The Macroeconomic Effects of Fiscal Policy Shock in Ethiopia: Evidence from a Bayesian VAR Approach

Kumadebis Tamiru Gemechu[1]

Abstract

This paper investigated the macroeconomic effects of fiscal policy shocks in Ethiopia using a Bayesian Vector Auto Regression model. We examined the dynamic responses of output, inflation, interest rate and exchange rate to fiscal policy shocks employing quarterly data from 2000/01Q1 to 2015/16Q4. The empirical evidence suggests that government spending shock had a positive impact on output and inflation but the effect was too small. Initially the interest rate responded negatively to government spending shocks and was positive with small effect and the nominal exchange rate showed deterioration. In addition, government revenue shocks had positive effect on real GDP and exchange rate and then they responded negatively. The inflation response to the net tax was medium and negative whereas its effect on interest rate was positive, and persistent. Furthermore, positive shocks to recurrent expenditure had a persistent positive impact on real output. Recurrent expenditure appeared not to be responsible for inflationary pressure. Interest rate picked up slightly as a result of recurrent spending shocks in the short run. The response of exchange rate to recurrent expenditure was small and remained negative. In contrast, capital expenditure was found to have an insignificant effect on output. The reasons could be the administrative lag and contractual bottleneck that are sometimes involved in executing capital projects and that appeared to be responsible for inflationary pressure. In the short term, the interest rate responded negatively and the estimated impact on exchange rate was insignificant. Following indirect tax revenue shocks the rise in output and inflation was very persistent. Regarding the effects of indirect taxes on interest rate and exchange rate our results show a clear and negative impact-whereas direct taxes were found to affect output and inflation very little and were insignificant. Initially, interest and exchange rates responded positively to direct tax shock later interest rate and exchange rate become insignificant and negative respectively. The results support the idea of a 'crowding-in' effect and when we take into account the feedback from government debt, the results suggest that the effects of fiscal shocks on the majority of macro variables is too small except for the real GDP for government revenue shock. Therefore, empirical evidence shows that it is important to consider government debt dynamics in the model.

Key words: Ethiopia, Fiscal policy shock, public debt, Bayesian VAR
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1. Introduction

The main instruments of macroeconomic policy that tells how the government should respond to the business cycle are monetary and fiscal policies (Mankiw, 2001 pp. 381, Rena *et al.*, 2011). "Fiscal policy is a key policy tool that governments can use to mobilize domestic resources and allocate them to the pursuit of socio-economic development objectives" (Carmignani, 2010). Fiscal policy is the financial instrument used by the government as a deliberate manipulation of government receipts and expenditures to achieve economic, to allocate resources, stabilize the economy and redistribute income social objectives and maintain stable economic growth (Michaela et al., (2009), Tanzi (2008)). According to Rena *et al.*, (2011) the governance of fiscal policy is a powerful instrument for stabilizing the economy, which controls over the amount and structure of taxes, expenditures, and the debt management. Fiscal policy is one of the instruments with which government in a country employed in the administration of their economy to attain desired objectives (see Medee *et al*., 2011, Mohamad *et al.*, 2015). It entails those actions initiated by the government which aim at influencing the budget in order to induced effective demand by various economic units. For most economies, the fundamental objectives of fiscal policy include price stability, maintenance of balance of payments equilibrium, and promotion of employment, output growth and sustainable development. These objectives are necessary for the attainment of internal and external balance of value of money and promotion of long run economic growth (Mohamad *et al.*, 2015). Blanchard (2009) defined fiscal policy as the government's management of the economy through the changes of its income and spending abilities envisioned to create conducive macroeconomic environment.

"Recent years have seen a revival of the debate about the role of fiscal policy in stimulating economic activity" (Baldacci *et al.*, 2001). Fiscal policy's failure to boost economic growth in the wake of the oil shocks of the 1970s, and the associated increase in budget deficit and public debts, have led a lot of economists to be doubtful about the effectiveness of fiscal policy to smooth cyclical fluctuations (Beetsma and Giuliodori, 2011) .Consequently, fiscal policy has received less attention while policymakers continued to rely heavily on active fiscal policy as a policy instrument and academic researchers have

not reached a consensus about the effects of fiscal policy on macroeconomic variables, or about the magnitude of such effects (Afonso and Sousa, 2012, Boiciuc, 2015). However,

> *"The global economic crisis that broke out in 2008 has reawakened interest in fiscal policy. In the early stages of the crisis, there was a widespread turn to countercyclical fiscal stimulus. Furthermore, the recent euro area crisis has underlined the importance of long-term fiscal sustainability for macroeconomic stability. More subtly, the global crisis has also refocused interest in fiscal policy as an instrument for longer-term growth and development. In the potential "new normal" of continued sluggishness in the advanced world, developing countries have strong incentives to seek out new domestic engines for efficiency and productivity growth, as well as for greater equity in development. The potential of fiscal policy to promote these ends is therefore of great interest to developing country policy makers"* Brahmbhatt (2012).

The effects of fiscal policy shocks are still a subject of lively debate, as neither theoretical nor empirical studies have reached a consensus on either the qualitative or quantitative properties of such effects (Franta, 2012). "The effectiveness of a fiscal policy in stimulating the real economy is an ongoing intellectual debate in prominent academic journals and columns with high-profile" (Gaber, 2013). "The interest in the use of fiscal policy as an effective economic policy tool has been revived recently, since the global recession of 2008 hit the world. In spite of a large empirical literature, there remains substantial uncertainty about the size and even the direction of the effects of discretionary fiscal policy" (Yang, 2013). In addition, the effects of fiscal policy on the macro-economy are of ongoing interest to economic policymakers. There are frequent calls for fiscal policy actions, stylized facts on the macroeconomic impact of fiscal policy have not been established yet much in contrast to monetary policy effects (Tenhofen *et al.*, 2010).

IMF (2016) stated that Ethiopia reached the completion point under the Heavily Indebted Poor Countries Initiative in 2004 and benefited from debt relief under the Multilateral Debt Relief Initiative in 2006. Public and publicly guaranteed (PPG) external debt fell in the years that followed, reaching a low

of 18 percent of GDP in mid-2012 and by end of 2015/16 it is estimated at 30.2 percent of GDP and total (including domestic) public debt is estimated at 54.2 percent of GDP. Thus, the country's public debt is very high (54.2%). Therefore, Ethiopia needs to do more to achieve its vision of climate resilient middle-income status by 2025. For instance, reduction of the country's still high poverty levels, economic transformation, and generation of adequate and sustainable employment opportunities for the large and growing workforce. To that end, the government has launched the second five-year GTP II, which spans 2014/15–2019/20. GTP II is a continuation of GTP I (AfDB, 2016). However, Ethiopia's output growth during 2015/16 is estimated to have slowed down to 6.5 percent (IMF, 2016). Therefore, the knowledge of fiscal policy plays a crucial role in achieving the country's objective.

Our intuition here is analyzing the effects fiscal policy by decomposing total net taxes and government spending, and examining their effect on the aggregate economy provide a more accurate picture than treating total net taxes as the fiscal policy variable. Thereafter, we propose a structural decomposition of total net taxes into two components: direct taxes and indirect taxes and also government spending in to two components as recurrent and capital expenditure. The paper provides estimates of the responses of macroeconomic aggregates to innovations in different tax and government spending groups by replacing total net taxes and government spending with each tax and spending components separately under debt feedback. In a further step, the responses of the GDP components, private investment and consumption, to a shock to each tax and spending component will be examined. Consequently, we are able to identify the potential 'crowding-out' or crowding-in effects of fiscal policy on the private sector. Unambiguously, Bayesian estimation of the reduced form of VAR could improve our understanding of the effects of fiscal policy shocks via incorporating prior information and knowledge.

1.1 Objective of the Study

The general objective of this study was to analyze the macroeconomic effects of fiscal policy shocks on the Ethiopian economy by using quarterly data that span from 2000/01Q1 to 2015/16Q4.

Specifically this paper envisioned to examine:

- The effects of tax revenue and public spending shocks on GDP, Inflation, exchange rate and interest rate.
- The effects of category of tax revenue and public spending shocks on GDP, Inflation, exchange rate and interest rate.
- The effects of tax revenue and public spending shocks on the composition of GDP, by analyzing potential "crowding-out" effects on private consumption and private investment and,
- The response of fiscal variables to the level of the government debt.

The rest of this paper is organized as follows: - Section II reviews the related theoretical and empirical literature. Section III explains the macroeconomic data set used. Section IV explains the empirical strategy used to identify the effects of fiscal policy shocks, and Section V provides the empirical analysis and discusses the results. Section VI concludes this paper with a summary, and policy implication.

2. Literature Review

Gaber *et al*, (2013) suggested that in examining the transmission mechanism of fiscal policy one crucial assumption of any model is whether or not agents are forward looking as briefed on the above section (see section 2.1.2.1 and 2.1.2.2). In the absence of micro founded forward looking behaviour, expected future changes have no effects on current period decisions whereas forward looking consumers, armed with rational expectations, do react in the current period to expected changes in future variables.

A simple framework of a fiscal policy for growth and development help us to organize issues of fiscal policy shock. First, what are the development objectives to which a fiscal policy should contribute (Figure 1)? Growth is clearly one of the objectives, though policy makers may want to go beyond the standard focus on GDP growth and consider broader measures in stimulus come, or even expand the focus to growth in a comprehensive measure of wealth, poverty reduction, social inclusion, and equity have complex links to growth, but also are rightly viewed as independent development objectives, because the distributional outcomes of market processes may not necessarily

ridicule with society's normative views on equity. Finally, although sometimes overlooked, there is protection against risk and vulnerability to shocks, which, assuming that most people are risk averse, is also an element of social welfare (Brahmbhatt *et al.*, 2012).

