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The Fiscal Multiplier Effect: A Quantitative Analysis of Government Spending's Impact on Economic Growth in Sierra Leone

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Abstract

This study quantifies and compares the macroeconomic effects of public consumption versus public investment in Sierra Leone, a fragile post-conflict economy facing severe fiscal constraints, where understanding the core drivers of growth is paramount. We employ the Structural Vector Autoregression (SVAR) approach, utilizing annual time series data from 2000 to 2024 to estimate the fiscal multipliers individually. Methodologically, this study contributes by estimating two separate SVAR models with different identification schemes, one for consumption and one for investment, implementing two separate theoretically grounded recursive identification schemes, arguing that recurrent consumption and discretionary capital expenditure differ fundamentally in both their policy response functions and information lags. Our findings revealed a remarkable counterintuitive ordering of fiscal impacts. Our estimations indicate that the peak multiplier for recurring public consumption expenditures is approximately 3.96, signifying a prevailing short-term aggregate demand-side effect, likely driven by an extreme liquidity challenge and a high marginal propensity to consume among households. In contrast, the peak multiplier for government investment is approximately 0.98; this serves as the fundamental puzzle of our study, suggesting that capital expenditure, on average, is unable to generate sufficient economic returns to offset its own investment cost. We conclude that consumption offers a powerful short-term fiscal stimulus and suggest that for Sierra Leone to adequately and efficiently realize all the gains identified, the relevant regulatory authorities must strengthen and improve the public investment management Public Investment Management (PIM) frameworks.

Subject Areas

Business Finance and Investment

Keywords

Fiscal Multipliers, Government Spending, Public Investment, Economic Growth

1. Introduction

Policymakers in low-income and post-conflict economies face a pivotal challenge amid heightened global uncertainty and constrained fiscal space in allocating scarce resources to boost economic growth and development without risking debt sustainability. The magnitude of the government consumption multiplier serves as one of the unresolved questions in modern macroeconomics. According to [1] [2], they posit that the fiscal multiplier is not a structural parameter that is fixed over time, but rather exhibits an important state dependence that varies across different exchange rate regimes, business cycle fluctuations, and with constant fluctuations in the level of public debt incurred by the government.

This study provides new insights into the understudied debate by estimating and comparing the government spending and investment multipliers for Sierra Leone, a fragile post-conflict economy with significant infrastructural gaps and a high level of public debt that is undergoing structural transformation. The fragility of the Sierra Leone economy is further deepened due to its exposure to severe exogenous macroeconomic shocks and persistent exchange rate fluctuations, which destabilize the macroeconomic stability [3]. This instability is further complicated by extreme inflation volatility, which remains highly contingent on external shocks and international commodity prices [4]. The composition of fiscal stimulus has served as another important dimension of heterogeneity. Moreover, the stability of the domestic financial system, as well as the structure of money demand, is essential in determining the effectiveness of fiscal interventions. [5] highlights the issue of interest rate volatility in Sierra Leone and its significant short-run effects on the demand for money. This implies that, for a given level of fiscal stimulus, it is important to ensure that the monetary conditions do not destabilize the liquidity preferences of the respective households. The differential macroeconomic impacts of public spending and government investment serve as a central policy concern. However, there have been limited or even scarce empirical studies from low-income and fragile economies where fiscal constraints are inadequate and growth is most urgent.

To achieve the study's primary objective, this paper seeks to provide a quantitative answer to the central research question: What is the dynamic causal impact of an external macroeconomic shock to public spending versus government in-

vestment on real Gross Domestic Product (GDP) in Sierra Leone? We employ the Structural Vector Autoregression (SVAR) approach, utilizing annual time series data from 2000 to 2024. However, due to the three-lag selection and model specification, the actual estimation sample covers the period 2004 to 2024, yielding 21 observations.

The core methodological contribution of this study is grounded in its identification strategy. We contend that most empirical studies use a uniform identification strategy for all forms of government consumption, leading to misidentification of structural shocks when the primary policy functions diverge. We strongly argue that public spending and government investment differ fundamentally in both their policy response functions and information lags. To capture these changes, we implement two separate recursive identification structures: the first follows the standard ordering for the consumption model proposed by [6], and the second recursive identification structure involves a counter-cyclical ordering for the government investment model, which recognizes capital expenditure as an additional discretionary policy instrument. These two tale orderings offer a further sophisticated and context-specific identification of fiscal shocks than a uniform approach.

This study makes several notable contributions to the literature. Firstly, it provides new empirical insight into country-specific fiscal multipliers for Sierra Leone, a framework for which such estimations are rarely conducted. Secondly, the contribution of this study is grounded in the tailored identification strategies that are specific to the nature of the fiscal tool employed in low-income, fragile, and post-conflict economies. Thirdly, the paper provides robust quantitative empirical evidence for a policy frequently recommended but rarely validated in fragile, post-conflict economies: the most effective and efficient pathway to enhance economic growth and development is the reallocation of government expenditure from public spending to productive investment activities.

The remainder of this study is structured as follows. Section 2 provides an extensive literature review on the fiscal multiplier. Section 3 entails a detailed methodological approach of the Structural Vector Autoregression (SVAR) model, including the secondary data used in the study, the model specification, and estimation strategies. Section 4 consists of the empirical results and analysis section, including the comparative results and diagnostic test. Section 5 of this paper includes the conclusions and policy recommendations of the study findings.

