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The Dynamic Effects of Fiscal Policy Shocks on Macroeconomic Variables in Ethiopia: Evidence from (SVAR) Model

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Declaration

I, Marsimoe Bekele, declare that this thesis titled, **The Dynamic Effects of Fiscal Policy Shocks on Macroeconomic Variables in Ethiopia: Evidence from (SVAR) Model** and the work presented in it are my own. I confirm that:

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- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
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Abstract

This paper investigates the dynamic effects of fiscal policy shocks on macroeconomic variables in Ethiopia using SVAR and VECM approach on quarterly data for the period 2000/01Q1-2016/17Q4. From the empirical findings, the response of macroeconomic variables is asymmetrical depending on the aggregate and disaggregate components of fiscal policy variables. Basically, a positive shock to government spending was found to have a positive effect on output but at the cost of higher inflation,and has delayed positive effect on the interest rate. In line with the theory, the response of output to positive innovations of tax revenue was found negative in the short run and long run. Consequently, a positive shock to tax revenue has a positive effect on inflation and interest rate. For the subcategory of government spending –similar to total government spending a positive shock to recurrent spending has a positive effect on inflation and output in the short run. However, in the long run the effect of recurrent spending on inflation was insignificant. In addition, the response of interest rate is negative to a positive recurrent spending shock in the short run and insignificant in the long run. In contrast to recurrent spending shock, a positive shock in capital spending has a positive effect on output in the short run. However, it is insignificant. The reason could be the mismanaged and corrupted capital projects which contribute to inflationary pressure in the short run. However, in the long run the effect of capital spending on output is positive and significant and also does not lead inflation. Similar to recurrent spending positive innovations of capital spending has a negative effect on the interest rate in the short run. However, in the long run the effect of recurrent spending on interest rate was insignificant. Whereas, the effect capital spending was negative on the interest rate which result in crowding in private investment. In the case components of tax revenue, a positive shock to indirect tax has a negative effect on output in both in the short run and long run. Similar to the total tax revenue shock, a positive shock to indirect tax has a positive effect on interest rate and inflation in the short run. However, the effect of indirect in the long run on inflation was negative. On the other hand, a positive shock to direct tax has a persistent positive effect on output and has delayed positive effect on interest rate and inflation in the short run. Consequently, the effect of direct tax in the long run on both inflation and output was positive.

Key words: Fiscal policy, total government spending, total tax revenue, recurrent spending, Capital spending, indirect tax, direct tax

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Abbreviation

NBE	National Bank of Ethiopia
WEO	World Economic Outlook
IMF	International Monetary fund
MOFEC	Minster of Finance and Economic Cooperation
CSA	Centeral Statistical Agency
ADF	Augmented Dickey Fuller
DF	Dickey Fuller
SVAR	Structural Vector autoregressive
VAR	Vector autoregressive
VECM	Vector Error Correction Model
WB	World Bank
OCED	Organisation for Economic Co-operation and Development

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Chapter 1

Introduction

1.1 Background of the Study

Fiscal policy is referring to the set of decisions or rules regarding taxes and public expenditures for the purposes of reducing the fluctuations of the economic cycle in order to keep unemployment close to its equilibrium value and avoid the build-up of deflationary or inflationary pressures (Samuelson, 1948). Fiscal policy alongside with monetary policy is one of the main tools available to public authorities to intervene and influence the real economy.

Historically starting from the emanation of fiscal policy which can be traced to the work of Keynes who suggested the idea of fiscal policy as a measure to stimulate growth during the great depression of the 1930's has become top government tools to steer the economy. However, there was a debate on the effectiveness of fiscal policy in stabilizing the economic activities after the end of dominance year of fiscal policy during 1970s because of stagflation. Although there was opposing ideas on the efficiency of fiscal policy, most scholars gave their witness about the effectiveness of fiscal policy.

For instance, Osuala and Jones (2014) noted that government intervention in the economy through fiscal policy has been to manipulate the receipt and expenditure sides of its budget in order to achieve certain national objectives.

The recent financial crisis has shown the importance of government intervention to stabilize and alleviate any threat on the economy. Indeed, fiscal activism, after more than two decades of neo-classical and the "no fiscal dominance" paradigm, has come back on the top of government agendas in recent years (IMF, 2016).

Moreover,(Abubakar, 2016) Abubakar (2016) also preached, the use of fiscal policy is very important in every[1] society, most especially in Less Developed Countries (LDC's) as a major tool for economic stabilization and enhancing development.