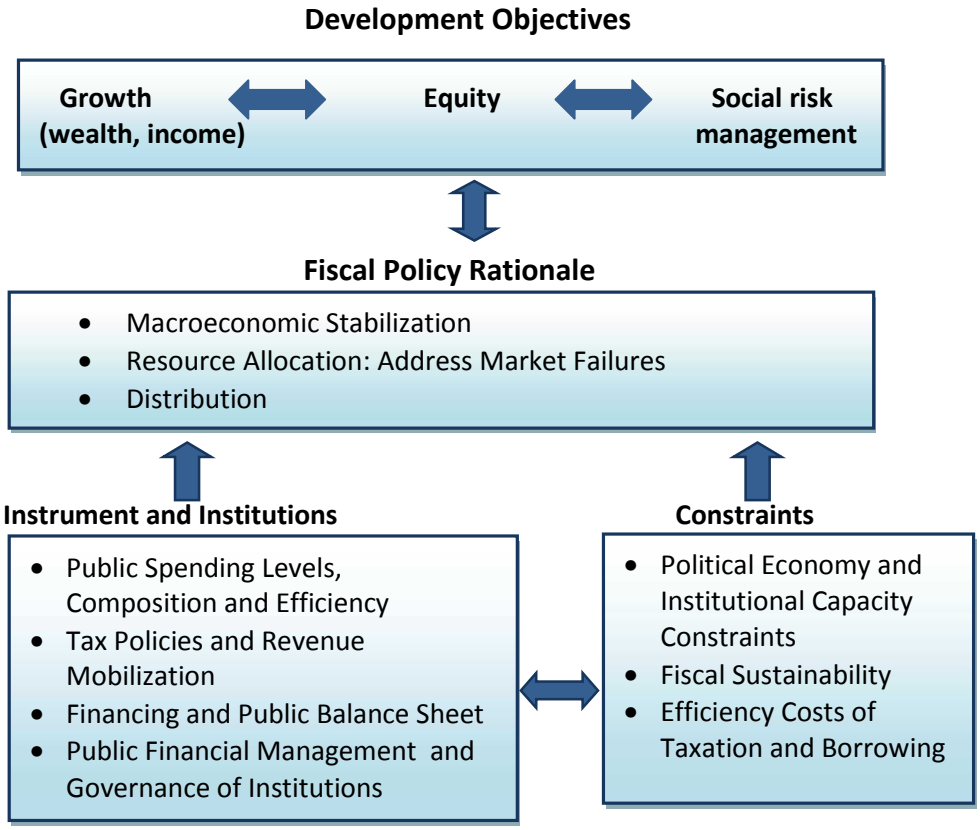
Nevertheless, one cannot simply assume that there is a role for a government in advancing these development objectives. Ostrom (1990) stated that there must be a clear rationale for public action rather than relying on private markets or on the kinds of self-organizing. The traditional rationale for fiscal policy proposed is still useful: fiscal policy should aim to promote macroeconomic stabilization, improve resource allocation, and address distributional disparities (see Figure 1).

Musgrave (1959) indicated that the stabilization rationale has both short- and long-term aspects. The short-run aspect focuses on the possibility of using countercyclical fiscal policy to offset the impact of macroeconomic shocks that create large or persistent gaps between aggregate demand and potential output, thereby helping to avert both excessive cyclical unemployment and inflationary pressure. From a longer-term perspective, stabilization is also concerned with keeping fiscal deficits and public debt on a sustainable path, so that public finances do not themselves become a source of macroeconomic instability. As for the resource allocation rationale of fiscal policy, the focus is on the potential for the government to improve economic performance through expenditure and tax policies that boost efficiency and improve long-term development performance by dealing with critical market failures.

As shown in Figure 1, the government must remain solvent (able to pay off its debts at some future time), liquid (able to meet its current outgoings), and credible (retaining the confidence of investors in its solvency and liquidity). The effectiveness of fiscal programs depend crucially on the quality of public financial management institutions in a country. For instance the effectiveness of fiscal policy can be seen in terms of: the efficiency with which revenues are raised, the cost-effectiveness of public service delivery, or how well public resources are protected from corruption and waste (Canuto *et al.*, 2012).

Indeed, the costs of government failures may even exceed the costs of the market failures the government is trying to address. Political economy factors and institutional capacity intimately affect a country's ability to actually implement sound fiscal policies (Figure 1). As elaborated in Figure 1 below the aims of the government are macroeconomic stabilization, resource allocation and distribution. To achieve these objectives, the instruments and institutions used are public spending levels, composition and efficiency, tax policies and revenue mobilization, financing and public finance sheet, and public financial management and governance. However, there are a number of constraints on the way that prevent these objectives from being achieved as expected. Some of these constraints are political economy, fiscal sustainability and efficiency costs of taxation and borrowing.

Figure 1: Fiscal Policy for Growth and Development: A Framework



Source: Brahmbhatt *et al.*, (2012).

There are a few related studies conducted in Ethiopia. For instance, Teshome (2006) examined the impact of government spending on economic growth and came up with the conclusion that government spending does not have significant insinuation to explain growth in the short-run.

Daniel (2012) analyzed dynamic effects of fiscal policy shocks on some macroeconomic variables excluding debt feedback rule. He examined the impulse responses of GDP, inflation and interest to the shocks of tax revenue and government expenditure. He found that tax shocks had a positive impact on output but little impact on inflation, whereas government spending shocks had an expansionary effect on output and have an inflationary impact in the short run.

Mathewos (2015) investigated the macroeconomic effects of fiscal policy shocks in Ethiopia using the Structural Vector Auto Regressive model (SVAR) by considering the feedback effects of public debt. His result confirms the argument that ignoring the reactions of fiscal and macro variables to the debt level produces incorrect estimates of the effects of fiscal policy in Ethiopia. He concluded that, shocks in government spending have an expansionary effect on output; lead to quick rise in prices; produce a small varied effect on the cost of debt; decrease nominal exchange rate in the long run and make debt-to-GDP ratio increase. Alternatively, shocks in revenue have a less clear cut, and small positive effect on output; a temporary price stabilization effect; no meaningful effect on the cost of debt; and less stabilization effect on debt- to-GDP ratio.

3. Macroeconomic Data

We employed a quarterly data set on macroeconomic and fiscal variables. The variables included as major macroeconomic variables assumed to give a quick response to fiscal policy shocks are real gross domestic product, private consumption, private investment, inflation, interest rate and nominal exchange rate whereas government expenditure, government revenue and public debt are fiscal variables. The study used the quarterly data over the period of 2000/01Q1 up to 2015/16Q4 due to availability of organized data in between these years. Pedro (2011) stated that the use of high frequency data offers

many advantages over that of low frequency data. The use of quarterly fiscal data allows us to identify more precisely the effects of fiscal policies since it capture intra-year dynamics and gives the possibility for larger samples so as to avoid the vanishing degrees of freedom in estimation. The data on CPI as a proxy for inflation, nominal exchange rate and interest rate were obtained from the National Bank of Ethiopia (NBE); whereas the quarterly fiscal data are obtained from the Ministry of Finance and Economic Cooperation of Ethiopia. Lastly, the annual data on Real GDP, private consumption and private investment are obtained from the National Planning Commission of Ethiopia, MoFEC and NBE. However, the quarterly data on real GDP, private consumption and private investment are mandatory to look at crowd-out and crowd-in effects of fiscal policy shocks. That is why we "quarterise" the real GDP, private investment, and private consumption using linear match last method of disaggregation by assuming real GDP and the growth of its components as a linear trend as suggested by Kitov (2005). He assumed the linear growth trend for real GDP and its components. All variables are expressed in logarithm apart from interest rate and seasonally adjusted before estimation

4. The Bayesian VAR Model

We employed the Bayesian methodology to estimate our model. Recently Bayesian VAR methodology has become a relevant tool to evaluate the effects of macroeconomic shocks (for instance, see Doan *et al.* 1984; Litterman 1986; Ritschl and Woitek 2000; Caldara and Kamps 2008; Koop and Korobolis, 2010, Afonso and Sousa 2009, 2012, Michal Franta, 2012, and Bobasu, 2016). The Bayesian approach offers a solution to the curse of dimensionality problem by shrinking the parameters via the imposition of priors (Koop and Korobolis, 2010, and Michael Franta, 2012). Koop and Potter (2003), Wright (2003), and Stock and Watson (2005, 2006) have explored the use of the Bayesian approach in relatively small systems, while De Mol et al. (2008) and Banbura *et al.* (2010) suggested the appropriateness of the Bayesian approach in systems with a large number of predictors compared to the small sample sizes that are essential in fiscal policy analysis.