2. Methodology

2.1. Econometric Framework and Estimation Strategy

The main aim of this study is to investigate the causal and dynamic effects of fiscal policy on economic activities in Sierra Leone, employing the Structural Vector Autoregression (SVAR) approach to examine the core drivers of the endogenous responses of regulatory authorities to exogenous fiscal shocks. This framework serves as a standard workhorse in macroeconomics for identifying and analyzing

the impact of structural shocks over time [7]. In addition, the application of the baseline Vector Autoregression (VAR) models in analyzing the structural relationship among macroeconomic variables in Sierra Leone has been demonstrated to be effective in a previous study [8].

2.2. Data, Variables, and Study Period

This study employs annual time series data for Sierra Leone covering the post-civil war period from 2000 to 2024. The key variables used in this study are: real Gross Domestic Product (GDP), real government consumption, real government investment, and real tax revenue, all in current prices. The secondary data used in this study were collected from the World Development Indicators (WDI), in which all of the variables were transformed into real per capita terms and further log-transformed. The variables were log-transformed in order to reduce variability in the time series data and allow the interpretation of the impulse responses and coefficients in percentage changes or elasticities.

2.3. The Structural VAR Model

We define Y_t as an $(n\times 1)$ Vector containing endogenous stationary variables, in which we model the primary structural VAR model as;

$$A_0 Y_t = \sum_{i=1}^{p} A_i Y_{t-i} + B\epsilon_t \tag{1}$$

where ϵ_t represents the vector of the structural shocks, which are jointly uncorrelated, and A_0 captures the structural association. The study begins by estimating the reduced-form $VAR(p)$ model.

$$Y_t = \mu + \sum_{i=1}^{p} \Pi_i Y_{t-i} + \mu_t \tag{2}$$

The residuals of the reduced-form VAR are denoted as $\mu_t = A_0^{-1} B\epsilon_t$, with a covariance matrix $\mathrm{E}(u_t u_t') = \sum u$. The central relationship that exists between the structural errors and the reduced-form errors is denoted as $A_0 U_t = B\epsilon_t$, this indicates the covariance matrix identity as given below;

$$A_0 \sum u A_0' = B \sum u \epsilon B' \tag{3}$$

From Equation (3) above, the identification problems arise because there are more unknown parameters on the left-hand side A_0 and B then there are identified parameters in the estimated covariance matrix $\sum u$. To estimate this, the imposed restriction we used was based on sound economic theory on A_0 and B.

2.4. Identification Strategy and Formal Model Specification

Due to data limitations for Sierra Leone that prevent the use of external or narrative methods, we employ the recursive identification approach that is grounded on the Cholesky decomposition of $\sum u$. Under this method, B is normalized

to the identity matrix (I), and imposing a lower triangular structure on A_0, which yields the $\frac{n(n-1)}{2}$ restrictions required for the precise identification. The ordering of variables in the vector Y_t, it is of great importance because it is based on theoretical assumptions about the flow of information and the implementation of fiscal policy. For this study, we specify two different orderings that are theoretically grounded in fiscal policy discourse; they are Consumption Model Identification and Investment Model Identification.

2.5. Consumption Model Identification

We employ the standard recursive ordering of our key variables in estimating the consumption multiplier effect as in [6]:

$$Y_t = \begin{bmatrix} \Delta \ln(T_t) \\ \Delta \ln(G_{cons,t}) \\ \Delta \ln(Y_t) \end{bmatrix} \tag{4}$$

With this ordering, it is assumed that government tax revenue does not respond simultaneously to other macroeconomic variables over the same period, while government consumption is expected to respond to changes in tax revenues, and output is further assumed to respond to both government consumption and tax revenue. The standard ordering, the imposed structure of the simultaneous relationship between the reduced form residuals u_t and the structural shocks ε_t are represented as;

$$\begin{pmatrix} 1 & 0 & 0 \\ a_{21} & 1 & 0 \\ a_{31} & a_{32} & 1 \end{pmatrix} \begin{pmatrix} u_t^T \\ u_t^{G_{cons}} \\ u_t^Y \end{pmatrix} = \begin{pmatrix} \varepsilon_t^T \\ \varepsilon_t^{G_{cons}} \\ \varepsilon_t^Y \end{pmatrix} \tag{5}$$

The structural form of this simultaneous system of matrices can be equivalently written as;

$$\Delta \ln(T_t) = \sum_{i=1}^{p} \alpha_{1i} \Delta \ln(T_{t-i}) + \sum_{i=1}^{p} \beta_{1i} \Delta \ln(G_{cons,t-i}) + \sum_{i=1}^{p} \gamma_{1i} \Delta \ln(Y_{t-i}) + \varepsilon_t^T \tag{6}$$

$$\begin{aligned} \Delta \ln(G_{cons,t}) = & -a_{21} \Delta \ln(T_t) + \sum_{i=1}^{p} \alpha_{2i} \Delta \ln(T_{t-i}) + \sum_{i=1}^{p} \beta_{2i} \Delta \ln(G_{cons,t-i}) \\ & + \sum_{i=1}^{p} \gamma_{2i} \Delta \ln(Y_{t-i}) + \varepsilon_t^{G_{cons}} \end{aligned} \tag{7}$$

$$\begin{aligned} \Delta \ln(Y_t) = & -a_{31} \Delta \ln(T_t) - a_{32} \Delta \ln(G_{cons,t}) + \sum_{i=1}^{p} \alpha_{3i} \Delta \ln(T_{t-i}) \\ & + \sum_{i=1}^{p} \beta_{3i} \Delta \ln(G_{cons,t-i}) + \sum_{i=1}^{p} \gamma_{3i} \Delta \ln(Y_{t-i}) + \varepsilon_t^Y \end{aligned} \tag{8}$$

where lags represent the contributions of the endogenous lagged variables in the Vector Auto-Regression (VAR) model. This formulation allows us to estimate

the dynamic effects of government consumption shocks on the Gross Domestic Product (GDP), while holding all other macroeconomic shocks constant.

