.	LGS	LTR	LGR	LDT	LIT
1	0.632	44.507	39.418	16.075	0.000	0.000
2	0.678	39.057	34.300	26.227	0.155	0.261
3	0.735	33.405	34.699	22.531	7.715	1.650
4	0.773	30.442	32.132	23.558	9.104	4.764
Variance decomposition of LDT:						
Period	S.E.	LGS	LTR	LGR	LDT	LIT
1	0.148	29.376	0.056	32.162	38.406	0.000
2	0.178	30.852	9.542	24.081	27.677	7.849
3	0.183	30.676	12.845	22.836	26.208	7.435
4	0.191	30.433	12.323	25.695	24.294	7.255
Variance decomposition of LIT:						
Period	S.E.	LGS	LTR	LGR	LDT	LIT
1	0.336	23.495	0.411	32.638	2.362	41.096
2	0.359	21.773	2.577	31.641	3.211	40.798
3	0.364	22.519	2.545	30.800	3.655	40.480
4	0.402	19.732	3.403	39.424	3.763	33.679

4.12. Serial Correlation LM Tests

Table 11 presents a serial correlation test and fails to reject the null hypothesis of no serial correlation at individual lags 1, 2, and 3. In contrast, while at lag 4 the LRE statistic indicates significant serial correlation, the Rao F-statistic shows only weak evidence for rejection of the null hypothesis, thus suggesting that serial correlation is present but not strongly significant.

Table 11. Serial correlation LM test results.

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	34.05	25	0.11	1.454	(25, 68.4)	0.11
2	23.98	25	0.52	0.96	(25, 68.4)	0.53
3	18.40	25	0.83	0.71	(25, 68.4)	0.83
4	25.66	25	0.43	1.04	(25, 68.4)	0.44

Note: * indicates statistical significance at the 10% level.

4.13. Normality Tests

Table 12 summarizes the normality tests of residuals. The tests for skewness indicate that component 3 exhibits significant non-normality, leading to the rejection of the null hypothesis that skewness is zero. Regarding kurtosis, no components show significant deviations; therefore, the null hypothesis of normal kurtosis cannot be rejected. The Jarque-Bera test suggests non-normality in component 3, while the joint test for all components rejects the null hypothesis of multivariate normality. Overall, there are some deviations of residuals from normality, particularly concerning skewness and multivariate normality, whereas kurtosis does not present significant issues.

Table 12. Normality test results.

Component	Skewness	χ^2	df	Prob.	Component	Skewness	χ^2	df	Prob.
1	0.42	1.28	1	0.26	1	3.24	0.10	1	0.75
2	0.11	0.08	1	0.77	2	2.94	0.00	1	0.94
3	-0.97	6.76	1	0.01	3	4.43	3.69	1	0.05
4	0.57	2.33	1	0.13	4	2.59	0.29	1	0.59
5	-0.68	3.28	1	0.07	5	4.10	2.185	1	0.14
Joint		13.73	5	0.02	Joint		6.27	5	0.28
Component		Jarque-Bera			df		Prob.		
1		1.38			2		0.50		
2		0.089			2		0.96		
3		10.45			2		0.01		
4		2.63			2		0.27		
5		5.47			2		0.07		
Joint		20.01			10		0.03		

4.14. Heteroskedasticity Test

Table 13 presents the residual heteroskedasticity test by testing the null hypothesis of no heteroskedasticity. The joint test statistic yields a chi-square value of 499.26 with 450 degrees of freedom and a p-value of 0.06. Since the p-value is just above the generally accepted significance level of 0.05, we fail to reject the null hypothesis of no significant evidence of heteroskedasticity in the residuals at the 5% level of significance.

Table 13. Heteroskedasticity test.

χ^2	df	Prob.
499.26	450	0.06

5. DISCUSSIONS

The analysis highlights the importance of indirect taxation in generating revenue in fragile economies, as there is a positive correlation between indirect taxes and government spending in the VAR model. This finding aligns with the arguments presented by Mullins et al. (2020) and Eissa et al. (2023), which suggest that indirect taxes, particularly VAT, are prevalent in situations where direct tax collection is significantly hindered. For such economies, especially those with underdeveloped institutional structures, indirect taxes have played a crucial role in financing government expenditure due to their relative stability and predictability.

The results from the VAR model confirmed that, similar to what Kaya and Kaya (2020) found, an increase in foreign aid usually leads to a matching rise in government spending. According to Mascagni and Timmis (2017), foreign aid also supports increased government expenditure in Ethiopia, illustrating the potential of external financing to relieve national fiscal burdens and promote economic growth. Other possible volatility noted in the VAR results suggests aid conditionality and shifting donor priorities.