In addition to economic stabilization in less developed countries, Fiscal policy also plays significant role in economic growth of both developed as well as emerging economies. In the developed economies the objective of fiscal policy is to raise the rate of capital formation by reducing the level of consumption and increasing the marginal propensity to save. While in the developing economies, creation of equitable distribution of income and diversion of existing resources from unproductive to productive use is the main target of fiscal policy (Popa & Codreanu, 2010).

The importance of fiscal policy in impacting the dynamics of an economy was echoed by Arnelyn, Gemma, Minsoo, and Donghyun (2014) who proclaimed that; in the short term, countercyclical fiscal policy expansion encourages the growth of aggregate demand and economic growth during recessions, on the other side, fiscal contraction can cool down an economy that is growing at an unsustainable pace and save the risk of overheating economy.

[1]Fiscal policy is the instrument that government employ to intervene in the economy for stabilization.

The effect of fiscal policy in an economy is an issue that has always been high on the minds of academics and policymakers alike. This is especially the role that fiscal policy has played in the attempts to mitigate the economic downturn during the current global crisis, and also because of the fiscal tightening associated with the debt crises worrying peripheral European economies. It has been widely recognized that fiscal stimulus can foster economic recovery(Yang, 2013).

However, there are both theoretical and empirical controversies regarding the effect of fiscal policy until the recent global financial crisis of 2008. Unfortunately, and very often it happens that theoretical predications to be different from the situation in the field in developing countries. Indeed, for many developing countries fiscal budget deficits failed to enhance output growth and these deficits by the end of 1970s ended up with severe debts problems (Ly, 2016).

Before the recent global financial and economic crisis, the focus of the research was mainly on the consequences of monetary policy, while the role of fiscal policy was left to one side. Because, in the decades following the emergence of stagflation as an economic phenomenon in the 1970s, marked by sluggish economic growth and inflation, as a result economic theory established a general consensus that monetary policy is more suitable and effective than the adoption of fiscal policy measures in achieving and pursuing macroeconomic policy objectives.

However, the dominance of monetary policy across countries ended during the recent global crisis, because it was ineffective to stabilize economic activity (Christiano, Eichenbaum, & Rebelo, 2011). Therefore, the fiscal policy through changes in the level and composition of taxation and government spending in various sectors has become vital in terms of its significant and substantial impact on economic activity (Mencinger & Aristovnik, 2013).

During the global recession and financial crisis of 2008 and onwards, often referred to as the 'Great Recession', most advanced countries implemented a variety of active fiscal policies as large stimulus packages to mitigate the recession. In particular, since monetary policy options are restricted by the very low interest rates which were central features of the recession, most governments relied much more on fiscal policy (Yang, 2013).

Consequently, many developing countries faces the problem of a weak level of national savings. In such situation, the scarcity of savings usually causes a deficiency in terms of funds necessary to ensure investment and sustainable growth in the economy. For instance, for developing African countries except South Africa savings as a percent of GDP have been progressing in a very inconsistent way and since 1960s remained under 20% of GDP for most countries. Therefore, fiscal policy remains the most feasible investor agent in such economies (Ly, 2016).

Ethiopia is Africa's second most populous country and has recorded fast and broad-based economic growth for the last decade which provided momentum for faster economic development. GDP per capita reached an all-time high of US$794 in 2015/16 which is a three-fold increase from the 2006/07 level of US$262 per capita. Economic growth has remained robust, and real GDP grew by 8.0 per cent in 2015/16, some 2.7 percentage points lower than a year before, mainly due to two exogenous shocks – drought caused by El Niño and a slow recovery of the global economy. Overall growth has been driven by a rapid expansion of public infrastructure and basic services (NBE,2016).

According to the 2016 African Economic Outlook, the agriculture, services and industry sectors accounted for 38.8%, 46% and 15.2% of real GDP respectively in 2014/15. The growth momentum was however challenged by high inflation, largely fueled by food inflation. As a result, the government of Ethiopia has employed Fiscal policy to curb the inflationary pressure by reducing the government budget deficit and including measures such as refraining from financing the

budget deficit through direct advance borrowing from the Central Bank. As a result, the share of the budget deficit in GDP has reduced from 3.7% in 2006/07 to 1.8% in 2015/16 (UNICEF, 2017). According to the above report like other developing countries in Africa and elsewhere in the world Ethiopia also employed fiscal policy to solve the economic instability.

Therefore, using fiscal policy is advisable in order to solve the economic fluctuations particularly for developing countries mostly characterized by weak level of national saving. Hence Ethiopia is also employing fiscal policy for the purpose of solving economic instability; it is very paramount to see the effect of fiscal policy by conducting research on this area using Ethiopia's data. Consequently, the aim of this study is to investigate the effect of fiscal policy shock on macroeconomic variables in Ethiopia.