2.6. Investment Model Identification

To estimate the government investment multiplier effects, we adopt an alternative information ordering that reflects the policy role of government investments as more counter-cyclical and discretionary. The ordering is thus stated as:

$$Y_t = \begin{bmatrix} \Delta \ln\left(Y_t\right) \\ \Delta \ln\left(T_t\right) \\ \Delta \ln\left(G_{inv,t}\right) \end{bmatrix} \tag{9}$$

Among investment variables GDP comes first in the recursive ordering and the reasoning behind this is the lag in implementation and recognition lags in capital expenditure. Contrary to government consumption (like wages or transfers) which can impose an impact on aggregate demand immediately, public investment (in infrastructure, for example) is where such demand is created, but not immediately, as there are lengthy procurement and construction phases. Therefore, we take the view that a shock to government investment has no bearing on real GDP contemporaneously (in the same year). Also, this ordering permits tax revenue to react to output changes before investment decisions are made, which reflects the discretionary, counter-cyclical capital budgeting gaps in a financially constrained system.

The baseline assumption is that output $\left(Y_t\right)$ responds to its shocks, while government tax revenue $\left(T_t\right)$ simultaneously responds to output shocks and government investment shocks $\left(G_{inv,t}\right)$ can respond to both output and tax revenue shocks over the same period. The imposed structure of the simultaneous relationship between the reduced form residuals u_t and the structural shocks ε_t are denoted as;

$$\begin{pmatrix} 1 & 0 & 0 \\ a_{21} & 1 & 0 \\ a_{31} & a_{32} & 1 \end{pmatrix} \begin{pmatrix} u_t^Y \\ u_t^T \\ u_t^{G_{inv}} \end{pmatrix} = \begin{pmatrix} \varepsilon_t^Y \\ \varepsilon_t^T \\ \varepsilon_t^{G_{inv}} \end{pmatrix} \tag{10}$$

This can be written in the structural form as;

$$\Delta \ln\left(Y_t\right) = \sum_{i=1}^{p} \alpha_{1i} \Delta \ln\left(Y_{t-i}\right) + \sum_{i=1}^{p} \beta_{1i} \Delta \ln\left(T_{t-i}\right) + \sum_{i=1}^{p} \gamma_{1i} \Delta \ln\left(G_{inv,t-1}\right) + \varepsilon_t^Y \tag{11}$$

$$\begin{aligned} \Delta \ln\left(T_t\right) = -a_{21} \Delta \ln\left(Y_t\right) + \sum_{i=1}^{p} \alpha_{2i} \Delta \ln\left(Y_{t-i}\right) + \sum_{i=1}^{p} \beta_{2i} \Delta \ln\left(T_{t-i}\right) \\ + \sum_{i=1}^{p} \gamma_{2i} \Delta \ln\left(G_{inv,t-1}\right) + \varepsilon_t^T \end{aligned} \tag{12}$$

$$\begin{aligned} \Delta \ln\left(G_{inv,t}\right) = -a_{31} \Delta \ln\left(Y_t\right) - a_{32} \Delta \ln\left(T_t\right) + \sum_{i=1}^{p} \alpha_{3i} \Delta \ln\left(Y_{t-i}\right) \\ + \sum_{i=1}^{p} \beta_{3i} \Delta \ln\left(T_{t-i}\right) + \sum_{i=1}^{p} \gamma_{3i} \Delta \ln\left(G_{inv,t-1}\right) + \varepsilon_t^{G_{inv}} \end{aligned} \tag{13}$$

This recursive ordering is in line with [6], which allows for the dynamic identification of government investment shocks' impacts on output while holding other macroeconomic variables constant.

2.7. Structural Analysis and Multiplier Derivation

The impulse response functions were computed based on the identified structural shocks in the study. To achieve this, we invert the structural vector autoregression to its structural moving average:

$$Y_t = \mu + \sum_{i=0}^{\infty} C_i \varepsilon_{t-i} \tag{14}$$

where C_i represent the coefficient of the impulse response matrices. Also, $(C_i)_{jk}$ denote the impulse response function of the variable j to a standard structural shock in a variable k after i time. Meanwhile, we estimate the SVAR model in differences and further analyze the accumulated impulse response functions to recover the impacts on levels of the key macroeconomic variables used in the study. Following [9]-[12] we compute the monetary multiplier, M_h, at period h. We first compute the cumulative elasticity ε_h as the ratio of the cumulative responses:

$$\varepsilon_h = \frac{\sum_{i=0}^{h} (C_i)_{Y,G}}{\sum_{i=0}^{h} (C_i)_{G,G}} \tag{15}$$

where the cumulative response of log GDP to a one percent log government consumption shock is the numerator, and the cumulative response of log government consumption to its shock is the denominator. In addition, the elasticity is further computed using the sample average ratio of the variables:

$$M_h = \varepsilon_h * \frac{\overline{Y}}{\overline{G}} \tag{16}$$

The same also holds for the public investment multiplier calculation.

3. Empirical Results and Analysis

3.1. Unit Root Analysis

We use the Augmented Dickey-Fuller (ADF) tests to check the time series properties of the data to avoid spurious regressions that are commonly associated with time series variables. The test was conducted both at the level and the first differences of the log-transformed per capita series.