Based on Cicarelli & Rebucci (2003), and Koop and Korobolis (2010) the typical VAR model for n – dimension column vector Y_t can be written as shown below for this study:

$$\boldsymbol{Y}_t = \boldsymbol{C} + \sum_{p=1}^{L} \boldsymbol{b}_i \boldsymbol{Y}_{t-p} + \boldsymbol{D}\boldsymbol{Z}_{t-p} + £_t \qquad \textbf{(4.1)}$$

Where Yt is n×1 vectors of endogenous variables; D is n×d parameter matrix, Zt is d×1 dimension vector of exogenous variables; ε_t is n×1 vector of independently, identically, and normally distributed (n.i.i.d) error terms:- and $(\boldsymbol{b}_i,\ i = 1,2,\ldots,L)$ is n×n coefficients matrices of VAR model. Covariance matrix of error term is Σ. Hence, ε_t~iid (0, Σ). In order to introduce the Bayesian estimation technique Eq. (4.1) can be rewritten in shortened form as follows;

$$\boldsymbol{Y}_t = \boldsymbol{X}_t \quad + £_t \qquad \textbf{(4.2)}$$

where Xt= (In⊗Wt-1) is n×nk matrix, $W_{t-1} = \begin{pmatrix} \boldsymbol{C}' & \boldsymbol{Y}'_{t-1} & \boldsymbol{Y}'_{t-2} & \cdots & \boldsymbol{Y}'_{t-L} & \boldsymbol{Z}'_t \end{pmatrix}$ is 1×k, and β=vec (b1, b2, b3,,,,,,,,,,,,,,,,,,,,,,,,,,,,bp, D) is nk×1. The unknown parameters of the model are B and Σ. Estimation of the parameters is quite straightforward. By combining the likelihood function of the parameters which is the probability density of the data conditional on the model's parameters given below

$$L(Y/\beta,\Sigma) \propto |\Sigma|^{-\frac{T}{2}} exp\left\{-\tfrac{1}{2}\textstyle\sum_t (Y_t - X_t\beta)'\,\Sigma^{-1}(Y_t - X_t\beta)\right\} \qquad \textbf{(4.3)}$$

and a joint prior distribution on the parameters, p (β, Σ), the joint posterior distribution of the parameters conditional on the data is given as follows (we follow Cicarelli & Rebucci, 2003, and Del Negro *et al*., 2009).

$$p(\beta,\Sigma) = \frac{p(\beta,\Sigma)L(y/\beta,\Sigma)}{p(Y)} \propto p(\beta,\Sigma)L(y/\beta,\Sigma) \qquad \textbf{(4.4)}$$

Where ∝ represents "proportional to" (see Del Negro et al., 2009, Kociecki *et al*., 2014). The commonly used prior distribution is the prior suggested by

Litterman (1980), which is known as "Minnesota prior". This prior, transforms the VAR model into random walk process for each variable (Luetkepohl, 2011). At the same time, imposing Minnesota priors is the simplest way of dealing with the variance covariance matrix of the VAR coefficients (Bobasu, 2016). In addition, the Minnesota prior expresses the degrees of uncertainty and the specification of prior variance for each coefficients of the variables in the model (Litterman, 1986) and (Ciccarelli and Rebucci, 2003).

Given equation (4.1) the discussion above can be formalized as follows.

$$\textbf{Let } \beta = vec(\Gamma_1, \Gamma 2, \Gamma 3, , , , , , , , , , , , , , \Gamma p) \qquad (4.5)$$

be the vector of all the dynamic coefficients of the model.

The Minnesota prior can be specified as $\beta \sim N(\beta, V)$ (4.6)

Where β and V are the prior mean and variance of the coefficients, respectively. This approach is popular and used due to its simplicity in computation and interpretation. A big advantage of the Minnesota prior is that it leads to simple posterior inference involving only the normal distribution (Korobolis and Koop, 2010).

After imposing prior restrictions, we derive the conditional posterior for the coefficients and the variance-covariance matrix of the VAR model. The main advantage of using Bayesian estimation is that it brings additional information into the model, by setting the priors, and therefore the analysis is more accurate and more precise (Franta, 2012).

The additional information brought about by the data series help to derive the posterior distribution of the coefficients. The fiscal shocks are identified using a Cholesky identification scheme. In VARs Model, the priors can take many forms. Examples are a general shrinkage of all coefficients towards zero, shrinkage towards specific typical dynamic patterns, and Shrinkage towards fully specified dynamic stochastic general equilibrium models (Del Negro and Schorfheide, 2004, and Sims and Zha, 1998). Details on hyperparameter values are given in the next subsection.

Litterman (1980) stated that in Minnesota prior approach the coefficient of the first-own lag is set equal to one and all the other coefficients, including all the other own-lag coefficients and the coefficients for the other variables in the BVAR system, are set equal to zero. We are left with the task of choosing good values of hyperparameters for this study purpose. Even though there are several ways to do this a researcher is free to set these hyperparameters to any values *i.e.*, your priors are your priors (Nason, 2016). The standard values of hyper-parameters recommended by Sims and Zha (1998) are used since they are applicable and works well in practice even if the length of time periods and system size vary (Wind, 2015). As all the data are in log levels except for interest rate, we followed Litterman (1986). In addition, we set the prior value of the autoregressive coefficients on its own first lag for each variable to one. Hence, the value of lambda 1=0.2(overall tightness), lambda2=1(cross-equation tightness) and lambda3=1(harmonic lag decay). Therefore, in this paper, BVAR model with a Minnesota prior (MVAR) is applied to the Ethiopian economy for assessing the effects of fiscal policy shock.

5. The Fiscal Policy Effects on Macroeconomic Variables

The impulse response functions are plotted for the first 10 quarters only. Since we estimate the BVAR in levels there are unit roots or near unit roots in the system. For these cases Phillips (1998) shows that, if estimated long period ahead impulse responses are inconsistent i.e., they tend to random variables and not give the true impulse responses. Thus, in such a setting confidence in impulse responses for longer periods ahead does not seem to be high and impulse responses are generated only for 2.5 years.

According to Harris's (2007) recommendation looking at residual correlograms is a good idea when there are uncertainties in choosing the lag length of a VAR model. Hence, this study conducted residual correlograms for different order BVAR. Since there is no autocorrelation of residuals in the BVAR (4) model it is chosen and used as the benchmark.

The validity of analysis based on the benchmark model depends on how the estimated residuals perform when investigated with post-estimation diagnostic tests. These are test for the stability of the model, for autocorrelation, and for

the normality of the estimated residuals. The test for stability shows that all roots of the characteristic polynomial lie inside the unit circle signifying that the model is stable and that VAR satisfies the stability condition. Therefore, our model is stable to generate impulse responses that can be used to examine the dynamic effects of fiscal policy shocks.

The LM test for residual autocorrelation indicates no evidence of autocorrelation at any of the first four lags at five percent significance level. The Jarque-Bera test for residual normality indicates that the residuals are normal. The null hypothesis states that residuals are multivariate normal and based on the result, the null hypothesis is accepted[1]. However, normality is large sample property and given the small sample size, the residual normality can be better improved with a larger sample size.

In the following sub-sections, impulse responses estimated from the BVAR model for a period of 2.5 years are presented in figures and discussed in detail. Accumulated impulse responses are also estimated for the baseline model.

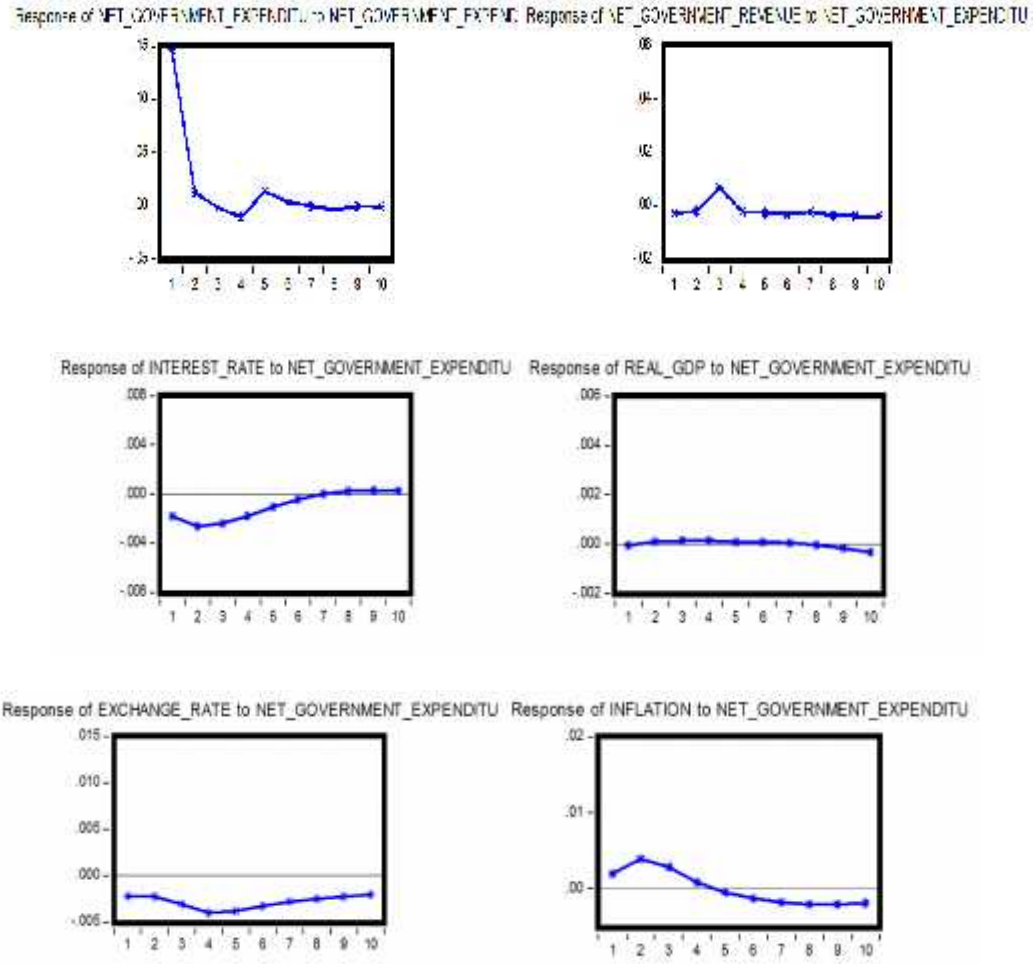
i. Effects of Government Spending Shock

Figure 2 displays the responses of the endogenous variables to a positive spending shock. Here we present the responses of net government expenditure, net tax revenue, real GDP, prices, interest rate and exchange rate to a unit shock to net government expenditure. We have the response of the endogenous variable to a unit shock and time horizon on the vertical and horizontal axis respectively. The immediate impact of a one percent increase in spending on itself is around 0.15 percent and then it has a cyclical pattern effect.

