The macroeconomic effects of fiscal policy shocks in Sierra Leone: A structural vector autoregression approach

Samuel Bonzu *

Macro-Fiscal Policy Division, Ministry of Finance, Treasury Building, Freetown, Sierra Leone

Abstract

The aims of this paper are as follows: To examine the dynamic effects of discretionary fiscal policy shocks on key macroeconomic variables in Sierra Leone. Also, to empirically investigate which fiscal policy tool is most efficient for short-run macroeconomic stabilization in Sierra Leone. These objectives are explored within the context of a structural vector autoregression. The key findings are: Short-run government spending expansion significantly increases private consumption and output at the cost of higher inflation. Private investment is significantly crowded-in by spending expansion, exhibiting a link between investment and economic activity, and thus suggesting the existence of the acceleration hypothesis of investment in Sierra Leone. Private investment and output fall in response to tax increase. Also, government investment spending strongly stimulates the economy compared to government consumption expenditure. Government revenue increased in response to spending shock. This short-run response of revenue to spending expansion could be due to the positive reaction of output to government spending shock and/or the authorities' willingness to finance the increased spending needs by the government. In the short-run, spending cuts seem plausible in achieving fiscal consolidation compared to tax increase. The findings validate the potency of fiscal policy to stabilize the economy in the short run.

Keywords: Fiscal Policy; Macroeconomic Stabilization; Structural Vector Autoregression

* Corresponding author. *E-mail address:* author@email.com

1. Introduction

Prior to the first and second oil price shocks of 1973 and 1979, fiscal policy was extensively viewed as a powerful tool for stabilization. However, its inability to boost economic recovery following these shocks and the related increase in fiscal deficits and public debts have led some macroeconomists and policymakers to be doubtful about its potential to smooth business cycle fluctuations (Beetsma and Giuliodori, 2011), and thus its effectiveness as a stabilization tool (Afonso and Sousa, 2012). However, during the 2008 financial crisis when many advanced economies were experiencing zero lower bound interest rates that hindered the effectiveness of monetary policy for economic recovery, policymakers in these economies resorted to fiscal policy as an alternative tool for stabilization and growth. According to Auerbach (2012), the United States government approved a fiscal stimulus package as part of the American Recovery and Reinvestment Act (ARRA) of 2009, which comprised tax cuts, transfers and spending expansion amounting to 5.5% of the GDP. In a similar vein, the European Union adopted the European Economic Recovery Plan (EERP) equivalent to 1.5% of the EU GDP (Beetsma and Giuliodori, 2011). Fiscal policy is once again at the center of macroeconomic policy debate.

Theoretical predictions and empirical findings still offer contrasting views on the effects of fiscal policy. Unlike monetary policy where there is some agreement on how it affects the macroeconomy following Taylor's rule, there is no such consensus among macroeconomists regarding fiscal policy. One reason for such disagreement stems from theoretical predictions on the impacts of government spending on private investment and private consumption and, how private consumption responds to tax cuts. The new Keynesian model with price rigidity predicts that positive government spending shocks will stimulate labor demand, household consumption and a rise in real wages, thereby increasing output. Models with increasing return to scale and perfect competition have shown that positive shocks to government spending increase real wage (Rotemberg and Woodford, 1992) and consumption and real wage (Devereux et al., 1996). These disparities in predictions between the new Keynesian and the neoclassical model are due to the theoretical assumptions underpinning consumers' behavior. The new Keynesian model assumes consumption depends on current disposable income, which implies consumers are non-Ricardian. In the neoclassical real business cycle model, however, consumption depends on lifetime wealth, which implies that consumers are Ricardian optimizing agents (Galí et al., 2007).

Also, on the empirical spectrum, academic and policy makers are yet to reach a consensus on the effects of fiscal policy on the macroeconomy. This lack of agreements motivates the need to contribute to the existing literature by providing empirical evidence for Sierra Leone by answering the following questions: What are the dynamic effects of discretionary fiscal policy shocks in Sierra Leone? Which fiscal policy tool is most efficient for short-run macroeconomic stabilization in Sierra Leone? Though such questions are useful and are often asked in academic and policy discussions about the efficacy of fiscal policy in stimulating growth and welfare, the existing literature is sparse for Sierra Leone. Despite the large volume of the empirical literature, little is known about how the economy responds to fiscal shocks. Specifically, to the best of my knowledge, there are no known studies that characterize the dynamic effect of fiscal policy shocks on the macroeconomy in the framework of the structural VAR model given the various tax reforms that have been introduced in the past and the corresponding changes in government spending behavior.

Some earlier studies on fiscal policy often depend on the cyclically adjusted primary deficits as determinants of the fiscal policy stance. Though cyclically adjusted deficits do offer insight into current fiscal

policy, their use is unsuitable in dynamic macroeconomic analysis, because competing macroeconomic theories predict different effects from spending increases and tax cuts on the macroeconomy (Fatás and Mihov, 2001). Structural Vector Auto Regression (SVAR) is more appropriate in the dynamic macroeconomic context (Blanchard and Perotti, 2002).

In SVAR, the identification of fiscal shocks can be documented in five methodological groups. First, fiscal policy shocks can be identified by using dummy variables that capture specific episodes, such as the military-build ups (i.e., the Korean and the Vietnam wars) or the Reagan fiscal expansion in the US (Ramey and Shapiro, 1998; Edelberg et al., 1999; Burnside et al., 2000). Second, sign restrictions can be imposed on the impulse-response functions (Mountford and Uhlig, 2002) and third, fiscal shocks and be identified based on recursive ordering (Fatás and Mihov, 2001; Favero, 2002). Fourth, fiscal policy shocks can be identified by assuming decision lags in policy-making and information about the elasticity of fiscal variables to economic activity (Blanchard and Perotti, 2002; Perotti, 2005) and finally, fiscal shock can be identified by exploiting the conditional heteroscedasticity of the structural shocks (Bouakez, et al., 2014). This paper employs the third and fourth identification strategies stated above.

Over the past decades, Sierra Leone has introduced various tax reforms and changes to government spending priorities. Regardless of these changes in spending and taxes, to the best of my knowledge, there are no known studies that have examined the dynamic effects of such discretionary fiscal policy measures on the macroeconomy in the framework of the structural VAR. As such, this paper exploits the gap in the literature and contributes in the following ways: (i) I employ higher frequency data in the empirical analyses as it is uncommon for developing countries. Doing so makes this study and findings comparable to the existing literature as most, if not all, fiscal VARs employ quarterly data. (ii). The findings from this paper contribute to the existing literature on fiscal policy shocks by providing recent evidence for Sierra Leone.

2. Literature review

The effects of fiscal policy on the macroeconomy are still debatable among academics and policy makers. The empirical literature continues to offer contrasting evidence on the effects of fiscal policy regardless of the methodology employed. Different approaches to examine the macroeconomic effects of fiscal policy shocks have been employed by various researchers and academics over the past decades.

Ramey and Shapiro (1998) introduce the narrative approach to capture an exogenous increase in defence expenditure, implying government spending. The methodology involves constructing a dummy in a series of univariate equations to account for the increase in defense spending that takes value one at a quarter and zero otherwise when large military build-ups took place in the United States to identify episodes of discretionary fiscal policy. Some studies that adopted this approach with modification include Edelberg et al. (1999) Burnside et al. (2000), Eichenbaum and Fisher (2005). Notwithstanding the minor methodological modifications, these studies reach similar conclusions. From a qualitative point of view, in response to a discretionary positive government spending shock, output and non-residential investment increase and consumption, wages and residential investment fall. In effect, these findings support the neoclassical business cycle theory.

Recent empirical literature that examines the effects of fiscal policy shocks do so within the framework of SVAR to determine the dynamic responses of macroeconomic variables. Fatás and Mihov (2001) employed the

recursive approach to achieve identification in a five-variable Vector Auto Regression (VAR) system. They found strong, positive, and persistent impacts of fiscal expansions on economic activity. Consumption, real wage, and residential investment rise in response to positive government spending shocks.

Blanchard and Perotti (2002) employed a three-variable SVAR model to identify the impact of government spending and tax policy on output. Following positive spending shocks, output and consumption increase and investment fall. This approach is extended in Perotti's (2005) to study the effect of fiscal policy in five OECD countries (US, the UK, Germany, Canada, and Australia). Mountford and Uhlig (2002) propose and adopted a different approach to achieve identification of fiscal shocks from VAR residuals by imposing sign restrictions on the impulse responses instead of contemporaneous restrictions. However, they found a small response of consumption, significant only on impact. Investment falls to positive spending and tax shocks. Yet by imposing restrictions on the impulse response, this approach found a positive relationship between output and revenue shocks as opposed to business cycle shocks and by implication rules out the non-Keynesian effects of fiscal policy. That is, it rules out that output may respond positively to tax shocks for a few quarters after the shocks (Caldara and Kamps, 2008).