The results of the Augmented Dickey-Fuller (ADF) tests are presented in **Table 1** below. The ADF tests revealed the order of integration of all the core variables used in the study. The results indicates that the probability values for all the variables which includes log of real (GDP) (p = 0.3000), log of real government consumption (p = 0.9595), log of real government investment (p = 0.5322) and log of real tax revenue (p = 0.3069) all exceeds 5% in their level, the ADF tests fails to reject the null hypothesis of unit roots at the conventional 5% significance level,

which implies that the variables are non-stationary at level.

In contrast, when the first differencing of the variables is applied to the ADF tests, the probability values for all the variables-log of real (GDP) (p = 0.0001), log of real government consumption (p = 0.0201), log of real government investment (p = 0.0000) and log of real tax revenue (p = 0.0027) falls below the conventional 5% significance level. This indicates that the null hypothesis of a unit root is rejected at the 5% conventional significance level, indicating that the variables are stationary after first differencing, *i.e.*, they exhibit an integration of order 1 or I (1) order.

Table 1. Augmented Dickey-Fuller (ADF) unit root test results.

	Test in Levels		Test in First Differences	
Variable	**t-Statistic**	**p-value**	**t-Statistic**	**p-value**
Log of Real GDP $(\ln Y)$	−2.559	0.3000	−6.467	0.0001
Log of Gov't Consumption $(\ln G_{cons})$	−0.722	0.9595	−4.081	0.0201
Log of Gov't Investment $(\ln G_{inv})$	−2.074	0.5322	−7.289	0.0000
Log of Real Revenue $(\ln T)$	−2.542	0.3069	−5.029	0.0027
Test Critical Values (5%)	−3.612		−3.622	

Source: Author Computation, 2025.

3.2. Structural VAR Estimation Results

Table 2. Structural VAR estimation results for fiscal shock identification.

Parameter	Consumption Model		Investment Model	
	Coefficient	**Std. Error**	**Coefficient**	**Std. Error**
***Panel A*: *Contemporaneous Structural Parameters* (*Matrix A*)**				
a_{21} (Tax on Spending)	−0.0876	0.1787	-	-
a_{21} (GDP on Tax)	-	-	−1.1504	1.2995
a_{31} (Tax on GDP)	−0.0423	0.0378	-	-
a_{31} (GDP on Spending)	-	-	−3.6518	3.9227
a_{32} (Spending on GDP)	−0.0777	0.0459	-	-
a_{32} (Tax on Spending)	-	-	0.4233	0.6468
***Panel B*: *Standard Deviation of Structural Shocks* (*Diagonal of Matrix B*)**				
σ_{Tax} (or σ_{GDP} in Inv. Model)	0.143	0.0221***	0.0209	0.0032***
$\sigma_{spending}$ (or σ_{Tax} in Inv. Model)	0.1171	0.0181***	0.1242	0.0192***
σ_{GDP} (or $\sigma_{spending}$ in Inv. Model)	0.0246	0.0038***	0.3682	0.0568***
Log Likelihood	**74.26**		**56.65**	

Source: Author Computation, 2025.

Table 2 presents the estimated maximum likelihood estimates for the structural

vector autoregression model. In panel A, we present the off the maximum likelihood estimates of the just-identified SVAR models. Panel A shows the off-diagonal fundamentals of the contemporary structural matrix A_0. In panel B, we also present the assessed std. deviations of the orthogonal structural shocks, which form the diagonal of the matrix B. The parameters a_{ij} correspond to the coefficients C (1), C (2), and C (3) as assessed using EViews for each model. ***p < 0.01.

3.3. Detailed Impulse Response Function to a Government Consumption Shock

Table 3. Responses to a government consumption shock.

Period (Year, t)	Accum. IRF of GDP ($\%\ \Delta Y_t$)	Accum. IRF of Gov't Cons. ($\%\ \Delta G_t$)	Elasticity Multiplier ($\Delta Y_t/\Delta G_t$)
1	0.0091	0.1171	0.078
2	0.0148	0.1339	0.111
3	0.0257	0.1862	0.138
4	**0.0469**	**0.2076**	**0.226**
5	0.0353	0.2426	0.146
10	0.0478	0.2371	0.202

Source: Author Computation, 2025.

The results in Table 3, Columns 2 and 3 are cumulative responses to a one S.D. structural shock in government consumption. Column 4 is the ratio of Column 2 to Column 3. The results show a peak elasticity multiplier of approximately **0.23** four years after the initial shock. This suggests that a 1% cumulative increase in real government consumption leads to a peak cumulative increase of 0.23% in real GDP.

3.4. Detailed Impulse Response Function to a Government Investment Shock

Table 4. Responses to a government investment shock.

Period (Year, t)	Accum. IRF of GDP ($\%\ \Delta Y_t$)	Accum. IRF of Gov't Inv. ($\%\ \Delta G_t$)	Elasticity Multiplier ($\Delta Y_t/\Delta G_t$)
1	0.0000	0.3682	0.000
2	0.0120	0.4995	0.024
3	0.0410	0.4247	0.097
4	**0.0638**	**0.3599**	**0.177**
5	0.0356	0.3065	0.116
10	0.0374	0.3494	0.107

Source: Author Computation, 2025.

The results in Table 4, Columns 2 and 3 are cumulative responses to a one S.D. structural shock in government investment. Column 4 is the ratio of Column 2 to Column 3.

3.5. Multiplier Calculation Methodology

The monetary multiplier is calculated by scaling the unit-free elasticity multiplier (the ratio of the IRFs) by the average ratio of real GDP to the respective real government spending aggregate over the sample period.