The government spending shock has a small positive impact on output from quarter two to six but the estimated impulse responses are mostly insignificant. The immediate impact of a one percent GDP increase in spending on output is almost zero. The GDP response turns slightly negative after two years in confirming with the findings of Yang (2013), Boiciuc (2015), Bobasu (2016), Heppke-Falk *et al*. (2009). Despite a very small positive effect GDP is suggesting a 'crowding-in' effect and a 'Keynesian' pattern. Net taxes respond positively to the spending increase after the second quarter with the response

peaking in the third quarter and immediately being eroded out and becoming negative via the horizon.

Figure 2: Responses of endogenous variables after the government spending shock



Inflation picks up slightly as a result of the government spending shock and the impulse responses are statistically significant in the first four quarters and peak at the second quarter. Then, it becomes negative after the fifth quarter. This implies that it has a positive effect on inflation in the short run.

Initially the interest rate responded negatively to the government spending shock and became positive at the 7th quarter and turned positive in the

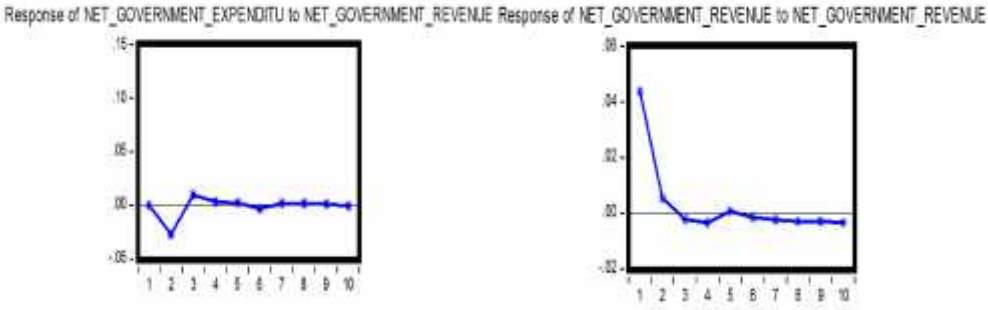
subsequent quarters with a small effect. The nominal exchange rate shows a decline roughly for the first year of the response period following an increase in expenditure and then starts to improve even though it responded negatively to the shock.

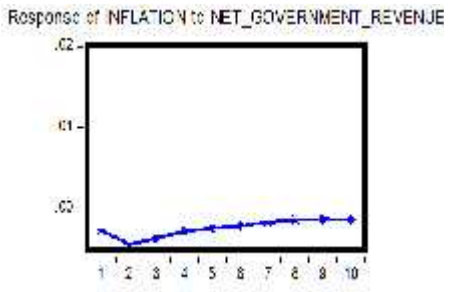
ii. Effects of Net Revenue Shocks

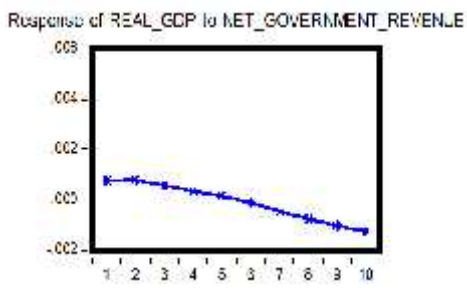
Figure 3 displays the endogenous responses of each variable following an increase of net taxes. Following its own shock the net tax revenue responded quickly by 0.04 percent. It continuously declined and became negative except at the fifth quarter at which it became insignificant. The tax shock is relatively more persistent compared to the expenditure. Following a slight initial increase in government revenue, government spending starts to decline and the effect was small, reaching its peak at the third quarter and becoming insignificant throughout the horizon.

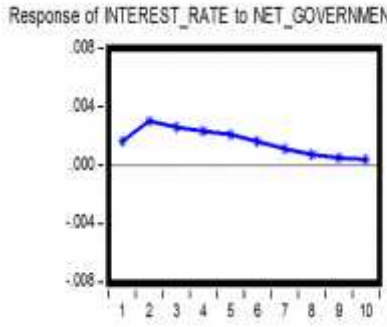
Real GDP increases in the first five quarters and becomes negative throughout the whole horizon. The results suggest that government revenue declines steadily following the shock which erodes after three quarters. The inflation response to a net tax increase is medium and negative. The effect is significant after the initial quarter. Contrary to a shock in government spending, the effects on interest rate are positive and persistent and the trough is reached after two quarters. By its turn, exchange rate reacts positively to the shock but the effect reaches a peak nearly after two quarters and becomes negative after six quarters.

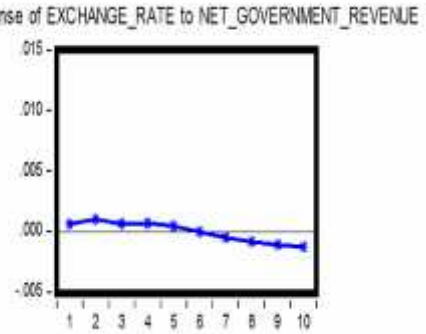
Figure 3: Responses of endogenous variables after net revenue shocks











5.1 The Effects of Disaggregated Fiscal Variable Shocks

In this section we investigate the effects of different components of fiscal policy on output, prices, interest rates, and exchange rate. To do so, we augment our basic 6-variable specification by splitting up either expenditure or revenue. Accordingly, we estimate BVARs with seven variables by splitting up fiscal variables into two components.

i. The Effects of Net Government Expenditure Components

In the first disaggregated specification, we include – in addition to net revenue – capital and recurrent expenditure as fiscal variables in the BVAR based on the major classifications of expenditure available. These two expenditure components add up to our previous net government expenditure variable, which is dropped. Concerning the relative ordering of the fiscal variables, we assume the priority of recurrent expenditure relative to capital expenditure, and then the priority of those two expenditure categories relative to net tax revenue.

Figure 4 shows the impulse-response functions to a positive shock in recurrent expenditure. Recurrent expenditure is positively affected by its own shock up to the 6th quarter except at the 4thquarter at which it becomes insignificant. Capital expenditure initially gives negative response and then it gives a positive, becoming cyclical for recurrent spending. More or less similar to the effect of total government spending, a positive shock to recurrent expenditure in Ethiopia has a persistent positive impact on real output. Recurrent expenditure appears not to be responsible for inflationary pressure in Ethiopia. Interest rate picks up slightly as a result of recurrent spending shocks and the impulse responses are positive in the first four quarters and peak at the 4th quarter. Then, it dies out after the 9th quarter. Although the initial response of exchange rate is small and negative in the first quarter, its overall response for the rest of the quarters remains negative and significant.

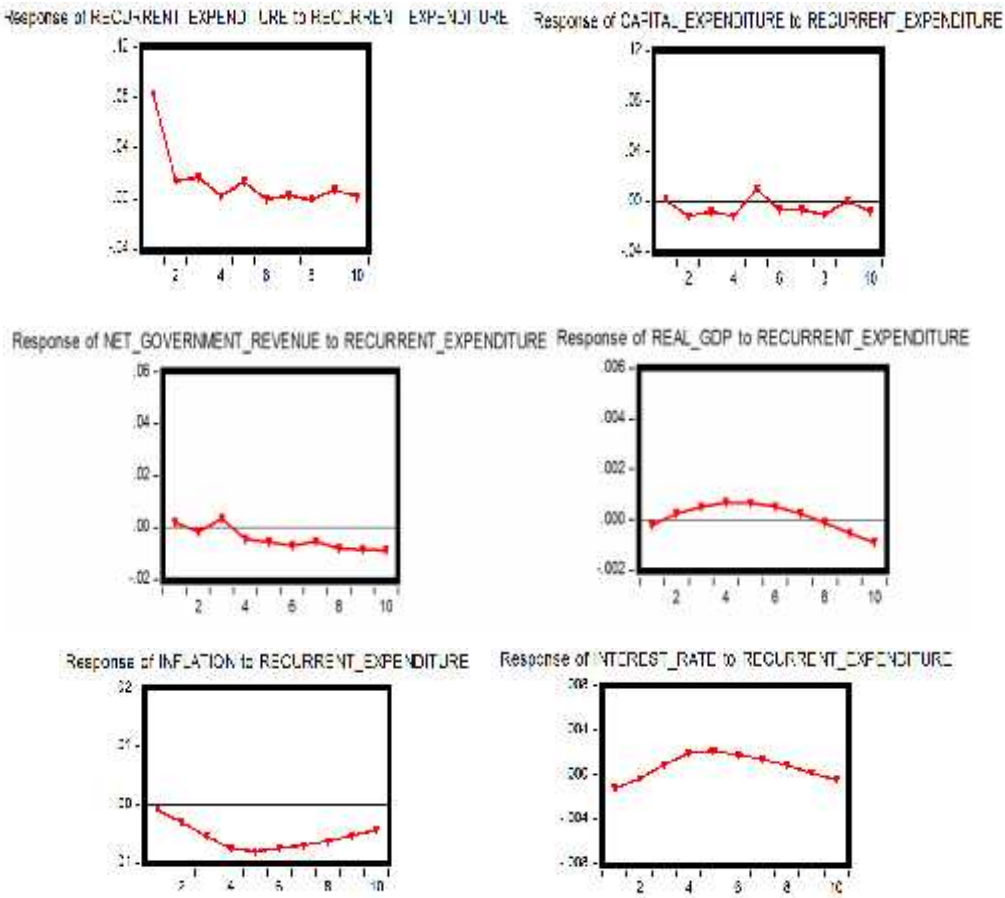
Figure 5 shows the impulse-response functions to a positive shock in capital expenditure. The capital expenditure is found to have a positive response in the first quarter and a cyclical response following a shock in capital spending where the effect is barely significant up on impact. In contrast to the effect of recurrent spending on output, capital expenditure is found to have a negative effect and finally become small. The reason could be the administrative lag and contractual bottleneck sometimes involved in executing most capital projects in Ethiopia support the finding of Atan for Nigeria (2015) and Lledo et al. (2011) suggested that capital expenditure is not significant for output since planned fiscal adjustments or expansions are less likely to be implemented the larger they are, the more inaccurate the growth forecasts they are based on, the more fragile the regulatory system in the country, and the weaker the institutions framing the design, approval, and execution of the budget in sub-Saharan Africa in general.