1.2 Statement of the Problem

There is huge literature on the effect of monetary policy on economic activity, but fiscal policy received less concern and also its role is undermined in economic stabilization. However, the recent financial turmoil has revitalized the motivation of policy maker, academia, central bankers and governments on the importance of fiscal policy (Afonso & Sousa, 2012).

Opposite to fiscal policy shock, monetary policy effect has been researched extensively in time series analysis frame work. But most of the recent studies gave attention to the shocks of fiscal policy dynamics on economy in terms empirical validation of theoretical models. For instance, VAR models are now well-established time series tools for policy analysis, structural inference and description of economic relationships. In the last decade, VARs have been used to investigate fiscal policy implications on the macroeconomic structure (Mançellari, 2011).

Following the global financial crisis of 2007-2008 that put many of the world economies in a state of deep recession, various government from both developed and developing countries have used fiscal policy in an attempt to recover their respective economies out of the economic collapse (Rena & Kefela, 2001). Following this, most of empirical study on the effect of fiscal policy on macroeconomic variables has gained great importance and also fiscal policy is recognized as a macroeconomic stabilization tool.

Afonso and Sousa (2012) conducted study on the impact of fiscal policies on macroeconomic structure in Portugal by employing the Bayesian structural vector auto regression (SVAR) approach. This study found that the shocks in public expenditures have negative effect on GDP, caused a reduction in private consumption and investments and result in increase of inflation and cost of public debt financing.

Another study conducted by Blanchard and Perotti (2002) explored the dynamic effects of shocks in fiscal policy on economic activity in the US in the post war period using a structural vector auto regression (SVAR) and employed quarterly time series data starting from 1947Q1 :1997Q4. The result of the study shows that positive shock in government spending result in a positive effect on output where as positive shocks in revenue negatively affect output.

Moreover, the effect of positive innovations in government spending and government revenue were found to crowd out private investment spending. In addition to the above studies few papers were conducted on fiscal policy shocks in developing countries. for instance, the study conducted by (Schclarek, 2007) reveal that government spending and government revenue (taxes) has Keynesian effects on private consumption and its result do not depend on the initial situ-

ation of the public finance.

Consequently, few number of studies were conducted in Ethiopia on the effect of fiscal policy shock. For instance, Teshome (2006) assessed the impact of government spending on economic growth and the outcome of his study shows that government spending does not have significant implication to explain short run growth.

Furthermore, the research that investigates the dynamic effect of fiscal policy shock on selected macroeconomic variables without including the debt feedback rule conducted by Asfaw (2012) tried to examine the impulse responses of GDP, inflation and interest to the shocks of tax revenue and government expenditure. Accordingly, the tax revenue shock positively affects the output but has little effect on price, while government spending shocks has an expansionary effect on output; and it has an inflationary impact in the short run.

In addition to the aforementioned study another study using (SVAR) examined the macroeconomic effects of fiscal policy shocks by including the feedback effect of public debt in Ethiopia. The result of the study shows that the ignorance of debt level reaction to fiscal and macroeconomic variable ends with wrong conclusion of the effects of fiscal policy shock and also found that, shocks in government spending have an expansionary effect on output; quick rise in price; 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. On the other side, the shocks in tax revenue have small positive effect on output; a temporary price stabilization effect; no significant effect on the cost of debt; and less stabilization effect; on debt to-GDP ratio (Mathewos, 2015).

The last but not the least study conducted by Gemechu (2017) on the macroeconomic effect of fiscal policy shocks in Ethiopia by employing a Bayesian vector autoregression model and using quarterly data from 2000/01Q1 to 2015/16Q4. The outcome of his paper shows that the shock in government spending positively affect output and inflation but the magnitude of the effect was small and negatively affects the interest rate initially but the effect was positive in latter period. On the other hand, the shock in government revenue is expected to have positive effect on real GDP and exchange rate but they respond negatively.

Although different studies conducted on both developed and developing countries shows the effect of fiscal policy on macroeconomic variables, still there is a debate on the effectiveness of fiscal policy. Therefore, it is very important to understand whether fiscal policy changes in government spending or in taxes? has any effects on the economic activities.

Therefore, it is very important to conduct study on the effect of fiscal policy on selected macroeconomic variables. Hence to the best of my knowledge, there was only one study that was conduct by Asfaw (2012) using structural vector auto regression approach to empirically characterize the dynamic effects of net government spending with its disaggregated government spending components and net tax revenue on key macroeconomic variables in Ethiopia using quarterly data over the period 1998/99:1-2010/11:4.