The examination revealed a significant interdependence between revenue mobilization and government spending, which supports the findings of Ndubuisi et al. (2020) and Sere and Choga (2017). The studies seem to validate the revenue-expenditure or tax-spending hypothesis, which suggests that changes in revenue collection influence government spending patterns. This relationship indicates a state of equilibrium, albeit in a weak, semi-controlled economy, implying a relative optimization of revenue collection and expenditure during periods of lower economic performance. The situation also highlights an urgent need to improve policies related to revenue collection to strengthen the fiscal position.

The findings of the VAR model regarding the revenue mobilization process align with the arguments made by Eissa et al. (2023), who show that weaker contexts struggle with revenue collection because of poor tax administration, governance, and endemic corruption. Brautigam et al. (2008) as well as Besley (2020) strongly emphasize the role of revenue performance from an institutional perspective. These findings reinforce the argument for constraining institutions to provide those reasons why policymakers have to change to deepen sustainable fiscal discipline.

The VAR results seem to imply that indirect taxes play a more important role, although it can also be reasonably inferred that those direct taxes, despite being more inflexible, have some importance in revenue mobilization. This supports the conclusions of Moore et al. (2018) and Besley et al. (2013), who postulated that improving direct taxation regimes is even more crucial in fiercely vulnerable situations for equity and fiscal sustainability.

Domestic revenue, external grants, and government expenditure are interconnected, as discussed in Balima et al. (2021)'s work. Their study indicates that countries prioritizing the development of domestic revenue resources tend to experience lower aid dependency. Similarly, Besley (2020) argues that focusing on domestically generated revenues rather than capital grants can reduce dependency on aid and promote better fiscal discipline.

6. CONCLUSION

The public finance of fragile economies, such as Somalia, is particularly challenging because of fragile tax systems, a heavy reliance on external grants, and ineffective governance structures. Utilizing the VAR model to analyze grants, total taxes, direct taxes, indirect taxes, and spending, this study seeks to address a fundamental gap in existing knowledge. The study confirmed a strong long-term interdependence between public revenue and government expenditure, as a component of fiscal policy in Somalia indicated the revenue and spending hypothesis that Somalia's context validated. There is a considerable degree of indirect tax revenue responsiveness to public consumption, which underscores the significance of indirect taxation in underdeveloped economies. The study found that government spending responds to grants, but its volatility can negatively impact budgetary stability and predictability in the long run. The study found that relying on external aid could undermine fiscal autonomy and lead to a gendered approach in the execution of domestic policy. The situation is otherwise optimistic, but the prevalence of weak tax

administration processes and governance diminishes the government's ability to effectively mobilize revenue. The presence of institutional inefficiencies, along with corruption, leads to poor fiscal effectiveness and an increasing gap between budgetary plans and their execution. In summary, relying on the strengthening of internal fiscal systems enhances the flexibility and sustainability of fiscal policy.

The study advises policymakers to prioritize automation, enforcement, and capacity building in the tax collection system. Expanding the coverage and structure of indirect taxes would help stabilize and smooth revenue flows while reducing dependency on grants. Policymakers must prioritize reducing fiscal dependence on external grants by increasing the mobilization of domestic resources and diversifying economic activities. For fiscal sanity to be maintained and unsustainable deficits to be avoided, expenditure frameworks must be designed and matched to realistic revenue estimates. The establishment of trust and public accountability requires improvements in transparency and governance within public financial management. Establishing fiscal regulations and rules and creating stabilization funds will enable more effective management of shocks and revenue volatility. Allocating all funds to productive sectors will enhance the efficiency of government spending and contribute to achieving long-term development goals.

A significant shortcoming of this study is the availability and reliability of quarterly fiscal data, as well as the linearity of the analysis, which does not consider sector-specific dynamics and may limit its applicability beyond Somalia's specific fiscal environment. Future research should employ more adaptable SVAR models, incorporating sector-level governance and variables. This study uses Somalia as a case study to provide insights into the tax behavior specific to Somalia for evidence-based analysis. Somalia's economic instability and underdevelopment have persisted for decades due to a lack of infrastructural improvements and underperformance of tax administration.

Funding: This study received no specific financial support.
Institutional Review Board Statement: Not Applicable
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Data Availability Statement: Upon a reasonable request, the supporting data of this study can be provided by the corresponding author.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.

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