In contrast to recurrent expenditure shocks capital expenditure appears to be responsible for inflationary pressure in Ethiopia. It is positive throughout the horizon and significant like net government expenditure up until the 4th quarter. In the short term, the interest rate responds negatively and then it is affected positively.

In the short term, the estimated impact on exchange rate is insignificant but becomes statistically significant after the 3rd quarter. In other words, the nominal exchange rate is insignificant for the first year of the response period following an increase in capital expenditure. However, this is not the case for the subsequent forecast periods for it has showed improvement. This means that an expansion in capital spending causes a deterioration of nominal exchange rate in the short run.

This probably holds true since the country relies on imported goods for different capital projects.

Figure 4: Responses of endogenous variables after recurrent expenditure shock



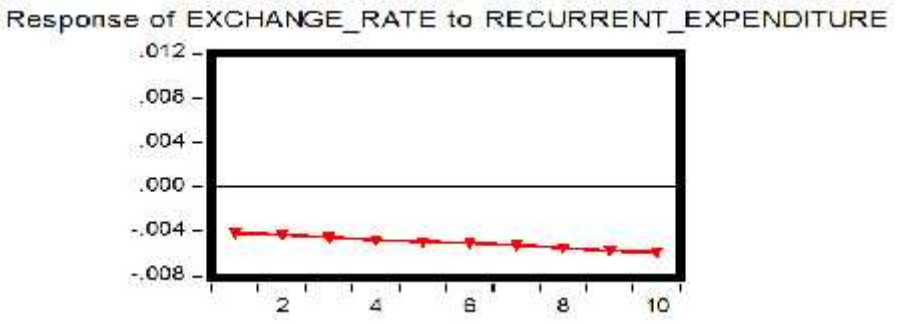
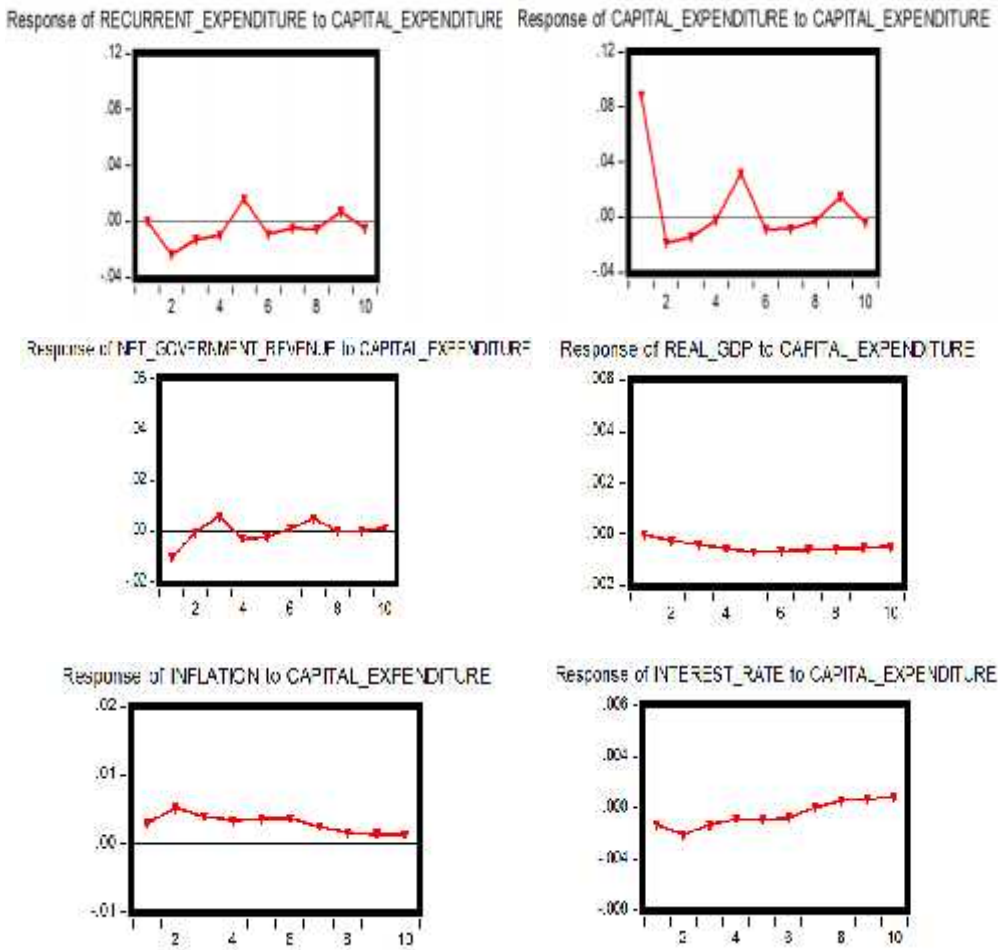
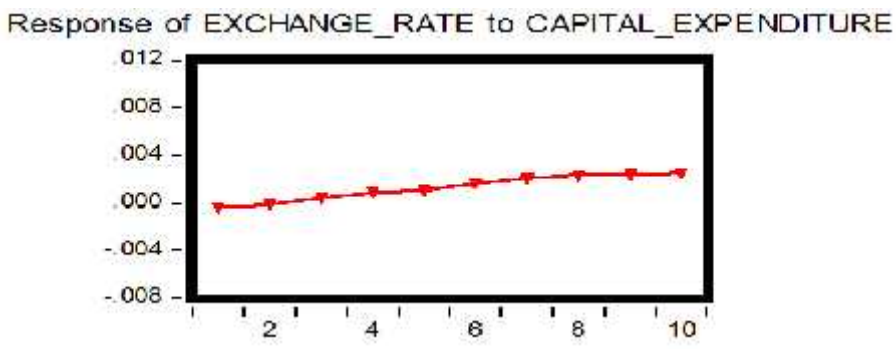


Figure 5: Responses of endogenous variables after capital expenditure shock





ii. The Effects of Net Tax Revenue Components

In this section, we investigate the effects of different sub-components of net revenue on real GDP, inflation, interest rate and exchange rate. In particular, we include indirect and direct taxes. In line with previous specifications among these two revenue components, we order indirect taxes first (Tenhofen *et al*., 2010).

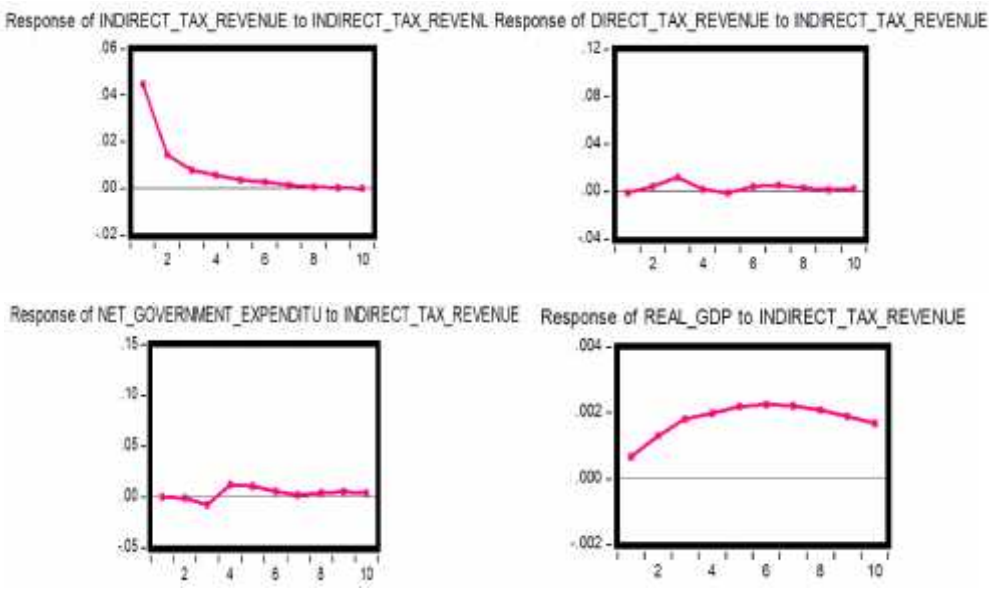
Figure 6 shows the impulse-response functions to a positive shock in indirect tax revenue. Surprisingly, the response of indirect tax revenue to its own shock was significantly positive for the first six quarters and remained positive but insignificant for the rest of the period. Both direct tax revenue and net government expenditure have a cyclical nature of response to indirect tax revenue even if the effect is too small. The rise in output is very persistent throughout the quarters and shows no tendency of returning to its baseline value following indirect tax revenue shocks. This result is in line with those reported by Giordano, *et al.* (2007), De Castro and de Cos (2008) and Tang *et al*. (2011) but differs from the findings reported by Blanchard and Perotti (2002), Parkyn and Vehbi (2013), and Akpan *et al.* (2015). In contrast to the findings of Akpan *et al*. (2015) inflation rises in response to an increase in indirect taxes. Regarding the effects of indirect taxes on interest rate and exchange rate our results show a clear and negative impact.