However, the study failed to see the effect of taxes by disaggregating into its components. As a result, this study not only investigates the effect of government spending with its component and total tax but also the effect of taxation, by disaggregating into its component on selected macroeconomic variables using SVAR approach and employing quarterly data spanning from 2000/01Q1 to 2016/17Q4. Thus, analyzing the effects of fiscal policy by decomposing total net taxes and examining their effect on the aggregate economy provide a more accurate picture than treating total net taxes as the fiscal policy variable.

1.3 Objective of the study

1.3.1 The general objective of the study

The general objective of this study is to examine the dynamic effect of fiscal policy shock on selected macroeconomic variables by employing the structural vector autoregressive approach.

1.3.2 Specific objective of the study includes:

- Analyze the effect of net government expenditure and net tax revenue on selected macroeconomic variables.
- Examine the effect of disaggregated components of government expenditure on macroeconomic variables.
- Investigate the effect of taxation by disaggregating into components that means direct and indirect tax on macroeconomic variables.
- Investigate the dynamic effects of fiscal policy variables on macroeconomic variables.

1.4 Hypothesis

- H_0 = The shocks in fiscal policy is pro cyclical in Ethiopia.
- H_A = The shocks in fiscal policy is countercyclical in Ethiopia.

1.5 The significance of the study

Although there was study that conducted on the dynamic effect of fiscal policy on macroeconomic variables by Asfaw (2012); but he did not incorporate the separate effect of tax in his study. As a result, this study investigates the separate effect of tax by disaggregating into its components. Because, understanding separate impact of each component of tax is crucial for policy maker to give due attention to the component of tax which affecting economic activities most while they formulate policy.

Furthermore, this study helps the policy maker which type of tax is distortionary and also which type of government expenditure affect macroeconomic variables positively and negatively.

1.6 Scope of the study

This study deal with the dynamic effect of fiscal policy shock on selected macroeconomic variables such as RGDP, inflation, interest rate with the corresponding fiscal policy variables: net government expenditure, net government revenue and with their respective components. This study employs the structural vector autoregressive approach and using quarterly data starting from 2000/01Q1 to 2016/17Q4.

1.7 Limitation of the study

This study, only discussed the effect of fiscal policy on variables RGDP, interest rate, and price level. However, fiscal policy could also affect other variables, such as wages, real exchange rate, trade balance which could not be included in the present study.

Like other developing countries the data on GDP were not available at quarterly frequency in Ethiopia. Therefore, this study interpolates the data on GDP in order to transform the data into quarterly frequency. This interpolation of data might affect the result.

This study only focused on the macro aspects of the effect of fiscal policy shocks but also the shock in fiscal policy variables can affect microeconomic variables. [2]

1.8 Organization of the study

The rest of this paper was organized as follows. Chapter two reviews the related theoretical and empirical literature. Chapter three highlights the trends of contemporary macroeconomic and fiscal developments of Ethiopian economy. Chapter four explains the empirical strategy used to identify the effects of fiscal policy shocks, and methodology used to investigate the effect of fiscal policy shocks. Chapter five provides the empirical analysis and discusses the results. Chapter six concludes this paper with the main findings, policy implications, and expanse for further study.[3]

[2]This study is limited because lack of quarterly data on RGDP

[3]Compared to previously conducted study this study investigates the separate effects of disaggregate components of fiscal policy variables in Ethiopia. For instance, Barassa (2015) study only the effect of fiscal policy at aggregate with debt fed back, Abebe (2012) investigates the effect of fiscal policy at aggregate.

Chapter 2

Literature Review

2.1 Theoretical literature review

2.1.1 Definition and basic concept of fiscal policy

Public finance represents the study of the role of government in the economy. A key economic function of public finance, besides the allocation and redistribution function, is to promote economic stability. The stabilization function of public finance represents the systematic and deliberate use of government revenues and expenditures in order to influence economic policy in the direction of various macroeconomic objectives, including high employment, positive and sustainable economic growth, and an appropriate current account on the balance of payments (Blanchard & Galí, 2010).

The key function of public finance is strongly associated with Keynesian economic theory framework which advocates an active stabilization role of government in shaping economic activity. The concept of fiscal policy is advocated by the famous economist Keynes in order to solve the Great depression that happened during 1929 (Snowdon & Vane, 2005).

The failure of old classical thought to solve the great depression raise question among economist on its validity to continue as dominant thought. As a result, another extreme thought was developed by Keynes to overcome the great depression.The idea of Keynes was contradicting with previously dominant neoclassical economic paradigm which relied on the basic assumption that the role of fiscal policy is to preserve a balanced government budget in a state of general equilibrium in economics (Snowdon & Vane, 2005).