To translate this elasticity into a more policy-relevant monetary value, we scale it by the average ratio of real GDP to real government consumption over the sample period. All secondary data used in the calculations are outsourced from the World Bank Development Indicators (WDI) for the period 2000 to 2024. We use the 2018 constant prices as the sample averages with a scaling factor (Y/G) of 4:

- ✓ Average Real GDP $\left(\overline{Y}\right)$: 42.40 trillion LCU.
- ✓ Average Real Government Consumption $\left(\overline{G}_{cons}\right)$: 2.42 trillion LCU.
- ✓ Average Real Government Investment $\left(\overline{G}_{invs}\right)$: 7.71 trillion LCU.

$$\text{Monetary Multiplier} = \left(\frac{\text{Accum. IRF of GDP}}{\text{Accum. IRF of Gov't Spending}}\right) \times \left(\frac{\text{Average Real GDP}}{\text{Average Real Gov't Spending}}\right)$$

C.1 Consumption Multiplier Calculation (at Peak, $h = 4$)

The peak elasticity from the impulse responses is calculated as:

$$\text{Elasticity Multiplier}\left(\varepsilon_4\right) = \frac{0.046865}{0.207604} = 0.2258$$

The data-driven scaling factor is calculated from the sample averages:

$$\text{Average}\frac{Y}{G_{cons}} = \frac{42398127156}{2,416031213} \approx 17.55$$

This yields the final monetary multiplier:

$$\text{Monetary Multiplier} = 0.2258 \times 17.55 \approx 3.96$$

C.2 Investment Multiplier Calculation (at Peak, $h = 4$)

The peak elasticity from the impulse responses is calculated as:

$$\text{Elasticity Multiplier}\left(\varepsilon_4\right) = \frac{0.063824}{0.359917} = 0.1773$$

The data-driven scaling factor is calculated from the sample averages:

$$\text{Average}\frac{Y}{G_{inv}} = \frac{42398127156}{7708719574} \approx 5.50$$

This yields the final monetary multiplier:

$$\text{Monetary Multiplier} = 0.1773 \times 5.50 \approx 0.98$$

3.6. A Tale of Two Multipliers: Consumption vs. Investment-Led Fiscal Policy in Sierra Leone

Following the preliminary data analysis and unit root test conducted, all the key

variables are integrated of order one I (1). To examine the macroeconomic effects of fiscal policy in Sierra Leone, we estimate and specify two different Structural Vector Autoregression Models (SVAR) in first differences. This method enables us to compare and quantify explicitly the impacts of macroeconomic shocks on government consumption and government investment, respectively, over a given period. We use the recursive Cholesky ordering to identify both models, a standard method for identifying macroeconomic shocks in annual time series data [6].

3.6.1. The Government Consumption Multiplier: A Demand-Side Analysis

Table 5. Comparative fiscal multiplier calculations (2000-2024 Data).

	Consumption Spending		Investment Spending	
Period (t)	**Elasticity**	**Monetary Mult.**	**Elasticity**	**Monetary Mult.**
1	0.078	1.37	0.000	0.00
2	0.111	1.95	0.024	0.13
3	0.138	2.42	0.097	0.53
4 (Peak)	**0.226**	**3.96**	**0.177**	**0.98**
5	0.146	2.56	0.116	0.64
10	0.202	3.55	0.107	0.59

[1]Note: Source (Author Computation, 2025).

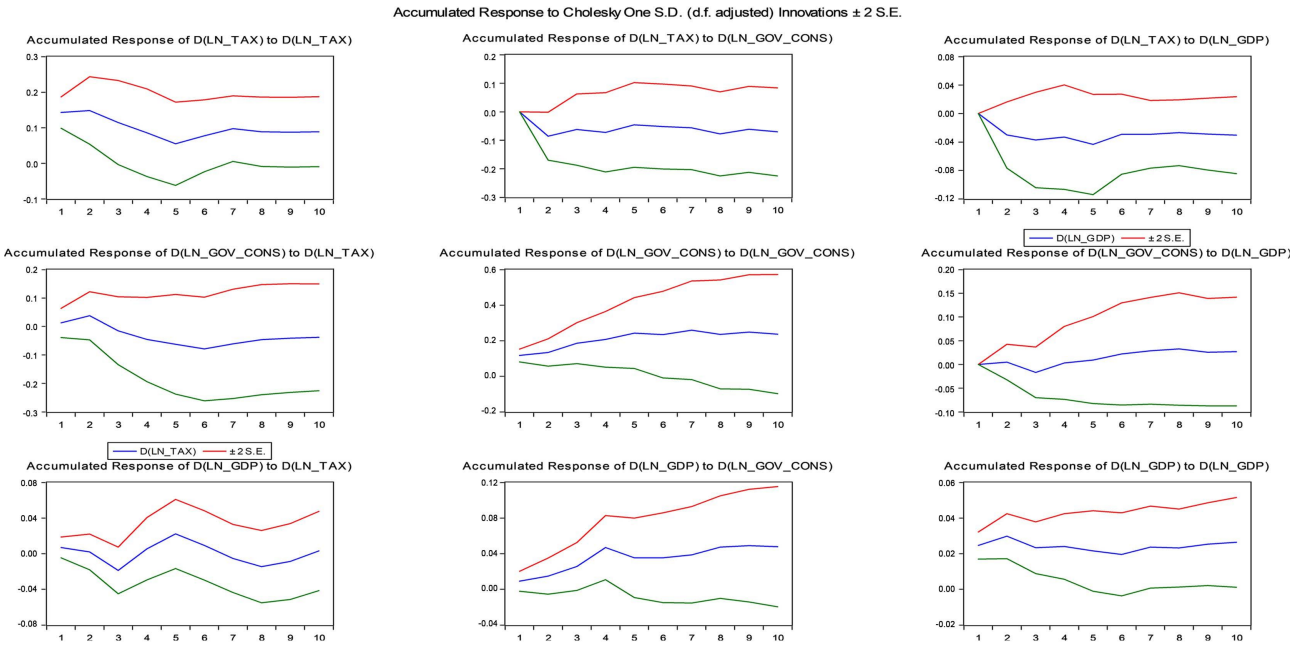


Figure 1. Panel A: accumulated response of real GDP to a government consumption shock.