Figure 7 shows the impulse-response functions to a positive shock in direct tax revenue. The response of direct tax revenue to its own shock was significantly positive in the first quarter and cyclical for the rest of the period. Net government expenditure responds cyclically to direct tax shocks with small

effects. However, indirect tax responds negatively and is insignificant. Unlike indirect taxes, direct taxes are found to affect output very little and the response is not significant. This evidence thus indicates that only some components of taxes (indirect tax) have significant effects on output. The decline in output is very persistent throughout the quarters and shows no tendency of returning to its baseline value following direct tax revenue. A possible explanation for this could be that an increase in direct tax is quite significant in decreasing the flow of foreign direct investment in Ethiopia that confirms the finding of Violeta *et al.*, (2011).

The response of inflation yields a negative and insignificant effect to direct tax shock. The response of interest rate to a shock in direct tax remains relatively positive but over time, interest rate declines, and become insignificant. Also, the nominal exchange rate initially appreciates by small amount and then depreciates slightly. Hence, interest rate and exchange rate respond positively to direct tax shocks. Later, interest rate and exchange rate become insignificant and negative, respectively.

Figure 6: Responses of endogenous variables after indirect tax revenue shock



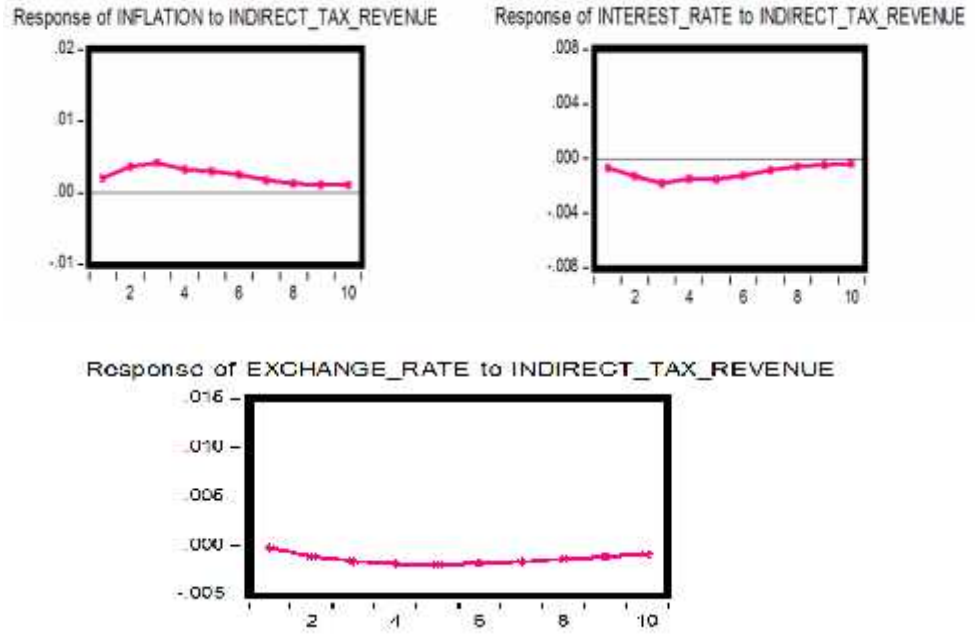
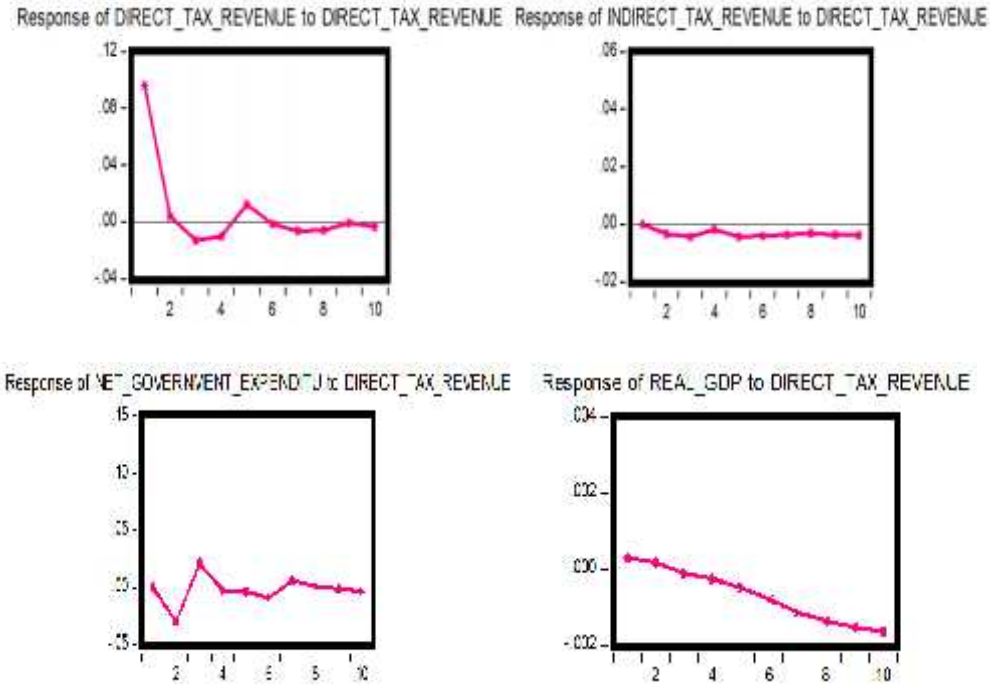
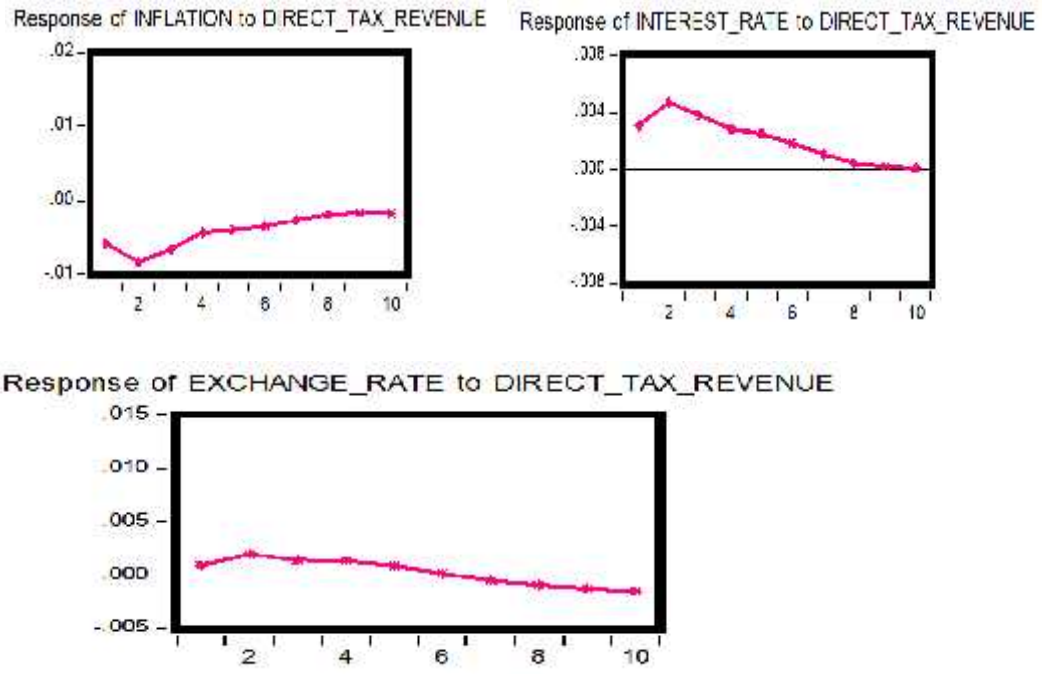


Figure 7: Responses of endogenous variables after direct tax revenue shock





5.2 The Effects of Fiscal Policy Shocks on Private Consumption and Investment: On the Private Sector

To get a more detailed picture of the effects of fiscal policy, we look at the response of GDP components, in particular private consumption and investment. Neoclassical theory broadly predicts that consumption should fall in response to a (temporary) spending shock, while New Keynesian models predict that consumption should increases. In the figure below the responses of consumption and investment to a spending and revenue shock in a 7- variable BVAR model are given. For this analysis real GDP has been dropped in this specification and replaced by private consumption and private investment.

Figure 8 shows the impulse-response functions to a positive shock in government spending. The impact of spending shock on private consumption is positive in the first eight quarters, and reaches its peak in the fourth quarter, hence, supporting the idea that government spending has an expansionary 'Keynesian' effect in the economy. Then, it starts to decline, becoming negative, although not significant. Contrary to a shock in government

spending effect on private consumption, the effects of a revenue shock on private consumption is positive, very persistent and the trough is reached after seven quarters.