The period following great depression which extremely characterized by high unemployment rates and wide spread economic turmoil gave golden opportunity for Keynes' revolutionary ideas (Klamer & Lucas, 1983). Opposite to old classical thought Keynes beliefs that state intervention is the best way to overcome the economic turmoil of 1929 through increasing government spending or reducing taxes as well as it is essential to avoid the loss of effective demand and increasing the level of unemployment during the period of recession when the economy experiences a substantial decline in private consumption and investment. Keynes fundamental assumption is that the use of countercyclical discretionary fiscal policy which focus on state that increase the government spending contribute to the rise of GDP growth and also maintain economic stability with fiscal policy in the long run (De Vroey, Malgrange, et al., 2011).

Furthermore, under these theoretical assumption fiscal policy can be considered as counter cyclical if it is expansionary when change in government expenditure is greater than change in output in the situation of a negative output gap. On the other hand, fiscal policy can be restrictive when change in government spending is less than change in output in the situation of a positive output gap (actual output greater than potential output where the actual growth

of GDP is above potential rate. By the same token, fiscal policy can be considered pro cyclical when the government uses restrictive fiscal policy instrument in situation of negative output gap and when fiscal policy reacts expansionary in the situation of positive output gap (Mencinger & Aristovnik, 2013).

In the 1950s and 1960s fiscal policy was viewed as dominant economic tool for stabilizing the economy. In that period discretionary fiscal policy was widely used instrument for stabilizing an economy. However, in the early 1970s a more pessimistic view took hold partly associated with stricter constraints on the use of fiscal policy as an economic policy tool (Mencinger & Aristovnik, 2013).

The reason for the collapse of the school were the termination of the Bretton Woods monetary system, the frequent oil shocks, and stagflation. These and other economic shocks open the door for the opponents of the Keynesians because their theory unable to adequately explain the occurrence and consequences of those economic events (Mencinger, 2016).

Including old classical which tended to revitalize the classical economic paradigms, and advocate the market economy is capable of achieving macroeconomic stability; as a result the visible hand of government must be prevented from conducting the misguided discretionary fiscal and monetary policies, and also Friedman's hypothesis of permanent income, Muth's formulation of rational expectations (Muth, 1961), Lucas' critique (1972, 1975, 1976) of the Keynesian macroeconomic models and real business cycles models (RBC models), established by Kydland and Prescott (1982) were the key elements of the monetarist and new classical counter-revolution affecting Keynes' economic theory (Snowdon & Vane, 2005; Mencinger, 2016).

In order to overcome the criticism that raised from different direction, the Keynesian economist developed assumption of incorporating price and wage rigidity as well as imperfect competition within the neoclassical theoretical framework. However, this also inefficient due to the Ricardian equivalence proposition which state that deficits and taxes are equivalent in their effect on the consumption (Barro, 1990).

According to the Ricadian theorem, if households are forward-looking and fully aware of the government's intertemporal budget constraint, they will anticipate that a tax cut in the current period, financed by issuing government debt, will be accompanied by higher taxes imposed on them in the future. If the permanent income hypothesis describes the consumption behavior of households, it means that permanent income is unaffected and therefore in the absence of liquidity constraints, consumption will not change. However, all these theoretical consensus was put into question during great recession because they were incapable to stabilize the economic and financial crisis. Consequently, the inability of those policy to solve the crisis pave the way for rebirth of fiscal policy (Akpan, et al ,2015).

Moreover, from a theoretical perspective, there is no single or straightforward answer regarding the sign and magnitude of the impact of discretionary fiscal policy on aggregate demand. Because, it depends on a number of crucially assumptions including the existence of nominal price rigidities, the elasticity of labor supply, the responsiveness of interest rate changes, and the role played by forward looking agents etc (de Castro Fernández & Hernández de Cos, 2006). In order to understand the differences among different theoretical economic ideology review of those economic theories could be of some help.

2.1.2 Keynesianism: activist fiscal policy

The publication of J.M. Keynes books the general theory of employment, interest rate and money in 1936 changed the attitude of the world about the role of government in the economy (Blanchard & Galí, 2010). Keynes work not only signify the start of modern macroeconomics but also it is turning point of fiscal policy revolution which became dominant in influencing economic activities for three consecutive decades.

Before the publication of Keynes books, classical economic theory had argued the ineffectiveness of fiscal policy in playing the stabilizing role in the economy. As to them the main objective of the government is to ensure a balanced budget (DeLong, Summers, Feldstein, & Ramey, 2012). Using their basic assumption that say an increase in government spending is fully offset by a reduction in private consumption of the same amount. So, the government spending has no effect on economic activity.