The literature on fiscal policy shocks in developing countries, specifically in sub-Sahara Africa, is very thin. This paucity in research could be due to the fact that most studies on fiscal policy surprises are conducted using higher frequency data that is unavailable for most developing countries. The few studies that have emerged so far essentially rely on recursive ordering because the restrictions imposed on Blanchard and Perotti's (2002) approach is limited to quarterly frequency data. In studying the impacts of discretionary fiscal policy change in Egypt and Tunisia, Slimane and Tahar (2013) found significant and positive effects of output on spending expansion. A similar conclusion was reached by Mutuku and Elias (2014) for Kenya. Driss et al. (2014) examine the impacts of fiscal policy shocks and exchange rate dynamics in Algeria. They found that both government spending and revenues expansion significantly increase output. The latter is, however, counterintuitive, as conventional wisdom predictions expect tax shocks to lower output. Akpan and Atan (2015) investigate the macroeconomic effects of fiscal policy shocks in Nigeria using the recursive ordering and found that output significantly rises to spending expansion while private investment is insignificantly crowded-in by government spending. Millo and Kollamparambi (2016) investigate how government spending and tax policy affect output and employment in South Africa using the recursive approach. They surprisingly found that output does not respond to spending expansion in the short run while positive revenue shocks increase output. They conclude that the transmission mechanism from government spending to output is not direct as predicted by the Keynesian doctrine, but is rather seen indirectly through employment, conforming to supply-side economics. Olivero (2019) examined the effects of government spending has on credit spreads in the United States between 1984-2017. The result indicates that fiscal policy affects the economy through credit channel mechanisms. He suggests that, from the standpoint of policy purpose, policymakers should be cautious when implementing fiscal consolidation measures during a period of distress in the financial market. Alami et al (2021) examined the macroeconomic impact of fiscal policy shocks in Morocco by employing disaggregated structural VAR. The found spending shock to negatively impact economic growth. This effect in turn also negatively impacts prices and interest rates. Munir and Riaz (2020) investigate the impacts of fiscal policy shocks in Pakistan using quarterly data spanning from 1976-2018. They found that in terms of disaggregated government spending, capital and development expenditures stimulate the economy more than current expenditures. Also, shocks to current expenditures are inflationary and shock to tax revenue increase output.

Notwithstanding the large volume of empirical studies on the macroeconomic effects of fiscal policy, to the best of my knowledge, there are no known studies that have examined the dynamic effects of fiscal policy shocks on the macroeconomy in the context of a structural vector autoregression. In this regard, this paper exploits the gap and contributes to the literature by offering recent empirical evidence for Sierra Leone.

3. Data sources and description

The data employed in this paper are GDP, Inflation, Government Spending, private consumption, private investment, Interest rate on borrowing (T-bill) and Tax revenue. The following variables: GDP, inflation, government spending (government investment expenditures and government final consumption expenditures), private consumption and private investment were obtained from the world development indicators (World Bank), treasury bill rate is obtained from the International Financial Statistics (IFS) and tax revenue is obtained from two different sources: National Revenue Authority, Sierra Leone, and the International Financial Statistics (IFS). As in Blanchard and Perotti (2002), I define government spending as the sum of general government final consumption expenditure and government investment. Net taxes are defined as the sum of all total tax revenues less transfers. The inflation rate is the GDP deflator annual percentage, while the interest rate is the treasury bill rate.

Some studies on fiscal VARs are carried out using quarterly data because of the assumptions used to identify the fiscal shocks. For example, Blanchard and Perotti (2002). However, some economies do not have quarterly data on fiscal variables. This problem of unavailability of higher frequency data has led the researcher to rely on interpolation of time series. For example, Favero (2002) and Marcellino (2002) estimated fiscal VAR using half-yearly data in four European countries: France, Italy, Spain, and Germany. In the first three countries, the budget data was interpolated from the annual series (Perotti, 2005). Because of the unavailability of quarterly data, which is a common feature of many developing and emerging countries, I interpolate the available annual data to quarterly data using the Chow and Lin (1971) approach. It is worth noting that the use of annual data does not change the result, as has been shown by Born and Müller (2012). These authors estimate the effect of government spending shocks using both annual and quarterly data for Australia, Canada, the United Kingdom, and the United States, and found identical effects on the impulse response function.

3.1. Methodology

Sims (1980) criticizes the specification methodology of large-scale macro-econometric models, citing two different methodological shortcomings. First, the simultaneous equations systems are specified based on the aggregation of partial equilibrium models, neglecting any concern for the subsequently omitted interrelations. Second, the dynamic structure of the model was often specified to provide restrictions that were essential to achieve identification or over-identification of the structural form (Amisano and Giannini, 2012). As such, Sims recommends the use VAR as an alternative to simultaneous equation systems for forecasting with macro-econometric models, which has given rise to the use of VAR in empirical research in macroeconomics. This paper employed the SVAR model as a framework for forecasting. The model is estimated using quarterly data for Sierra Leone from 1980q1-2014q4, providing us with a sample size of 140 observations. Following Perotti (2005), the benchmark model is a five-variable VAR model comprising output, government spending,

government revenue, inflation rate and interest rate. In addition, I specify a six-variable VAR model incorporating per capita private consumption and per capita private investment. All variables are real in log and per capita terms, except for the interest rate.

Denoting the vector of endogenous variables by X_t and the vector of reduced form residual as U_t, the reduced form VAR can be written as:

$$X_t = A(L)X_{t-1} + U_t \tag{1}$$

where A is $(K \times K)$ VAR coefficient matrices, L is a polynomial shift operator or lag length and U_t is a white noise error term with zero-mean and non-singular variance-covariance matrix $\sum u$, such that, $U_t \sim (0, \sum u)$. $X_t \equiv [\, g_t, y_{t,} \pi_t \tau_t r_t \,]'$, $U_t \equiv [u_t^g \, u_t^y \, u_t^\pi \, u_t^\tau u_t^r]'$ with $E[u_t] = 0$ and $E[u_t u_t'] = \sum u$ and $E[u_t u_s'] = 0$ for $s \neq t$. The reduced-form disturbances are usually correlated, which requires us to transform the reduced-form model into a structural model. Multiplying equation (1) by $(K \times K)$ matrix A_0 gives the structural form of the model:

$$A_0 X_t = A_0 A(L) X_{t-1} + Be_t \tag{2}$$

where $Be_t = A_0 U_{t,}$ defines the relation between the structural residuals e_t and the reduced-form residuals u_t. Matrix A_0 defines the contemporaneous relation among the variables in the vector X_t. Knowing that $Be_t = A_0 U_t$, the relation between the reduced form of residuals and the structural residuals, matrix B needs to satisfy the condition $\sum u = B\sum_e B'$. The relation $\sum u = BB'$ does not however uniquely determine matrix B, because $\sum u$ is symmetric and contain at most $K(K+1)/2$ different elements, while B has K^2 elements (Lütkepohl, 2005). Therefore, the structural shocks will not be uniquely determined without additional restrictions. Conversely, at least $K(K-1)/2$ additional restrictions are required for unique specification of matrix B transformation in characterizing the shocks. The procedure adopted to identify the fiscal shocks are highlighted below.

I adopt two identification techniques in the empirical analysis: the recursive approach proposed by Sims (1980) and applied in the study of fiscal policy shocks in the United States by Fatás and Mihov (2001), Favero (2002) etc. and the identification approach proposed and applied by Blanchard and Perotti (2002) to study the effects of government spending and taxes on output in the United States and applied to the study of fiscal policy shocks in OECD countries by Perotti (2005). I summarize below the two identification approaches used in this paper.

3.1.1. Recursive approach

The first identification strategy adopted here is the recursive ordering which is sometimes referred to as the Cholesky decomposition. I ordered the variables following Perotti (2005) and Caldara and Kamps (2008). The ordering is as follows: government spending enters the model first, output is ordered second, inflation is ordered third, government revenue is ordered fourth and interest rate last. The idea here is to separate the structural innovations u_t from the reduced-form innovations e_t, such that the errors should be uncorrelated with each other.

The relation between the reduced-form disturbances u_t and the structural disturbance e_t takes the following form:

$$
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 \\
-\alpha_{yg} & 1 & 0 & 0 & 0 \\
-\alpha_{\pi g} & -\alpha_{\pi y} & 1 & 0 & 0 \\
-\alpha_{\tau g} & -\alpha_{\tau y} & -\alpha_{\tau \pi} & 1 & 0 \\
-\alpha_{rg} & -\alpha_{ry} & -\alpha_{r\pi} & -\alpha_{r\tau} & 1
\end{bmatrix}
\begin{bmatrix}
u_t^g \\ u_t^y \\ u_t^\pi \\ u_t^\tau \\ u_t^r
\end{bmatrix}
=
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 1
\end{bmatrix}
\begin{bmatrix}
e_t^g \\ e_t^y \\ e_t^\pi \\ e_t^\tau \\ e_t^r
\end{bmatrix}
$$

The ordering of the variables implies that: (i) government spending does not respond contemporaneously to shocks to other variables in the system; (ii) output does not react contemporaneously to shocks to inflation, government revenue and interest rate, but is affected contemporaneously by spending shocks; (iii) inflation does not react contemporaneously to government revenue and interest rate shocks, but is affected contemporaneously by government spending and output shocks; (iv) government revenue does not react contemporaneously to interest rate shocks but is affected by government spending, output and inflation shocks; and (v) interest rate is affected by all shocks in the system. It is worth noting that after the early period, the variables in the system can interact freely – for example, inflation shocks can affect output in all periods after the period in which the shock occurred.