Figure 9 shows the impulse-response functions of private consumption and private investment to a positive shock in government revenue. Private investment is positively impacted by a shock in government revenues throughout the horizon whereas the effect of a spending shock on private investment is positive but quickly erodes after seven quarters, becoming negative, though significant. The trough is reached at after two quarters for both shocks. The results support the idea of a 'crowding-in' effect as both private consumption and private investment react positively to the fiscal shocks.

Interestingly, the investment response to a government revenue shock is positive, which is in line with the finding of Blanchard and Perotti (2002), Aschauer (1989), Argimon *et al.*(1997), Biau and Girard (2005), Hepke-Fak *et al.*, (2006), Burnside *et al.*, (2004), Giordano *et al.*,(2007),Grier and Tullock (1989). Similarly private consumption response to the shocks is positive, which replicates the results of Blanchard and perotti (2004), Hepke-Falk *et al.*, (2006), Giordano *et al.*, (2007), Fatas and Mihov (2001), Perotti (2004), and Biau and Girard (2005). Therefore, private consumption and private investment are not crowded out by net government spending and net government revenue.

Figure 8: Responses of private consumption and private investment to government spending Shock

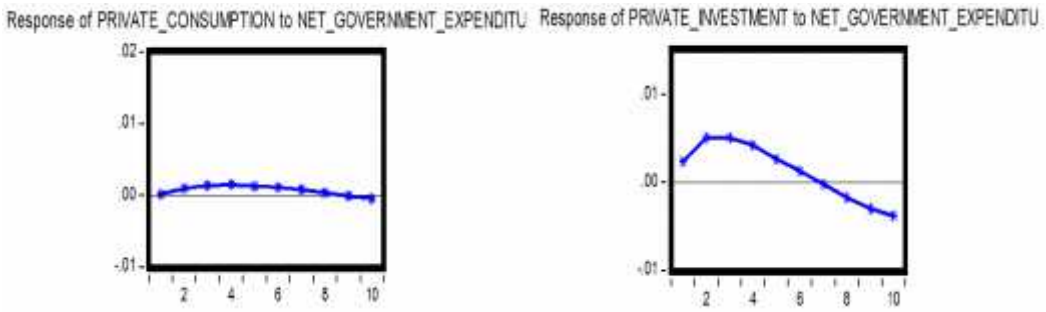
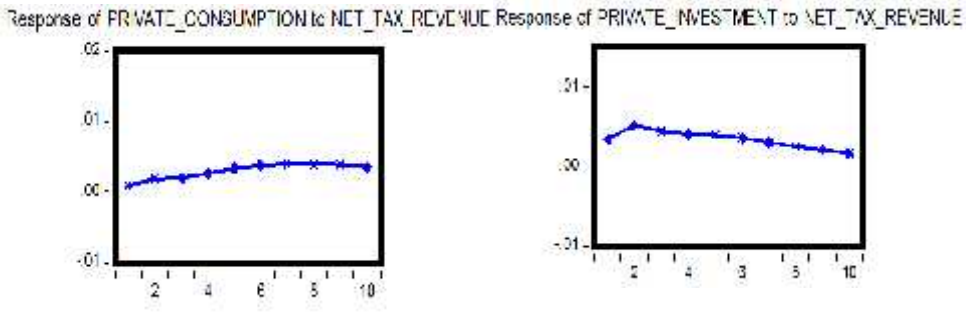


Figure 9: Responses of private consumption and private investment to government revenue shocks.



5.3 The Response of Debt to GDP Ratio to Spending and Revenue Shock

Investigating the reaction of debt to fiscal policy shocks helps us to identify the relative importance of expenditure and revenue measures for its stabilization and/or reduction purpose. "A deficit financed policy change causes government debt to accumulate, which brings forth future policy adjustments that can affect both the current economy (through policy expectations) and the future economy (through the implementation of policy adjustments)" (Yang *et al.*,2003). Furthermore, *"When the debt-to-output ratio rises, the government mainly relies on reducing its purchases and increasing income taxes to stabilize debt. When a fiscal shock hits the economy, it has a direct effect from the shock itself and an indirect effect through financing. When government investment increases or the capital tax rate decreases, higher debt is associated with higher investment at least in the short run" (Yang et al.,2003).*

As can be seen from the figure below, a positive discretionary increase in government expenditure is estimated to increase the debt-to-GDP ratio for the entire horizon. When we turn to see the revenue shock effects on debt dynamics, initially it decreases the debt ratio. However, the duration of this response is only short lived and debt ratio embarks on to take a positive response via the horizon. In comparison to a spending shock this positive response of debt ratio to revenue shock further appears to be a bit larger in magnitude.

Figure 10: Accumulated response of debt ratio after the government spending and revenue shocks

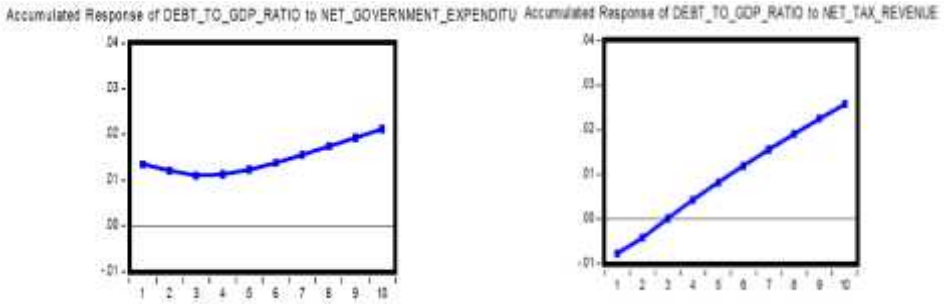


Figure 11 shows the impulse-response functions to a positive shock in government spending with debt feedback. When we take into account the feedback from government debt, the results suggest that the effects of government spending shocks on RGDP, private consumption, private investment, price level, interest rate and exchange rate become smaller. The results also show that government spending shocks, in general, have a small effect on Real Gross Domestic Product (RGDP); lead to a small 'crowding-out' effect i.e. a 'Non- Keynesian' pattern (Giavazzi and Pagano (1996), Giudice *et al.,* (2004) and Afonso (2010). Nevertheless, the magnitude of the impact is small and confirms the findings of Heppke-Falk *et al.* (2006). This gives rise to the importance of considering debt in the model. The empirical evidence suggests that it is important to explicitly consider government debt in the model. In sum, when we include the feedback from the government debt in the model, the effects on the majority of the variables included in the model become smaller as reported in Figure 11 below in line with the findings of Mathewos (2015), and Afonso and Sousa (2012).

Figure 11: Response of endogenous variables after net government spending shocks with debt feedback