[1]Note: Monetary multipliers are calculated by scaling the unit-free elasticity by the data driven average Y/G ratio from the 2000-2024 sample period. The scaling ratio is 17.55 for consumption and 5.50 for investment. See Appendix for detailed calculations.

In the first model in Table 5, we examine the macroeconomic outcomes of an expansionary shock to government recurrent spending. We present the results of the accumulated Impulse Response Functions (IRFs) in Figure 1, Panel A, which shows the response of real GDP per Capita to a one-standard-deviation structural shock on government consumption.

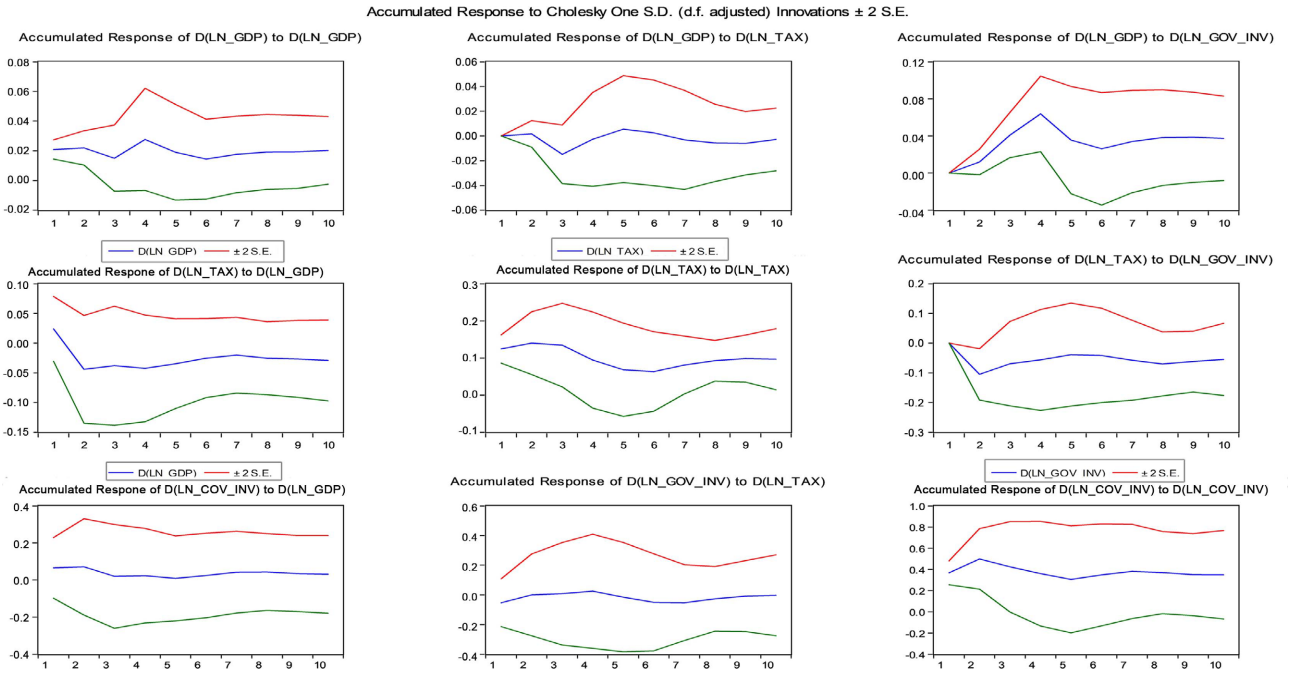
The estimated result revealed a positive and statistically significant response of real GDP, with the effect peaking in the medium term. We compute the fiscal multiplier using a two-step approach with the ultimate goal of expressing the impact in a sound policy-relevant form. Firstly, we estimate the unit free elasticity by taking the cumulative impulse response function of real GDP and comparing it to the accumulated impulse response function of government consumption. Secondly, we scaled this elasticity by the economy's average real GDP to the government consumption ratio, leading to an interpretable measure of the government fiscal multiplier, revealing a peak monetary multiplier of approximately 3.96 for government consumption. This suggests that for every increase in government consumption, there is a proportionate cumulative increase in real GDP per capita of nearly four (4) Leones for over four years. Our study presents a puzzle result, in contrast to the findings of [2] on cross-country studies on fiscal multipliers; their study revealed that in developing economies, fiscal multipliers on government consumption are relatively low and usually fall below unity.