Therefore, classical economists conclude that government intervention through fiscal policy is unnecessary or even can be harmful hence they consider that recession is only temporary as a result economic activity return to its full employment without any deliberate intervention of government (Mencinger, 2016).

Unlike classical economist Keynes formally rejected the assumption that the economy naturally returns to its full employment without the visible hand of government and he advocated that the government should actively intervene to assist the economy to return to its full employment. He also challenged the say's law because it does not always apply in short run hence during recession the economy faces a substantial drop in consumer and business confidence which then limits effective demand (Keynes, 1936).

According to Keynesian conceptual framework for the use of fiscal policy is to influence the level of aggregate demand whereas the concern of classical is about the solvency of public finance. Keynes analyses focused on the flows of public receipts and expenditures in the determination of macroeconomic equilibrium. To do this Keynesian assumes price rigidity or at least stickiness in short run. This implies that prices do not adjust immediately to ensure macroeconomic balance in other words the supply of goods and service is elastic and macroeconomic balance is determined by the level of aggregate demand (Bénassy-Quéré, Coeuré, & Jacquet, 2010).

However, until the publication of Hicks (1937) understanding the central message of Keynes is difficult later john hicks narrate the ideas of Keynes work using IS-LM framework which became the central methodological tool of Keynesian macroeconomics and to large extent still represents the essential building block for analysis of the economy in the short run (Blanchard & Galí, 2010).

2.1.3 New classical theory: challenging fiscal policy

The IS-LM framework was dominant tool for more than two decades after WWII. However, at the end of the 1960s this dominance was questioned by many economists who emphasized the requirements for introducing microeconomic fundamentals principles and rational expectation into the macroeconomic Keynesian model also known as Lucas critique which open the door for collapse of Keynesian economists and pave the way for the rise of new classical economic theory (De Vroey et al., 2011).

The new classical economic theory basically derived from the monetarist with more sophis-

ticated methodological approach and theoretical notion regarding the perspective about the effectiveness of macroeconomic stabilization policies. In contrast to the Keynesian view which emphasize on the inherent imperfection in the market and the use of interventionist policies to stabilize the economy, the new classical theory ignores the market imperfection and interventionist policies rather they suggest self-correcting mechanism of market for economic stabilization (Mencinger, 2016).

The criticism of Friedman on Keynesian theory resulted in the start of new classical theoretical revolution. Friedman not only disprove the Keynesian consumption function that argues consumption depends on current income but also discover another theory that states consumption is not only determined by the current income rather consumption is determined by the income that is obtained over life time span of individual. As a result, Friedman formulated the permanent income hypothesis which states that the expected average income of individual is determined by an individual real wealth.

According to the permanent income hypothesis the consumption of individual is driven by the change in permanent income than by a change in their current or temporary income. This makes consumer to have a stable consumption pattern over life span. Which means change in current income has little effect on the individual current consumption since the change in the level of permanent income is relatively small or even negligible. Consequently, this reduce the effectiveness of fiscal policy in playing the role of stabilization because fiscal policy measure only temporarily increases in the income of consumer in order to influence the aggregate consumption of household (Screpanti & Zamagni, 2005).

Moreover, the Keynesian assumption of stable relation between inflation and unemployment criticized by Friedman by claiming that a stable relationship between inflation and unemployment is only valid in the short term where as in the long term the unemployment rate cannot be reduced and sustained below its natural level by a monetary expansion policy since the long-term Philips curve is vertical at the natural rate of unemployment. Hence monetary policy does not have inflationary impact unless unanticipated (De Vroey et al., 2011)

Most new classical models are based on the ricardian equivalence proposition which assumes economic agents are forward looking and fully internalize the government budget constraints when deciding about their aggregate demand level of consumption (Blinder, 2004). Because of the forward looking behavior of household the government decision about spending does not affect the consumer choice of consumption. This leads to deficit financing spending is equivalent to government spending through tax (Mencinger, 2016).

Further, the ricardian equivalence proposition states that deficits and taxes are equivalent in their effect on consumption (Barro, 1990) . As of recardian, consumer is endowed with perfect foresight as a result change in lump sum taxes have no effect on consumer spending hence reduction in taxes leads to an equivalent increase in saving. However, there is no available evidence for both developing and industrial countries that provide support for the ricardain equivalence hypothesis. The reason is that the conditions required for Ricardian equivalence to hold are the existence of effectively infinite planning horizons, certainty about future tax burdens, perfect capital markets (or the absence of borrowing constraints), rational expectations, and no distortionary taxes (Romer, 2000).

In developing countries where financial systems are underdeveloped, capital markets are highly distorted or subject to financial repression, and private agents are subject to considerable uncertainty regarding the incidence of taxes, many of the considerations necessary for debt neutrality to hold are unlikely to be valid (Agénor & Montiel, 2015).