According to Caldara and Kamps (2008), the underlying assumptions for ordering the variables are justified as follows: changes in government spending in contrast with changes government revenue are often unconnected to business cycles. In this regard, it is reasonable to assume that government spending is not affected contemporaneously by shocks emanating from the private sector. Ordering output and inflation before government revenue is justified based on the grounds that shocks to these variables have an instantaneous impact on the tax base and, therefore, a contemporaneously effect on government revenue. This specific ordering of variables thus captures the effects of the automatic stabilizer on government revenue, while it rules out (possible important) contemporaneous effects of discretionary changes in taxes on output and inflation. Interest rate is ordered last, which is justified on the premise that given government spending and revenue as defined here (net of interest payment) are not sensitive to changes to interest rate.

3.1.2. Blanchard-Perotti approach

In this sub-section, I consider the ordering strategy in Perotti (2005) following Blanchard and Perotti (2002). This technique relies on institutional information about taxes and transfer and their collection period. This approach helps us to identify the automatic feedback of taxes and government spending on economic activity. This approach is of two-fold. First, the institutional information is used to estimate cyclically adjusted taxes and government spending. Next, estimates of the fiscal policy shocks are obtained. The relationship between the reduced-form innovations u_t and the structural innovations e_t is written as follows:

$$u_t^g = \alpha_{gy} u_t^y + \alpha_{g\pi} u_t^\pi + \alpha_{gr} u_t^r + \beta_{g\tau} e_t^\tau + e_t^g \tag{4}$$

$$u_t^\tau = \alpha_{\tau y} u_t^y + \alpha_{\tau \pi} u_t^\pi + \alpha_{\tau r} u_t^r + \beta_{\tau g} e_t^g + e_t^\tau \tag{5}$$

$$u_t^y = \alpha_{yg} u_t^g + \alpha_{y\tau} e_t^g + e_t^y \tag{6}$$

$$u_t^\pi = \alpha_{\pi g} u_t^g + \alpha_{\pi y} u_t^y + \alpha_{\pi r} u_t^\tau + e_t^\pi \tag{7}$$

$$u_t^r = \alpha_{rg}u_t^g + \alpha_{ry}u_t^y + \alpha_{r\pi}u_t^\pi + \alpha_{rr}u_t^r + e_t^r \tag{8}$$

The above system of equations is not identified. The variance-covariance matrix of the reduced-form disturbances has 10 distinct elements, whereas the above system of equations comprises 17 free parameters.

The Blanchard and Perotti (2002) approach is quite different from the recursive approach. In the recursive approach, all seven parameters are restricted to zeros, whereas Blanchard and Perotti (2002) estimate some of the parameters. The first step of the estimation procedure involves an adjustment of government spending and revenues for the contemporaneous response to these variables to the business cycle and inflation.

As in Perotti (2005), the aggregate output elasticity of government revenue $\alpha_{\tau y}$ and the aggregate value of the inflation elasticity of government revenue are estimated outside the model and these estimates are used in the VAR in order to identify the fiscal shocks. Since government spending is excluded from transfer, output elasticity of government spending (α_{gy}) is set to zero. Inflation elasticity of government revenue is set to -0.5, as in Perotti (2005). This figure is argued on the premise that nominal wages of government employees, which account for a large portion of government consumption, do not contemporaneously respond to changes in inflation, implying that government wage bill declines in real terms if there is an unanticipated inflation. Moreover, interest rate elasticities on government spending (α_{gi}) and government revenue ($\alpha_{\tau i}$) are set to zero, because interest paid, and interest received by government are omitted from the definition of government spending and revenue respectively.

From the reduced form residuals in equations (4) and (5), the structural innovations e_t^y and e_t^τ are linear combinations of three components. The first component is the systematic response of taxes and government spending to shocks in output, inflation, and interest rate under an existing fiscal policy regulation – such as an unanticipated change in taxes in reaction to output shock, for a particular tax rate. The second is the systematic discretionary reaction of policymakers to shocks in output, inflation, and interest rate – for example, decrease in tax rates applied contemporaneously in response to recession – while the final component comprises random discretionary shocks to fiscal policies, referred to as 'structural' fiscal shocks, which unlike the reduced-form residuals are uncorrelated with all other structural shocks. This is the component that is of interest when estimating the impulse responses of fiscal policy shocks.

Formally,

$$u_t^g = \alpha_{gy}u_t^y + \alpha_{g\pi}u_t^\pi + \alpha_{gr}u_t^r + \beta_{g\tau}e_t^\tau + e_t^g \tag{9}$$

$$u_t^\tau = \alpha_{\tau y}u_t^y + \alpha_{\tau\pi}u_t^\pi + \alpha_{\tau r}u_t^r + \beta_{\tau g}e_t^g + e_t^\tau \tag{10}$$

where the coefficients α_{jk} capture the remaining two components and e_t^y and e_t^τ are the 'structural' fiscal shocks, i.e., cov (e_t^g, e_t^τ) = 0. It is seen that e_t^g and e_t^τ are correlated with the reduced form residuals, making it impossible to obtain estimates using OLS regression of equations (9) and (10) above.

To achieve identification here, it is argued that because fiscal policy has long inside lags, the systematic discretionary fiscal response to any unanticipated event is absent within a quarter because policymakers would require at least quarter to respond to the given shock. Perotti (2005) argues that government spending does not systematically respond to surprise changes in output within a quarter, therefore α_{gy} is set equal to zero. As such, the coefficients α_{jk} in equations (9) and (10) capture only the automatic response of fiscal variables to economic activity.

Having external information on the elasticity of government revenue and spending to output, inflation, and interest rate, the fitting values of the coefficients α_{jk} can be computed. Also, the cyclically adjusted fiscal shocks can be constructed, which are linear combinations of two structural shocks, as follows:

$$u_t^{g,CA} \equiv u_t^g - (\alpha_{gy}u_t^y + \alpha_{g\pi}u_t^\pi + \alpha_{gr}u_t^r) = \beta_{gt}e_t^t + e_t^g \tag{11}$$

$$u_t^{\tau,CA} \equiv u_t^\tau - (\alpha_{\tau y}u_t^y + \alpha_{\tau\pi}u_t^\pi + \alpha_{\tau r}u_t^r) = \beta_{tg}e_t^g + e_t^t \tag{12}$$

Kargbo and Egwaikhide (2012) provide estimates of output elasticities of government revenue for Sierra Leone. These authors estimate the total tax output elasticity $\alpha_{\tau y}$ to be 0.89. I estimate the aggregate value of inflation elasticity on government revenue $(\alpha_{\tau\pi})$ as 0.44. The reduced-form residuals and the structural residuals is given as:

$$\begin{bmatrix} 1 & 0 & 0.5 & 0 & 0 \\ -\alpha_{yg} & 1 & 0 & -\alpha_{y\tau} & 0 \\ -\alpha_{\pi g} & -\alpha_{\pi y} & 1 & -\alpha_{\pi\tau} & 0 \\ 0 & -0.81 & -0.44 & 1 & 0 \\ -\alpha_{rg} & -\alpha_{ry} & -\alpha_{r\pi} & -\alpha_{r\tau} & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^y \\ u_t^\pi \\ u_t^\tau \\ u_t^r \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ \beta_{\tau g} & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} e_t^g \\ e_t^y \\ e_t^\pi \\ e_t^\tau \\ e_t^r \end{bmatrix} \tag{15}$$

Comparing the Perotti (2005) approach to the recursive approach, differences are evident. In the recursive approach, all elements of A_0 above the principal diagonal are restricted to zero, yet there are three exceptions in Perotti's (2005) identification approach. Estimating the output elasticity of government revenue in Perotti's approach and using this value as an instrument in estimating the fiscal shocks implies fixing the size of the automatic stabilizer. Therefore, Perotti (2005) estimates the contemporaneous effect of government revenue on output and inflation. In the recursive approach, the size automatic stabilizer is freely estimated while imposing zero restrictions on the contemporaneous effect of government revenue on output and inflation.

4. Empirical results

This section presents the estimates from the forecast error of variance decomposition and the impulse response functions. The impulse responses are reported for 16 quarters which gives a forecast for four years and one standard deviation confidence bands attained by Monte Carlo integration approach with replications set at 100.

4.1. Variance decomposition of forecast errors

Table 1 shows the results of the forecast errors and variance decomposition for the benchmark model. In both approaches, after 16 quarters the forecast error of government spending G_t is explained by itself above 65%, (68% and 67%) inflation π_t is 19% and 22% for each approach respectively, and taxes are at least 6%. Output and interest rate do not explain significant shares. More than 40% of the forecast error in net taxes, τ_t is explained by itself under both identification strategies (42.23% and 41.14% respectively). Government spending explains 37.68% and 30.03%, inflation explains 10.39% and 11.91%, output explains 9.34% and 8.22%, and interest rates explain 0.34% and 8.70% respectively. The moderate inflation and interest rates

could be due to the fact that an increase in taxes reduces inflationary pressure because an increase in tax reduces output, leading to downward pressure on inflation and interest rate. Above 40% of the variations in output Y_t is explained by shock to government spending (45.52% and 44.18% respectively) whereas shock to output itself explains 34.96% and 33. 40% in each approach.

Inflation explains about 12% and net taxes about 5% respectively. More than 55% of the variations in inflation (57.06% and 59.55% respectively) is explained by shock to inflation itself (inflation expectation). Government spending accounts for more than 20% (22.12% and 20.51% respectively), showing that government spending stimulates the economy by increasing output but at the cost of higher inflation. Above 50% of the variation in interest rate r_t is self-explanatory (56.23% and 54.33% respectively). Inflation accounts for more than 15% (21.17% and 15.97% respectively), whereas government spending accounts for about 10 % (10.97% and 10.92% respectively) of the variation in interest rate. The high share of inflation followed by an increase in interest rate could owing to an increase in interest rate increasing the demand for government securities, which in turn increases government spending, putting an upward pressure on inflation.