The main theoretical determinant for such a high multiplier is due to the severe liquidity constraints that the country faces. In a fragile, post-conflict economy like Sierra Leone, where a huge number of the nation's population greatly depend on "hand-to-mouth" for daily survival due to the lack of access to credit facilities from formal financial institutions and savings accounts, this breaks down the standard permanent income hypothesis [13]. The very high marginal propensity to consume has also been reflected by [5], who noted that the demand for money in Sierra Leone is very sensitive to changes in the economic environment in the short run. Since households do not have sufficient savings cushions, the government's consumption expenditures flow into the economy as short-term liquid demand, amplifying the multiplier effect to 3.96. Consumption patterns are strongly aligned with current income for these types of households, such that the marginal propensity to consume out of temporary macroeconomic income shocks is close to one. Apparently, an increase in income, whether through transfer payments or public sector wages, is not directed towards savings or in the payment of debt, but is rather spent immediately, thereby leading to an increase in aggregate demand. This is commonly referred to as the first round Keynesian effect, which is stronger in more advanced economies where consumption smoothing is more common [14].

Moreover, the size of the fiscal multiplier is extremely state dependent. The seminal work of Auerbach and [15] illustrates that during the period of recession or stagflation, fiscal multipliers tend to be larger. The Sierra Leone economy has

operated below potential since 2000 to 2024 period, with further external shocks such as the Ebola Epidemic and the COVID-19 pandemic. Under these shocks, fiscal spending was well structured to exert large impact on output, while reducing the inflationary pressures or crowding out private sector activity significantly. This finding is consistent with a broad body of existing literature in developing economies, indicating that fiscal multipliers are often moderate due to the impact of structural shocks; these features are highly relevant to Sierra Leone. Firstly, leakages due to imports reduce fiscal stimulus effectiveness, where an increase in government income is spent on imported goods rather than domestic goods [16]. Secondly, an increase in government borrowings proportionately raises the domestic interest rates, which crowds out private sector investment, particularly in developing economies [17]. Thirdly, the Ricardian equivalence may prompt households to save more due to the anticipated future tax burden and offset the fiscal stimulus impact [18].

3.6.2. The Public Investment Multiplier: A Puzzle of Inefficiency



Source: Author Computation, 2025.

Figure 2. Panel B: accumulated response of real GDP to a government investment shock.

In the second Structural Vector Autoregression model (SVAR) in **Table 5**, we specify it to isolate the effects of government capital spending. As shown in the visual plot in Panel B of **Figure 2**, the impulse response of real Gross Domestic Product (GDP) per capita is more persistent and less strong over time as compared to the government consumption model. Applying the same two-step approach for calculating the fiscal multiplier effect, we discover a peak monetary value of about 0.98. While this sub-unity multiplier is positive, it serves as the

central puzzle of our study. In contrast with strong theoretical arguments on the positive and larger effects of public investment on the supply side [19], and with empirical findings indicating that public investment in developing economies is greater than 1 or unity, especially for economies with large infrastructural gaps [20]. A public investment multiplier that is below one indicates that, on average, government investment has not generated enough economic activity to fully offset the investment cost.

This divergence is not due to failure of economic theory, but rather due to the implementation of poor policy. However, persistent inefficient public investment management may be one of the roots of this explanation, leading to a significant gap between budgeted capital expenditures and the establishment of productive public resources. In the field of development economics, these efficiency gaps are well recognized. According to [21], a seminal work revealed that a higher public investment does not automatically result in higher productive capital stock, because in many developing economies a huge share of public investment efforts is wasted effectively. Our result of a sub-unity multiplier or multiplier below one revealed strong empirical evidence that this efficiency gap is significant in the Sierra Leone economy. The sub-unity investment multiplier (0.98) aligns with the broader institutional challenges identified in the Sierra Leonean investment landscape. For instance, [22] argues that bureaucratic hurdles and political instability create a high-risk environment that dampens the returns on capital. If foreign investors are deterred by these "drivers", it stands to reason that public capital projects face similar implementation bottlenecks, leading to the efficiency gaps observed in this study.

According to a cross-country study conducted by the [20], it was revealed that on average, most countries lost over 30% of the value of their government investment to inefficiencies. The core drivers of these inefficiencies are due to weak project appraisal, where projects are being selected based on political considerations rather than cost-benefit analysis, leading to the implementation of "white elephant projects" with very low economic returns or even no returns. In addition, [23] also finds that governance issues, political conflicts of interest, coupled with lengthy implementation lags, make public investments yield a positive and short-run impact on economic growth. In another study conducted by [24], it is found that while government investment can have higher returns, there are only a few empirical studies that show that it can crowd in private sector investment in aggregate.

Consequently, our findings of a public investment multiplier of 0.98 should be understood as a declaration about the potential of public investment in Sierra Leone, but should be considered as a quantifiable arraignment of the current process. It indicates that the returns to government investment are potentially high, but the actual macroeconomic effect is strictly dampened by systemic inefficiencies in governance.

3.7. Limitations and Robustness

Despite this study's contribution to the understanding of Sierra Leone's fiscal sit-

uation, several constraints must also be recognized. The most important of these is the limited data samples, which have 21 observations (2004-2024) due to the availability of Sierra Leone's post-conflict data. In SVAR modeling, computation of the impulse response functions may be affected due to the reduction in degrees of freedom that may arise from the use of a small sample. However, the use of annual data is never a choice, especially in studies of low-income countries, because it is a rule of thumb to have quarterly GDP data. In this study, in order to avoid such risks, the parsimonious lag selection used the Schwarz Information Criterion (SIC), and the VAR roots stability tests were used to confirm that the VAR roots were indeed within the unit circle. Although the consumption multiplier of 3.96 appears sizably high, it is in specifications that the direction and statistical significance of the results remain strong, which provides a baseline which is acceptable for policy debates in the context of a data-scare situation.