As a result of the futility of the effect of fiscal and monetary policy the real business cycle (RBC) was developed. RBC, incontrast to Keynesian theory implies that fiscal policy at a time of recession is harmless or entirely impotent due to the complete crowding-out effect on private investments associated with changes in government consumption (Kydland & Prescott, 1982).

Further, the new classical theory rejects the neoclassical synthesis based on the assumption of rational expectation and the walrasian general equilibrium theory. However, unlike Keynesian theory new classical theory incorporate supply side policies and recommends the micro founded models for policy analysis. The conceptual amendment of new classical theory opens the door for development of new Keynesian which revitalize the basic tenets of old Keynesian theory including the possibility of involuntary unemployment, the real effect of fiscal and monetary policy shock on the economic activities (De Vroey et al., 2011)

2.1.4 Post-recession economic theory concerning fiscal policy

The great recession of 2008 indicates the revival of the Keynesian hence in the aftermath of the financial and economic crisis the proponents of Keynesian theory advocated the adoption of inclusive countercyclical fiscal stimulus measure to respond the substantial drop in aggregate demand. On the other hand, the advocates of contemporary mainstream economics rejected the use of fiscal stimulus measures to stimulate economic activity during a period of crisis. This revived disagreement and controversy regarding the appropriate remedy for disturbances in the economy was reflected in the diverse introduction of fiscal measures among countries since policymakers at the start of the crisis were uncertain how to proceed. However, the political urgency to intervene saw the theoretical concerns being left to one side and consequently turned into the conception of relatively coordinated responses among countries to counteract the crisis and stimulate economic activity (Eggertsson, 2011; Farrell & Quiggin, 2011).

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 slightly, the global crisis has also refocused interest in fiscal policy as an instrument for longer-term growth and development. The 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 & Canuto, 2012).

2.1.5 The effects of fiscal policy on output growth

Fiscal policy can play an important role in influencing economic growth. For instance, counter cyclical fiscal expansion can influence aggregate demand and growth during cyclical downturns. On the other side, the contractionary fiscal policy can cool down when an economy is at peak and save the economy from the risk of overheating. Using taxes and government spending to smooth business cycle has long history in industrialized economies. Similarly, fiscal policy can contribute to bring medium and long term economic growth. This is particularly, true in developing economies where the private sector is relatively weak and underdeveloped. Public spending on physical infrastructure affects the productivity of all firms and industries, and the entire economy. Likewise, public spending on education fosters human capital, a vital compo-

nent to long-term growth. Taxes can harm growth because they distort economic incentives and behavior. But generally, different taxes vary in the extent of their distortionary impacts (Arnelyn, Gemma, Minsoo, & Donghyun, 2014).

The size of government revenue and expenditure indicates the rate of government's intervention in the private sector's actions. Government can intervene into the economy through different ways like by collecting taxes, giving subsidies and social benefits, making public investments etc. By doing so the government can affect the private sectors action thereby it can affect the performance of the macroeconomic variables as a whole. Here, not only the size of government intervention affects the performance of macroeconomic variables but also the components the fiscal policy variables have a powerful effect on the economic growth of the nation (Kukk et al., 2007).

Furthermore, up to current date, there is no consistent theory developed on the impact of government spending on economic growth, to be governed by. For instance, Classical economists recommend lower government spending. Keynesian economists, on the other hand, emphasized government spending as an incentive to a stagnant economy. Others, such as Barro (1990) explain the role of government spending by disaggregating it into productive and unproductive in which productive government spending enhances economic growth while unproductive government spending retards it.

On the theoretical perspective public spending plays an important role in economic activities. On the other hand, lower government spending implies requirement of lower tax to balance the budget, this will stimulate the economy and employment by increasing saving level. Nevertheless, efficient management of fiscal variables lead the economy to eliminate or at least reduce the possibility that fiscal policy itself is a source of macroeconomic instability. Therefore, public expenditure should be redirected towards increasing the importance of fiscal and human capital accumulation. So as to manage efficient level of government size and volatility of fiscal variables, identification of which components of government revenue and spending are most detrimental to growth is important. In fact, understanding the channel through which fiscal policy affects growth can help us to understand how to redirect public spending and revenue, and which components should be limited (António & Davide, 2008).