Table 1. Variance Decomposition in the Baseline VAR: Recursive Approach (RA) and Blanchard-Perotti Approach (BP)

		G_t		Y_t		π_t		τ_t		r_t	
		RA	BP	RA	BP	RA	BP	RA	BP	RA	BP
G_t	4	93.58	92.62	2.18	1.82	0.36	0.31	3.24	3.34	0.64	1.91
	8	83.44	83.02	3.07	2.19	5.57	6.01	7.17	7.06	0.75	1.92
	12	75.27	73.54	2.48	2.20	12.76	16.04	6.93	6.81	2.56	1.41
	16	68.89	67.28	3.25	2.27	19.01	22.77	6.07	6.22	2.78	1.48
Y_t	4	0.78	0.40	96.71	95.89	0.07	0.22	2.36	1.96	0.08	1.53
	8	7.13	6.26	85.23	85.89	0.79	0.80	6.71	5.24	0.14	1.81
	12	36.55	36.62	52.76	52.73	1.34	4.14	4.61	3.70	4.74	2.81
	16	45.52	44.18	34.96	33.40	6.33	12.25	5.03	5.62	8.16	4.55
π_t	4	14.14	15.40	0.94	0.77	74.56	77.21	5.40	5.68	4.96	0.94
	8	14.53	16.93	9.24	6.90	66.38	69.72	4.98	5.50	4.87	0.94
	12	21.66	21.14	9.68	8.60	59.77	63.79	4.74	4.71	4.15	1.76
	16	22.12	20.51	11.99	12.57	57.06	59.55	5.12	5.64	3.71	1.71
τ_t	4	39.97	37.49	3.61	4.16	2.58	3.32	53.79	53.43	0.05	1.60
	8	29.78	28.48	8.06	11.86	5.94	6.92	55.98	51.29	0.24	1.45
	12	37.97	35.41	8.59	9.52	7.92	10.62	45.21	37.58	0.31	6.87
	16	37.68	30.03	9.34	8.22	10.39	11.91	42.23	41.14	0.34	8.70
r_t	4	0.63	4.77	0.07	9.80	4.37	1.26	1.41	0.68	93.51	83.49
	8	0.42	5.06	0.37	9.82	12.15	9.86	4.79	1.37	82.27	73.89
	12	1.94	6.66	0.40	7.82	20.10	12.66	8.50	9.68	69.06	63.18
	16	10.97	10.92	0.41	6.64	21.17	15.97	11.22	12.13	56.23	54.33

4.2. The fiscal policy shocks

In the recursive approach, since all elements of matrix A above the principal diagonal are restricted to zero, which means imposing zero restrictions on the contemporaneous effect of taxes on output and inflation, the size of the automatic stabilizer is freely estimated. In the Blanchard-Perotti approach, the size of the automatic stabilizer is predetermined since the elasticity of government revenue on output is estimated outside the VAR model and is used an as instrument in the VAR in estimating the fiscal shocks. Thus, this approach easily estimates the contemporaneous effect of revenue on output and inflation. However, the two approaches yield identical findings with respect to the impulse response functions. Similar conclusions were reached by Caldara and Kamps (2008) and Lozano and Rodríguez (2011), among other studies.

The results presented show the impulse response function for government spending and government revenue shocks in the baseline model (g_t, y_t, π_t $\tau_t r_t$). To account for the effect of fiscal policy shocks on private consumption and private investment, as these variables constitute major disagreements in both theoretical and empirical literature, we estimate a six-variable VAR model (g_t, z_t y_t, π_t $\tau_t r_t$), where z_t is components of output – that is, private consumption or investment. z_t (Private consumption or private investment) is ordered before output y_t on justification that private consumption or investment contemporaneously react to government spending shocks. Private investment and private consumption enter the model interchangeably. Since they are components of output, structural consumption and investment shocks are deemed to affect output within the quarter. Because of the identical impulse response in identification approaches, the results presented below for government spending and revenue shocks equivalently hold for both.

4.2.1. Government spending shocks

Figures 1. (Recursive approach) and Figure 2. (Blanchard-Perotti approach) show effect of one standard deviation shock to government spending on the endogenous variables in the system. Output increased with a hump shape after the shock, attaining its peak at the end of the third year on impact about 0.07 percent. The effect became significant at the start of the second year and lasted throughout the horizon. Private consumption displays similar response as output, with a similar hump shape. The effect became significant at the start of the second year, reaching its peak at the end of the third year after the shock on impact about 0.02 percent. The shock lasted throughout the horizon but became insignificant in the first half of the fourth year after the shock. These findings are in line with those reported by Blanchard and Perotti (2002), Fatás and Mihov (2001), Galí et al. (2007), Mutuku and Elias (2014) for Kenya, Slimane and Tahar (2013) for Egypt and Tunisia, Akpan and Atan (2015) for Nigeria among other studies.

Private investment rose with respect to government spending expansion, attaining it peak effect in the first year after the shock on impact about 0.08 percent. The shock lasted throughout the period but fades out after the third year. The response of private investment to government spending expansion is in line with findings reported by Tenhofen et al. (2010) and De Castro (2006). In the short-run, shocks to government spending have significant positive impact on output and its components (private investment and private consumption). More importantly, expansionary government spending significantly increases output and private consumption and the shock lasted throughout the horizon. These findings conform to the Keynesian prediction of expansionary government spending.
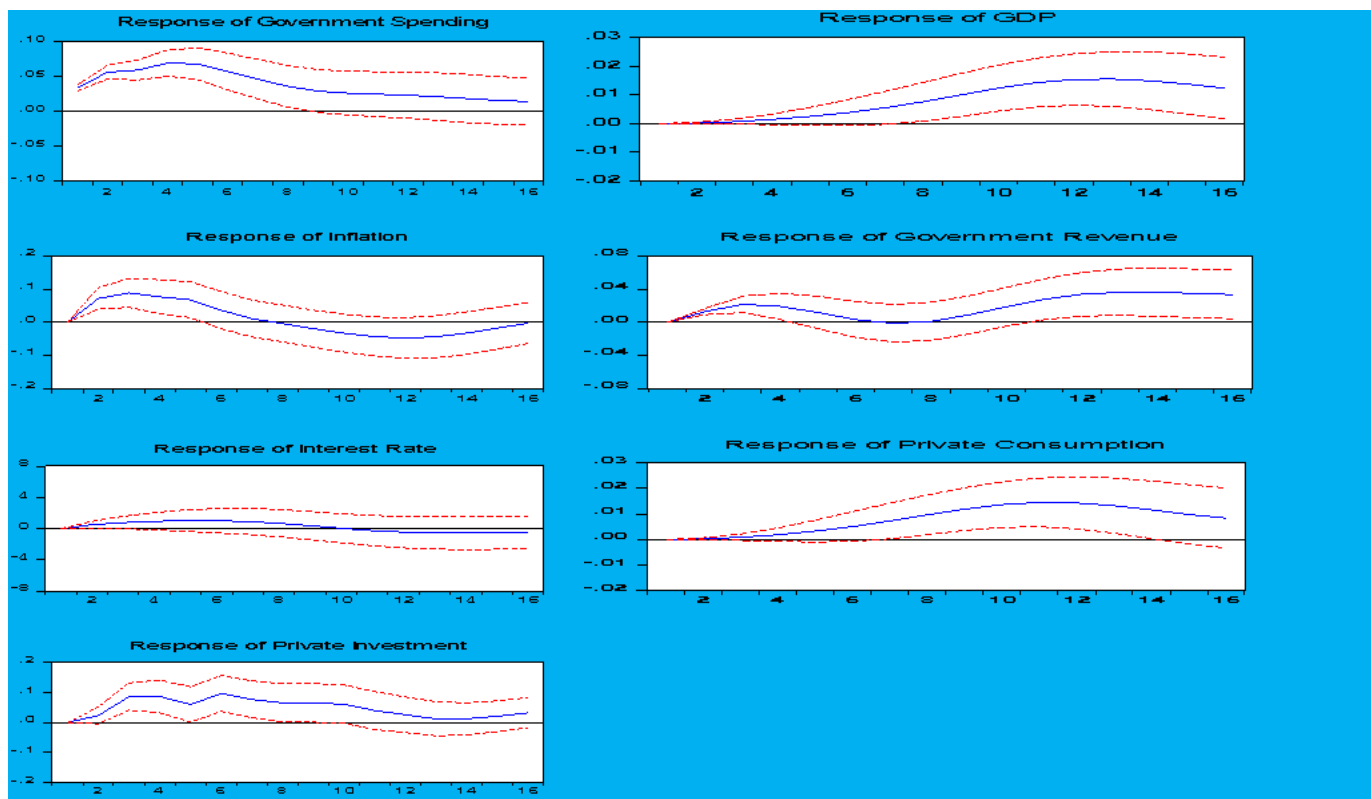
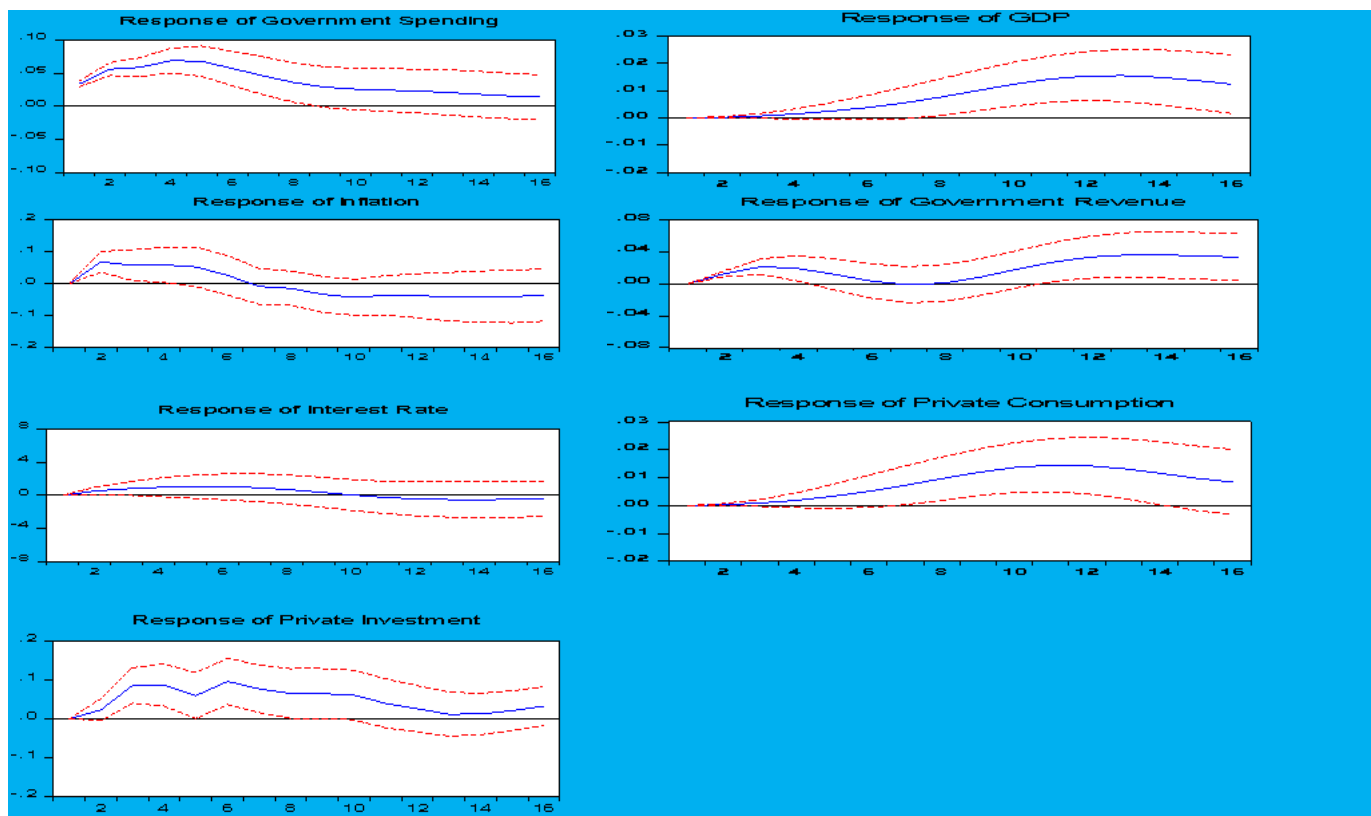**Figure 1.** Responses to government spending shocks – recursive approach