4. Conclusions and Policy Recommendations

This study aims to address the central research question for Sierra Leone's development policy in a fiscally constrained environment amid global uncertainties: What is the dynamic causal impact of an external macroeconomic shock on public spending versus government investment on real Gross Domestic Product (GDP) in Sierra Leone? We employ the Structural Vector Autoregression (SVAR) model, utilizing two theoretically grounded identification strategies, and apply annual time series data from 2000 to 2024 to provide a clear, but extremely puzzling answer. Our empirical findings reveal a significant disparity in the effectiveness of various types of government spending and investment, which carry insightful implications for debt sustainability and growth path in the domestic economy.

The study findings conclude that the composition of government expenditures plays a pivotal role in determining its macroeconomic effect. Our estimations revealed that the peak multiplier for recurring public consumption expenditures is about 3.96. This remarkably large multiplier indicates that fiscal stimulus that are consumption-based serves as a significant tool in enhancing economic growth in Sierra Leone. This implies that each additional increase in recurrent consumption spending proportionately leads to an increase in aggregate output by Four Leones, a result driven by an extreme liquidity challenge and a high marginal propensity to consume, particularly in fragile, post-conflict economies [25].

In contrast, the peak multiplier for government investment is approximately 0.98; this serves as the fundamental puzzle of our study. This suggests that capital expenditure, on average, is unable to generate sufficient economic returns to offset its own investment cost. The public investment multiplier is theoretically grounded in two key functions: firstly, in the short run, it provides an immediate boost to demand; in other words, it stimulates demand, while in the long run, it increases the economy's productive capacity, which in turn attracts private sector investment or crowds in private sector investment. This finding contrasts with the robust theoretical belief in public investment, which has two-fold demand and sup-

ply-side effects, serving as the core forces driving economic growth. This finding is not a result of economic theory failure, but rather due to the implementation of poor policies, which suggests that inherent inefficiencies are counterbalancing the potential of government investment.

To leverage these findings, we propose an evidence-based policy framework grounded in three key pillars for the Government of Sierra Leone and other international development partners that seek to overcome the challenges encountered with the sustainable development financing trajectory.

Pillar 1: Leverage Consumption Spending for Stabilization, Not Growth

The study's findings of a higher public consumption multiplier should not be understood as a directive for a wide, untargeted rise in recurrent spending. It rather revealed the prevailing macroeconomic effects of channeling resources to households that are facing severe liquidity challenges, for whom an increase in the size of the income level is rather spent on consumption than saved for investment purposes. This study suggests that the implementation of well-structured and targeted social programs, such as cash transfers and support given to the vulnerable in the form of wage subsidies, serves as a pivotal instrument in enhancing fiscal sustainability and stimulating aggregate demand during recession periods. The primary challenge is to use this channel for targeted poverty alleviation, while enforcing proactive fiscal policies and built-in exit strategies to avoid permanent expansion of the economy that could intensify fiscal vulnerabilities in the long run.

Pillar 2: A Radical Overhaul of Public Investment Management (PIM) as a Prerequisite for Growth

The core policy challenge emphasized in our study is the crucial need to close the huge gap between the potential and realized earnings of capital expenditures. The finding of a public investment monetary multiplier less than one serves as a significant indicator that public investment in Sierra Leone is fundamentally inefficient. The main policy recommendation is not to allocate more resources to public investment, but to radically improve the investment management strategies. On one hand, government spending does not automatically transform into productive investment; this can be severely impaired by weak institutions, leading to what we referred to as "efficiency gap". The urgent priority for regulatory authorities in Sierra Leone and its development partners is to reform the public investment management framework, as this serves as the most critical stepping stone in achieving sustainable long-term growth.

However, having a multiplier effect greater than one is not just an automatic realization, but rather greatly depends on the efficiency and quality of the institutional capacity for active public investment management. According to [26], poor governance structures and ineffective Public Investment Management (PIM) can significantly reduce the returns on public investment. This study suggests that for Sierra Leone to adequately and efficiently realize all the gains identified, the relevant regulatory authorities must strengthen and enhance the Public Investment Management (PIM) frameworks. This requires the implementation of rigorous

selection requirements and the implementation of a sound project appraisal approach, ensuring competitive procurement procedures that are highly transparent and free from conflicts of interest, and also conducting regular monitoring and evaluation with the ultimate goal of ensuring that project funds are directed towards the projects that yield maximum social and economic returns.

Pillar 3: Cultivating a Virtuous Fiscal Cycle through Governance

The study suggests that the most credible paths to achieving fiscal sustainability in the long run are through the implementation of an effective investment-led growth strategy. Our findings show that this cycle is presently blocked by the public investment inefficiencies. We therefore suggest that the most critical long-term goal is to focus on good governance reforms, through strengthening the public investment management in pillar 2, which in turn can gradually increase the public investment multiple above unity. A multiplier effect greater than one significantly drives economic growth and increases the formal tax base, which makes it easier to service public debt and provide funding for future initiatives. This initiative fosters a virtuous fiscal cycle wherein strategic public investment fuels economic growth, which in turn strengthens the domestic revenue mobilization capacity through tax policy reforms. This framework directly demonstrates how robust domestic policies can yield a more resilient and autonomous model for development.

In conclusion, this study presents sound quantitative evidence, tailored specifically for the Sierra Leonean economy, in evaluating the effectiveness of different types of public expenditures. This evidence-based policy approach is essential for making effective and efficient fiscal choices required to put Sierra Leone on an inclusive and sustainable path.

Data Availability Statement

The data employed throughout this study are available upon request from reviewer (s) for verification purposes.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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