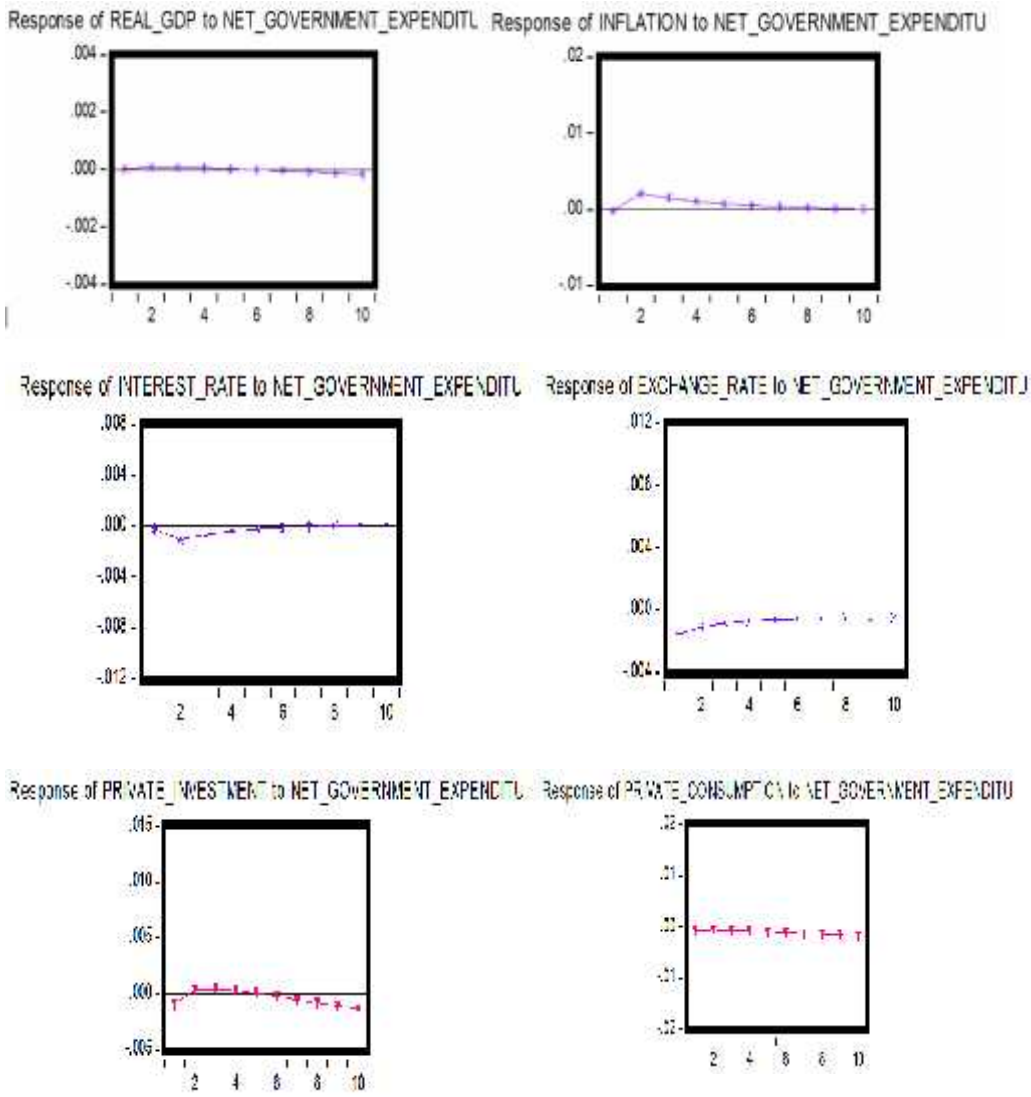
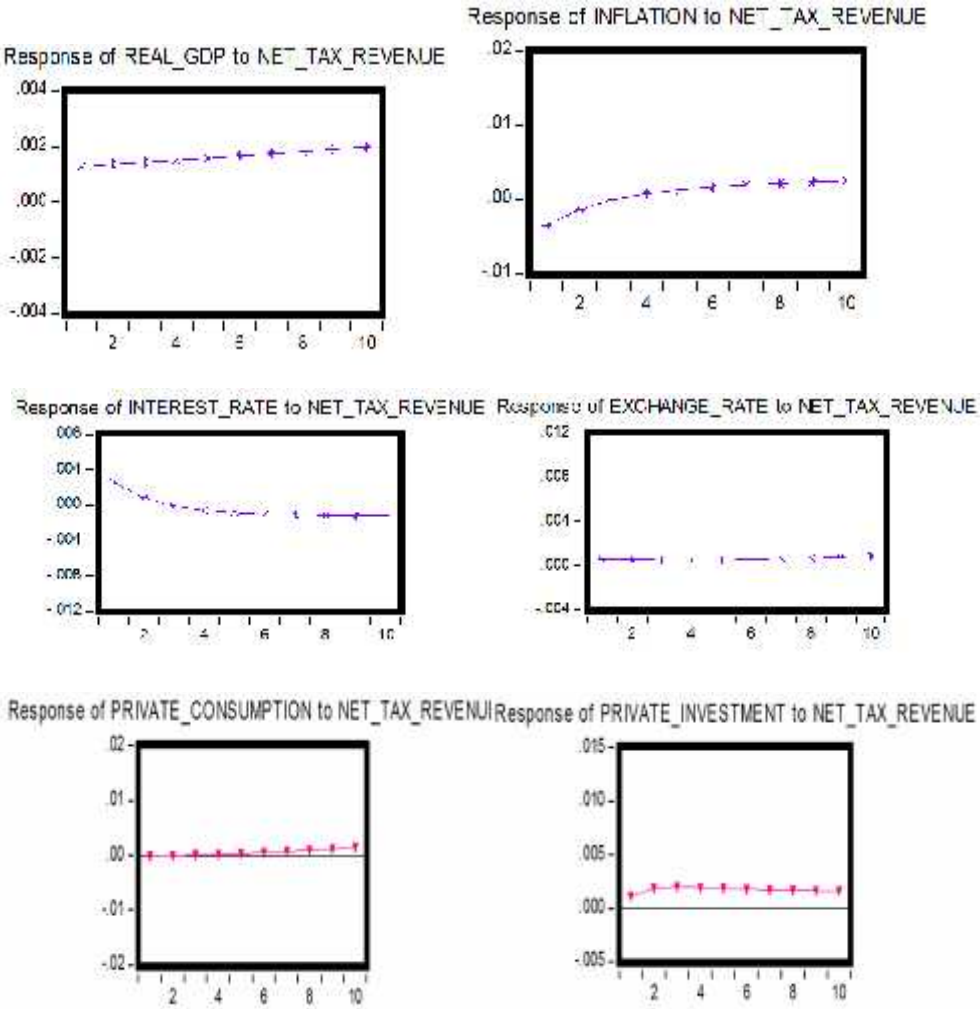


Figure 12 shows the impulse-response functions to a positive shock in government revenue with debt feedback. The effects on RGDP, exchange rate, and private investment are positive and the impacts are persistent. However, the effect on private consumption is small in comparison to that without debt analysis. The effect on inflation is negative in the first quarters, but the

impacts are persistent and even become positive after that whereas interest rate responds positively in the first quarter and then becomes negative via the horizon. Hence, when we include the feedback from the government debt in the model, the effects on the majority of the variables is too small except for real GDP.

Figure 12: Response of endogenous variables after net tax revenue shocks with debt feedback.



Several robustness checks are performed to make sure that the model yields a stable outcome. The first assumption considered and used is different order on

fiscal variables: government spending decisions came first, then net tax revenue followed, and the vice versa. In the second check, the model is estimated with a different lag, as the lag selection criteria indicated. The third robustness check is conducted by using the Cholesky decomposition. Finally, different hyper-parameter values are used to see if the impulse response functions are robust results, both short periods and long periods of impulse response function results were considered.

Particularly, a different ordering of the variables in which net tax revenue is ordered next to government spending (Tenhofen *et al.*,2010) yields almost the same impulse response functions. This finding is similar to that of Blanchard and Perotti (2001). After all of these assumptions had been carried out, the results under different robustness checks were found to be similar to the one obtained in the benchmark model. Therefore, we can conclude that the model is robust. Henceforth, very similar impulse responses are estimated in all cases of robustness check methods listed above but they are not reported here.

6. Conclusion

The effectiveness of a fiscal policy in stimulating the real economy is an ongoing intellectual debate. This paper assesses the macroeconomic effects of fiscal policy shocks in Ethiopia employing quarterly data for the period of 2000:Q1-2016:Q4 and using Bayesian Vector Auto Regression model with Minnesota prior. Following government spending shocks:- i) output has small positive feedback from quarter two to six quarters, but the estimated impulse responses are mostly insignificant:- ii) net taxes respond positively to the spending increase and immediately erode out and become negative via the horizon:-iii) inflation picks up slightly as a result of a government spending shock. This implies that it has inflationary pressure in the short run:- iv) initially the interest rate respond negatively to government spending shock and become positive at the 7^{th} quarter and positive in the subsequent quarters with small effect:-v) the nominal exchange rate shows a deterioration roughly for the first year of the response period and then starts to improve even if it respond negatively to the shock. In addition, government revenue shocks:-i) have a negative effect on government spending and the effect is small:-ii) Initially have a positive effect on real GDP and becomes negative throughout

the whole horizon:-iii) has a medium and negative effect on inflation:-iv) contrary to a shock in government spending, effects on interest rate are positive, and persistent:-v) lastly, exchange rate reacts positively to the shock but the effect become negative after half quarters. Furthermore, different tax and spending components have different effects on macroeconomic aggregates depending on the underlying cause of the shock. Similar to the effect of total government spending, a positive shock to recurrent expenditure in Ethiopia has a persistent positive impact on real output. Recurrent expenditure appears not to be responsible for inflationary pressure in Ethiopia. Interest rate picks up slightly as a result of recurrent spending shocks and the impulse responses become positive, peak and then dies out. Although the initial response of exchange rate is small and negative in the first quarter, its overall response in the rest of the quarters remains negative and significant. In contrast to the effect of recurrent spending on output, capital expenditure is found to have a negative effect and finally become small. The reason could be the administrative lag and contractual bottlenecks sometimes involved in executing most capital projects in Ethiopia. In contrast to recurrent expenditure shocks, capital expenditure appears to be responsible for inflationary pressure in Ethiopia. In the short term, the interest rate responds negatively and then it is affected positively. The estimated impact on exchange rate is insignificant but becomes statistically significant after one year. Both direct tax revenue and net government expenditure have a cyclical nature of response to indirect tax revenue but the effect is too small. The rise in output is very persistent and shows no tendency of returning to its baseline value following indirect tax revenue. Inflation rises in response to an increase in indirect taxes. Regarding the effects of indirect taxes on interest rate and exchange rate our results show a clear and negative impact. The response of direct tax revenue to its own shock was initially positive but cyclical for the rest of the period. Net government expenditure responds cyclically to direct tax shocks with a small effect. However, indirect tax responds negatively and is insignificant. Unlike indirect taxes, direct taxes are found to affect output very little and the response is not significant. The decline in output is very persistent following direct tax revenue. The direct tax shock has no inflationary pressure. The interest rate and exchange rate respond positively to direct tax shocks. Later, interest rate and exchange rate become insignificant and negative respectively. Furthermore, the results support the idea of a

'crowding-in' effect as both private consumption and private investment react positively to the fiscal shocks. The empirical evidence shows that it is important to explicitly consider government debt dynamics in the model.

6.1 Policy Implications

Based on the empirical findings the following policy implications are suggested.

- Government expenditure should not be taken as a stabilizing policy instrument due to its immediate inflationary pressure.
- Expanding the existing narrow tax base which in turn obliges increasing the capacity to collect and administer tax since tax has less effect on inflation.
- Current spending can be used to stimulate the economy at the expense of lower output in the long-run.
- The government has to do on the administrative lag and contractual bottleneck appears in the country sometimes involved in executing capital projects.
- The country's export potential plays a crucial role and must be increased to overcome the problem of ER deterioration.
- A great caution should be taken to avoid an expansion in spending leads to large debt accumulation in the economy.
- The policy move toward giving direct taxation a much bigger role in the tax systems of
- Ethiopia will not come without some tradeoff costs. It Slow FDI and economic growth.

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