Figure 2. Responses to government spending shocks – Blanchard-Perotti approach

Government revenue increased in response to spending shock and attained its peak in the third year after the shock, which on impact was 0.04 percent. Similar findings were reported by Mountford and Uhlig (2009), De Castro (2006) etc. This short-run response of taxes to spending expansion could be due to positive reaction of output to government spending shock as shown in the impulse response graph and/or the authorities' willingness to finance the increased spending needs by the government. Inflation increased for the first two years after the spending shock. The peak effect was attained in the second quarter after the shock on impact was 0.07 percent. However, it fell after the seventh quarter and remained insignificant throughout the horizon while the shock lasted. Similar result was reported by De Castro (2006) for Spain. The effect of government spending on inflation is not surprising. This is due to the fact that Serra Leone don't have an independent Central Bank neither with inflation targeting objective. This could also likely be due to fiscal dominance. Finally, interest rate rise for the first two years after the shock on impact was 1.2 percent and the peak effect was attained in the sixth quarter, a result similar to those reported by De Castro (2006) and Tenhofen et al. (2010). It is worth noting that the identical impulses between these two approaches are of no surprise. In response to government spending shocks, the assumptions in both identification approaches are almost the.

4.2.2. Government revenue shocks

Figures 3 (recursive approach) and Figure 4 (Blanchard-Perotti approach) show the impulse response for shock to government revenue. Government spending fell in response to government revenue shock and the effect was only significant for one year. The peak effect was attained in the third quarter after the shock on impact was about 0.02 percent. The fall in government spending when revenue increased could be interpreted as 'deficit-reducing tax increase'. This finding could be due to some reforms undertaken during Structural Adjustment Programme (SAP) era in the 1980s by the government. For example, the government reduces its spending by cutting subsidies to rice importers, reducing the size of the public workforce especially in the civil service due to the rising deficits and deterioration in revenue collections. Output and Private investment fell for two years in response to government revenue shocks, but the effect was only significant for the sixth quarter and died out after the second year. These findings are in line with results reported by Blanchard and Perotti (2002) and Mountford and Uhlig (2009). Private consumption and interest rate fell on impact but were statistically insignificant. Inflation soared to tax shocks and the peak effect of 0.06 percent was attained in the third quarter, while the shock lasted throughout the horizon. The response of inflation to tax shocks seems puzzling. A similar result is reported by Ravnik and Žilić (2011). Some plausible argument for this finding could be found in the supply-side perspective. An increase in taxes increases a firm's cost of production. The ultimate tax burden will then be transferred from firms to consumers in the form of indirect taxes. The end impact is higher prices of goods and services, hence higher inflation. Another argument could be that inflation is caused by other factors outside fiscal policy, such as imported inflation, output gap and monetary policy.

4.3. Responses to shocks in government spending components

I examine here the response of output and its components to shock in government spending components – that is, government consumption and government investment respectively. The aim of the approach is two-fold. First, the disaggregation of government spending into components clearly depicts a broader picture on how the economy responds to the different categories of government spending at large. Second, it serves as a

guide to policymakers on how to respond with the appropriate spending tool to smooth business cycle fluctuations, stimulus packages and economic recovery. I augment the baseline VAR here by replacing government spending with government consumption and government investment sequentially. The augment VAR becomes ($k_t, z_t \, y_t, \pi_t \, \tau_t r_t$), where K_t is either government consumption or investment and Z_t is a component of output, i.e., private consumption or private investment. These responses are illustrated in Figures 5 and 6 respectively.

4.3.1. Responses to shock in government consumption

In Figure 5 below, private consumption strongly increased with a hump shape and the shock is persistent throughout the horizon. The peak effect of 0.03 percent is attained in the fourteenth quarter and the effect is statistically significant while the shock lasted. Private investment moderately increased after the shock and fall gradually while the shock lasted throughout the period. The peak effect of 0.08 percent is attained in the sixth quarter and became insignificant after the second year. Output increased following the increase in its components. The shock was persistent, and it lasted throughout the horizons. The peak effect of 0.01 percent is attained in the fourteenth quarter after the shock.
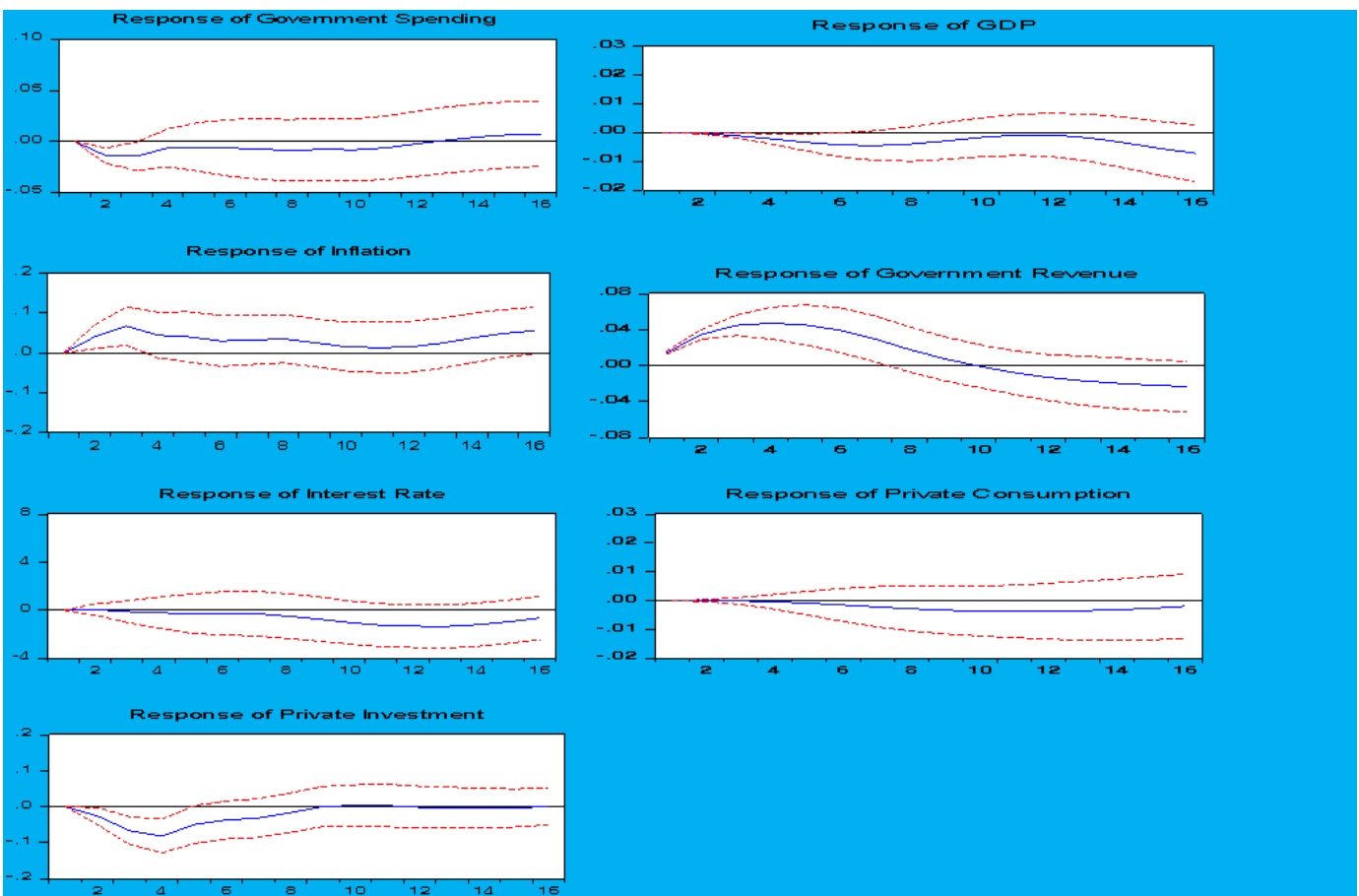

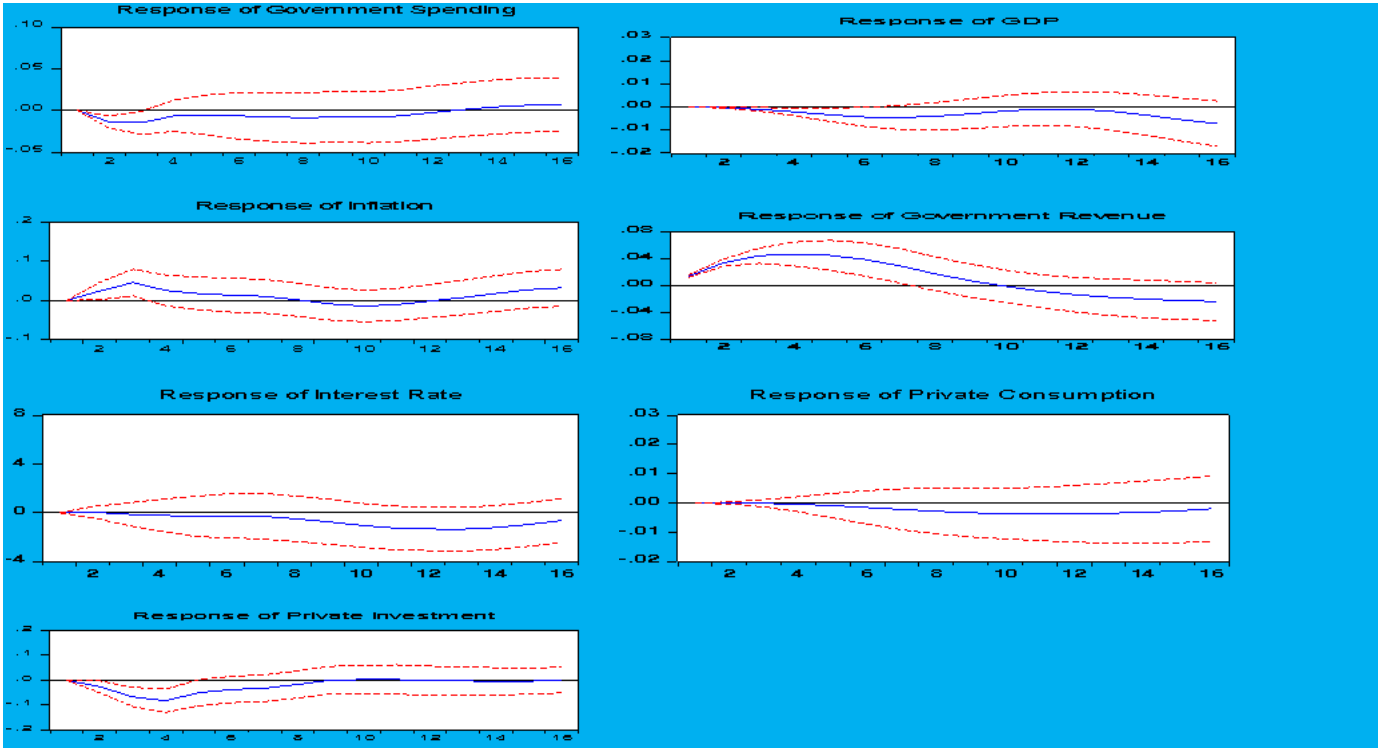**Figure 3.** Responses to government revenue shocks – recursive approach

Figure 4. Responses to government revenue shocks – Blanchard-Perotti approach
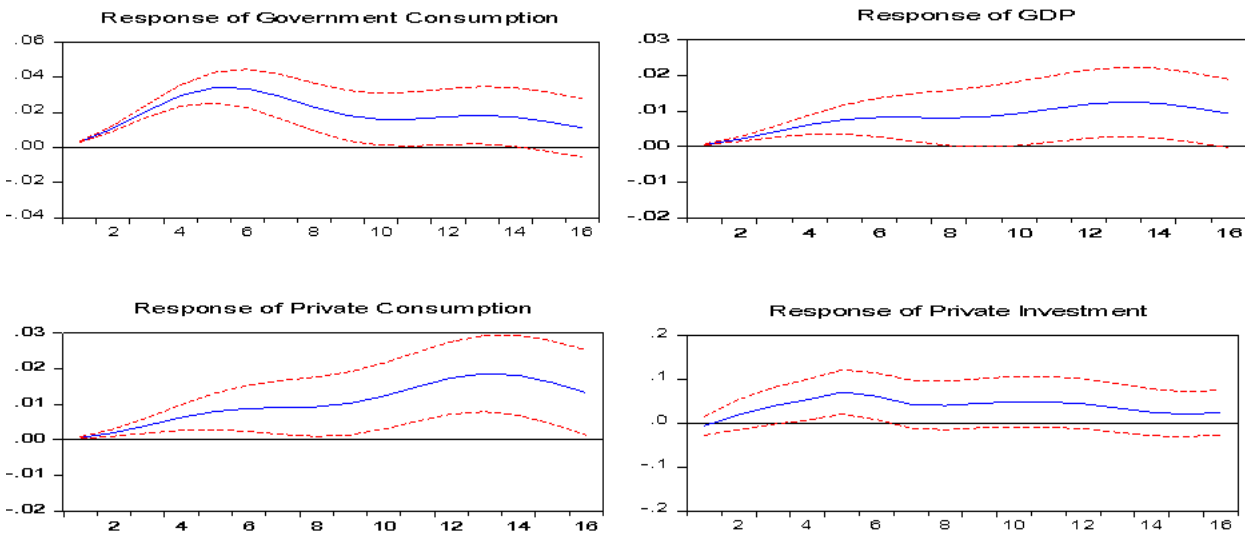

Figure 5. Responses to government consumption shocks

4.3.2. Responses to shock in government investment

In Figure 6, private consumption strongly increased for the first two years and faded thereafter. The peak effect of 0.03 percent is attained in fourth quarter. Private investment also rose following the shock for three years, but the effect was significant only for ten quarters. The peak effect of 0.08 percent was reached in the seventh quarter. Output rose with a hump shape and the shock lasted throughout the periods but was significant for

the first three years. The peak effect of 0.02 percent was reached in the tenth quarter. Though both spending components increased output and its components positively, the effect of government investment strongly stimulated output compared to government consumption. These findings are in line with those reported by Baxter and King (1993), De Castro (2006), Giordano et al. (2007), Perotti (2005), Marcellino (2002) and Tenhofen et al. (2010). Government investment strongly stimulated the economy in contrast with government consumption expenditures, shown by the size of the shocks on output. The above finding seems plausible for a small open economy characterized by large public-sector employment, small private sector, and low savings.
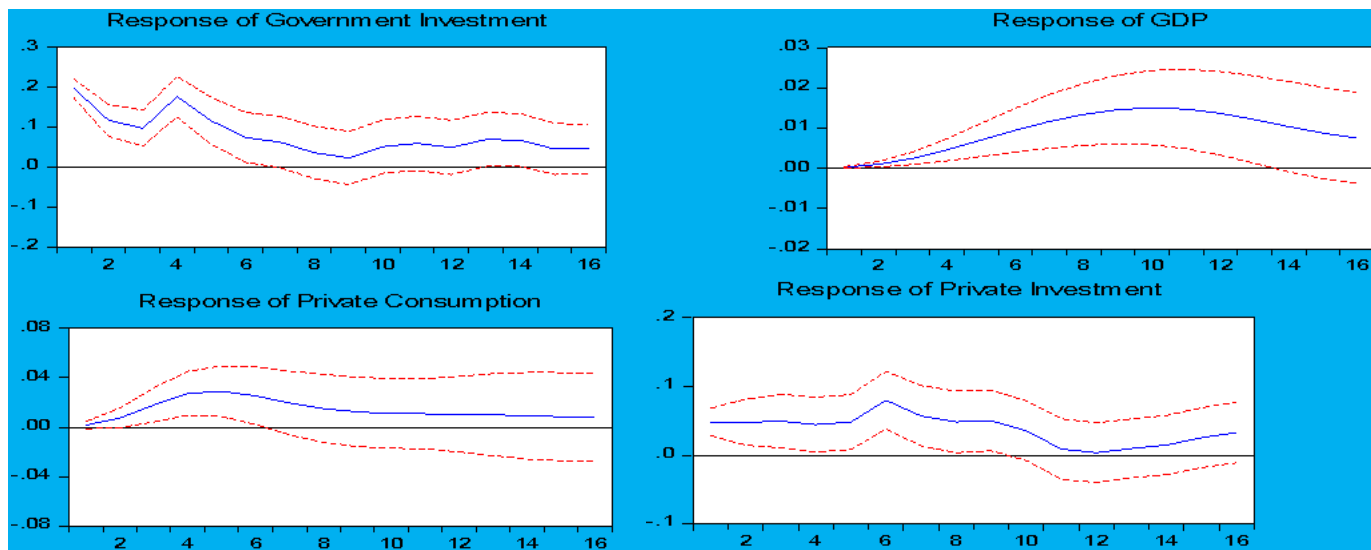

Figure 6. Responses to government investment shocks

4.4. Responses to shocks in government revenue components

This sub-heading displays how outputs and its components responded to the disaggregated components of government revenue. By doing so, it helps us to have a broader picture of how the economy responded to different tax policies. Indeed, the results indicate output and its components responded differently to direct and indirect taxes. Such analyses are useful for policy design and implementation and can guide policymakers as to which kind of tax policy is effective in stimulating growth. Output and its component responded to indirect and direct tax in the following manner as illustrated in Figure 7 and 8 respectively.

4.4.1. Responses to shocks in direct taxes

In Figure 7, output declined in response to shock in direct taxes for two and half years and the shock faded out thereafter. The peak effect of 0.03 percent is attained in the sixth quarter following the shock. Private investment fell throughout the period, but the effect was significant for only one year. Surprisingly, private consumption gradually increased after the first year following the shock, but the effect was not significant throughout. This finding is counter intuitive as we expect private consumption to fall in response to an increase in direct taxes.
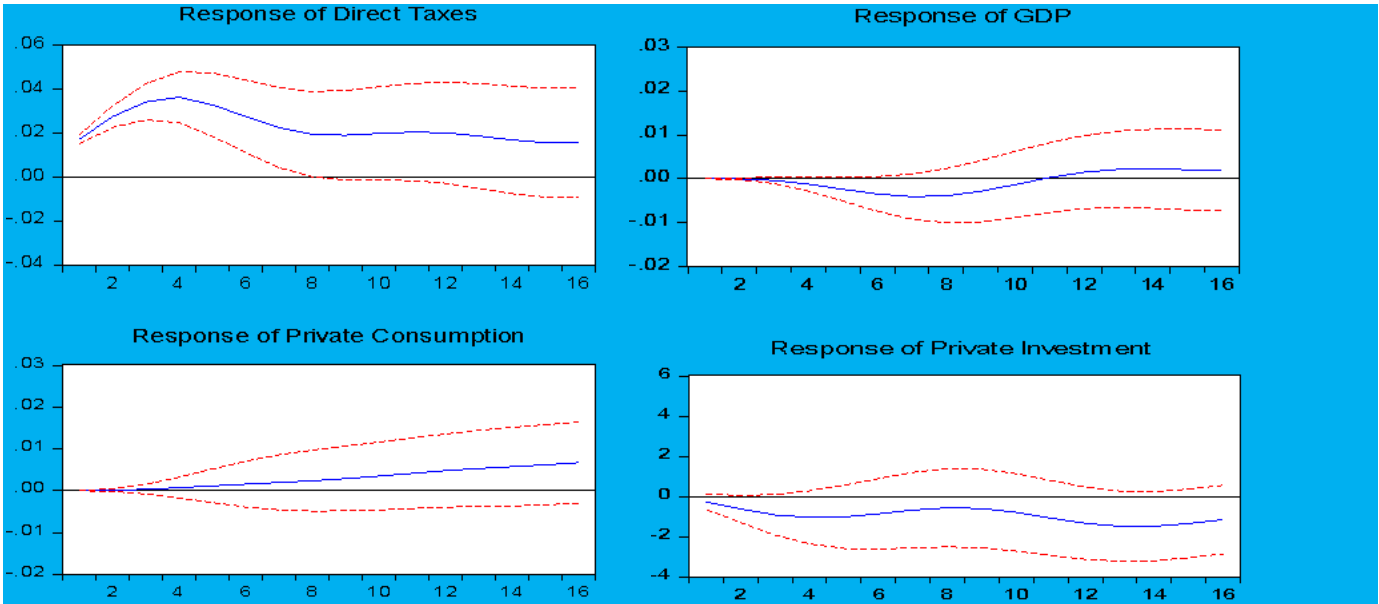
Figure 7. Responses to direct tax shocks

4.4.2. Responses to shock in indirect tax

In Figure 8, private investment gradually increased to shock in indirect taxes while the shock lasted throughout the horizon. It was significant between the second and third year following the shock. The peak effect of 0.04 percent is attained in the second year. In the short run, private consumption did not respond to indirect tax shock, which could have been due to the delay of increased taxes to result in increased prices.
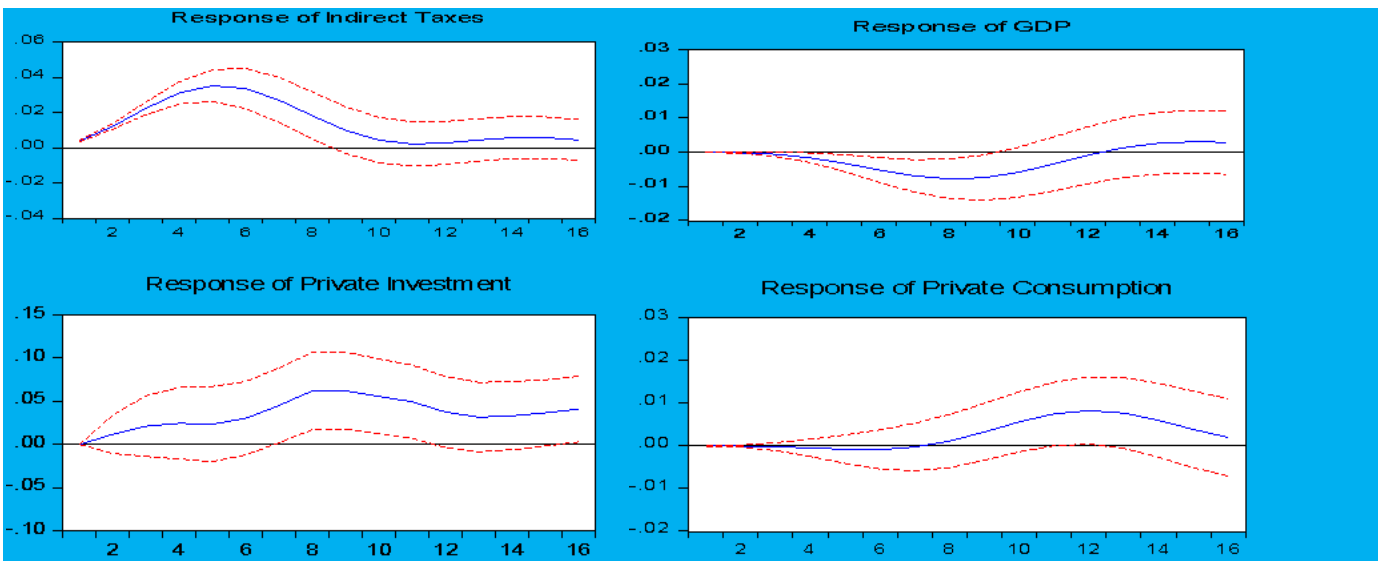

Figure 8. Responses to Indirect Tax Shocks

In the second year and thereafter, private consumption increased to indirect tax shocks. This result is also surprising. Output strongly fell in the first two-and-a-half years after the shock. The peak effect of 0.01 percent is attained in the second following the shocks while the shock gradually died out in the last year of the horizon.

Comparing the two tax components, shock to direct taxes was less distortionary and the effect on output was much less compared to indirect taxes. Our results are similar to De Castro (2006) but contrast with Tenhofen et al. (2010) and Lozano and Rodríguez (2011), among other studies.

5. Conclusion and policy implications

The paper presents empirical findings on the impacts of fiscal policy shocks on key macroeconomic variables for Sierra Leone in the context of SVAR. Shocks to government spending have significant impact on output and its components. Output and private consumption rise with a hump shape and in line with the Keynesian prediction of expansionary government spending. Again, private investment increase in response to expansionary government spending. This result is also in line with Keynesian wisdom. Government revenue increases to spending expansion. This short-run response of revenue to spending expansion could be due to positive reaction of output to government spending shock and/or the authorities' willingness to finance the increased spending needs by the government. Tax shocks reduced output and private investment significantly. However, the shocks to output were persistent and significant for only two years, whereas the shocks to private investment were temporary. Inflation increased due to an increase in taxes. With regards to the components of government spending (government consumption and government investment), both spending components increased output and its components significantly. However, the effect of government investment strongly stimulated output compared to government consumption as shown by the size of the shocks on output. Comparing the two tax components, shock to direct taxes was less distortionary and the effect on output was much less compared to indirect taxes.

The policy implications from this study could be summarized as follows: The empirical evidence suggests that to stabilize the economy in the short run, for example, a fiscal consolidation drive, spending adjustment seems be to more effective compared to taxes. Policies aimed at achieving such goal should be geared towards reducing spending, particularly unproductive expenditures. Also, to boost output, it is recommended that government should undertake more of capital investment spending. Additionally, tax policy geared towards stimulating the economy should be directed at direct taxes such personal income taxes, withholding taxes and corporate taxes etc.

Overall, this paper has examined the short-run impacts of discretionary fiscal policy shocks. There are however other studies that have examined the long-run impact of discretionary fiscal policy which is outside the scope of this research. Future studies can look into that dimension.

References

Afonso, A. and Sousa, R.M. (2012), "The macroeconomic effects of fiscal policy", *Applied Economics*, Vol. 44 No. 34, pp. 4439-4454.

Akpan, U.F. and Atan, J.A. (2015), "Macroeconomic effects of fiscal policy shock in Nigeria: A SVAR approach", *International Journal of Business and Economic Research*, Vol. 4 No.3, pp. 109-120.

Alami, Y., El Idrissi, I., Bousselhami, A., Raouf, R. and Boujettou, H. (2021), "Macroeconomic impacts of fiscal shocks on the Moroccan economy: a disaggregated SVAR analysis", *Journal of Business and Socio-economic Development*, available at: https://doi.org/10.1108/JBSED-08-2021-0112.

Amisano, G. and Giannini, C. (2012), "*Topics in Structural VAR Econometrics*", Springer Science & Business Media.

Auerbach, A.J. (2012), "The Fall and Rise of Keynesian Fiscal Policy", *Asian Economic Policy Review*, Vol. 7 No. 2, pp. 157-175.

Baxter, M. and King, R.G. (1993), "Fiscal Policy in General Equilibrium", *The American Economic Review*, Vol. 83 No. 3, pp. 315-334.

Beetsma, R. and Giuliodori, M. (2011), "The effects of government purchases shocks: review and estimates for the EU", *The Economic Journal*, Vol. 121 No. 550, pp. F4-F32.

Blanchard, O. and Perotti, R. (2002), "An empirical characterization of the dynamic effects of changes in government spending and taxes on output", *The Quarterly Journal of economics*, Vol. 117 No. 4, pp. 1329-1368.

Born, B. and Müller, G.J. (2012), "Government spending shocks in quarterly and annual time series", *Journal of Money, Credit and Banking*, Vol. 44 No. 2-3, pp. 507-517.

Bouakez, H., Chihi, F. and Normandin, M. (2014), "Measuring the effects of fiscal policy", *Journal of Economic Dynamics and Control*, Vol. 47, pp. 123-151.

Burnside, A.C., Eichenbaum, M. and Fisher, J.D. (2000), "Assessing the effects of fiscal shocks", NBER working paper, (w7459), Federal Reserve Bank of Chicago.

Caldara, D. and Kamps, C. (2008), "What are the effects of fiscal policy shocks? A VAR-based comparative analysis. European Central Bank", Working Paper Series No. 877, March 2008.

Chow, G.C. and Lin, A.L. (1971), "Best linear unbiased interpolation, distribution, and extrapolation of time series by related series", *The review of Economics and Statistics*, Vol. 53 No. 4 pp. 372-375.

De Castro, F. (2006), "The macroeconomic effects of fiscal policy in Spain", *Applied Economics*, Vol. 38 No. 8, pp. 913-924.

Devereux, M.B., Head, A.C. and Lapham, B.J. (1996), "Monopolistic competition, increasing returns, and the effects of government spending", *Journal of Money, credit and Banking*, Vol. 28 No. 2, pp. 233-254.

Driss, A., Bettahar, S. and Benbouziane, M. (2014), "Fiscal Policy Shocks and Real Exchange Rate Dynamics: Empirical Investigation in the case of Algeria–An", *International Journal of Trade and Commerce*, Vol. 3 No.1.

Edelberg, W., Eichenbaum, M. and Fisher, J.D. (1999), "Understanding the effects of a shock to government purchases", *Review of Economic Dynamics*, Vol. 2 No. 1, pp. 166-206.

Eichenbaum, M.S. and Fisher, J. (2005), "Fiscal Policy in the Aftermath of 9/11", *Journal of Money, Credit, and Banking*, Vol. 37 No. 1, pp. 1-22.

Fatás, A. and Mihov, I. (2001), "The effects of fiscal policy on consumption and employment: theory and evidence", available at: https://ssrn.com/abstract=267281(accessed 20 March 2022).

Favero, C.A. (2002), "How do European monetary and fiscal authorities behave?", available at: https://ssrn.com/abstract=323361 (accessed 20 March 2022).

Galí, J., López-Salido, J.D. and Vallés, J. (2007), "Understanding the effects of government spending on consumption", *Journal of the European Economic Association*, Vol. 5 No. 1, pp. 227-270.

Giordano, R., Momigliano, S., Neri, S. and Perotti, R. (2007), "The effects of fiscal policy in Italy: Evidence from a VAR model", *European Journal of Political Economy*, Vol. 23 No. 3, pp. 707-733.

Kargbo, B.I.B. and Egwaikhide, F.O. (2012), "Tax elasticity in Sierra Leone: a time series approach", *International Journal of Economics and Financial Issues*, Vol. 2 No. 4, p. 432.

Lozano, I. and Rodríguez, K. (2011), "Assessing the macroeconomic effects of fiscal policy in Colombia", *Journal of Financial Economic Policy*, Vol. 3 No. 3, pp. 206-228.

Lütkepohl, H. (2005), "*New Introduction to Multiple Time Series Analysis*", Springer Science & Business Media.

Marcellino, M. (2002), "Some stylized facts on non-systematic fiscal policy in the euro area", *Journal of Macroeconomics*, Vol. 28 No. 3, pp. 461-479.

Mlilo, M. and Kollamparambi, U. (2016), "Fiscal policy, employment, and output in South Africa: An open economy analysis", *Journal of Economic & Financial Studies*, Vol. 4 No. 03, pp. 11-23.

Mountford, A. and Uhlig, H. (2002), "What are the effects of fiscal policy shocks?", available at: https://ssrn.com/abstract=306321(accessed 20 March 2022)

Mountford, A. and Uhlig, H. (2009), "What are the effects of fiscal policy shocks?", *Journal of applied econometrics*, Vol. 24 No. 6, pp.960-992.

Munir, K. and Riaz, N. (2020), "Macroeconomic effects of exogenous fiscal policy shocks in Pakistan: a disaggregated SVAR analysis", *Hacienda Publica Espanola*, 233, pp. 141-165.

Mutuku, C. and Elias, K. (2014), "Monetary and fiscal policy shocks and economic growth in Kenya: VAR econometric approach", *Journal of World Economic Research*, Vol. 3 No. 6, pp.95-108.

Olivero, M.P. (2019), "Fiscal policy and credit spreads: Evidence from a SVAR", *Economics Bulletin*, Vol. 39 No. 2, pp. 1393-1403.

Perotti, R, (2005), "Estimating the Effects of Fiscal Policy in OECD Countries", available at: https://ssrn.com/abstract=717561 (accessed 20 March 2022).

Ramey, V.A. and Shapiro, M.D. (1998), "Costly capital reallocation and the effects of government spending", In: *Carnegie-Rochester conference series on public policy*, Vol. 48, pp. 145-194. North-Holland.

Ravnik, R. and Žilić, I. (2011), "The use of SVAR analysis in determining the effects of fiscal shocks in Croatia", *Financial Theory and Practice*, Vol. 35 No. 1, pp. 25-58.

Rotemberg, J.J. and Woodford, M. (1992), "Oligopolistic pricing and the effects of aggregate demand on economic activity", *Journal of Political Economy*, Vol. 100 No. 6, pp. 1153-1207.

Sims, C.A. (1980), "Macroeconomics and reality", *Econometrica: Journal of the Econometric Society*, Vol. 48 No. 1, pp. 1-48.

Slimane, S.B. and Tahar, M.B. (2013), "Is discretionary fiscal policy effective? Evidences for Tunisia and Egypt", *Review of Economics & Finance*, Vol. 3 No. 2, pp. 81-96.

Tenhofen, J., Wolff, G.B. and Heppke-Falk, K.H. (2010), "The macroeconomic effects of exogenous fiscal policy shocks in Germany: a disaggregated SVAR analysis", *Jahrbücher für Nationalökonomie und Statistik*, Vol. 230 No. 3, pp. 328-355.