Patterns of government financing also matter to economic growth. Taxes that distort incentives for productive investment or employment can impede growth, such effect might happen when governance is weak. In contrast, taxes that create fewer economic distortions, such as taxes on consumption, are less likely to have a negative effect on growth. Higher indirect taxes may even be associated with faster growth if the benefits of increasing expenditures outweigh the effects of increased taxation —and this is most likely to happen in countries where strong governance leads to growth-enhancing public spending. In sum, higher taxes are most likely to be harmful to growth when their design is distortionary and in settings where overall governance is weak (Gray, Lane, & Varoudakis, 2007).

2.1.6 The effect of fiscal policy in developing countries

Using fiscal policy in developing countries is more effective than monetary policy. The reason behind is that in developing countries especially for sub Saharan countries there is lack of instruments to apply monetary policy. The International Monetary Fund places great importance on monetary policy in its program for developing countries in Sub Saharan Africa. It regards such policy as crucial to holding down inflation and stabilizing the real exchange rate. But such

an approach is absurdly inappropriate since the vast majority of governments of sub-Saharan countries lack the instruments to make monetary policy effective (Weeks, 2010).

According to, Weeks (2010) in most sub-Saharan countries the demand by commercial banks for bonds does not readily respond to changes in the interest rate. One reason is that there is little competitiveness in domestic bond markets and another is that the bonds of African governments have extremely low credit ratings from Standard and Poor's or Moody's—if they are rated at all. Thus, the ineffectiveness of monetary policy because of lack of instrument open the door for fiscal policy to stabilize the economy.

However, fiscal policy implementation in any country is subject to a number of constraints. They arise from difficulties in, among other things, real time forecasting of downturns and recoveries; strategic considerations that lead to overambitious fiscal targets; lengthy budget procedures; and political pressure to overspend or under tax (Lledo & Poplawski-Ribeiro, 2011). Particularly, Fiscal policy implementation is challenging in sub-Saharan Africa (SSA). In that region, additional constraints include poor data quality, weaknesses in forecasting capacity, large and frequent macroeconomic shocks, inadequate budget institutions, dependency from volatile and unpredictable aid flows, slow project execution, and less stable political systems. Such factors have often been identified as reasons fiscal policies in SSA have tended to be more pro cyclical than elsewhere (Lledo & Poplawski-Ribeiro, 2011).

Despite the aforementioned limitations of fiscal policies in developing countries still public authorities are using it in order to stabilize macroeconomic fluctuations. According to Carmignani (2010)(Carmignani, 2010) finding fiscal policy in developing countries has remained invariably procyclical since 1960s. However, the recent IMF Regional Economic Outlook report in April 2010 (dedicated to Sub-Saharan African economies) calls into question these results. It has been found during the 2010 global economic crisis that low income countries had adopted counter-cyclical fiscal policies.

According to, Mountford and Uhlig (2009) countries will need to consider their options for fiscal policy responses. Countries with output gaps and sustainable debt and financing options have scope to implement expansionary fiscal policies, by letting automatic stabilizers work, accommodating declines in commodity-related revenues, and in some cases implementing discretionary fiscal stimulus.

2.1.7 Transmission channel of fiscal policy

Although the objective of macroeconomic policy is to encourage economic growth it also includes the broader measures of income, or even expand the focus to growth in all-inclusive measure of wealth, poverty reduction, social inclusion and equity have complex links to growth. For realization of those macroeconomic objectives there must be a clear rationale for public intervention than relying on private markets (Ostrom, 1990).

The traditional threefold rationale for fiscal policy proposed by Musgrave et al. (1959) is still useful: fiscal policy should aim to promote macroeconomic stabilization, improve resource allocation, and address distributional disparities. The stabilization rationale of public action has both short run and long run aspects. The short run aspects focus to avoid excessive cyclical unemployment and inflationary pressure that resulted from using of countercyclical policy to offset the effect of macroeconomic shocks that create large or persistent gaps between aggregate demand and potential output. On the other side long run aspect of rationale for

stabilization is about sustainability of fiscal deficit and public debt, thereby public finance do not themselves 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 (Brahmbhatt & Canuto, 2012).

For understanding of transmission of fiscal policy to affect the macroeconomic variables this study links the fiscal policy variables with that of macroeconomic variables using Keynesian framework. In the standard Keynesian macroeconomic model, fiscal policy fosters private sector investment by sustaining or increasing domestic demand. The positive effect on growth of fiscal expansions can be partially or entirely offset by adverse effects of deficit financing on investment through higher interest rate, inflationary pressures, and external sector instability. The decline in private investment following fiscal expansions often referred to as crowding out effect. Conversely, deficit reductions or fiscal contractions can increase investment, and thereby increase growth. This in general requires that deficit reductions occur through lower current government expenditure rather than through tax increases or reduced public investment (Hallett, Strauch, & Von Hagen, 2002).

However, such transmissions of fiscal policy not directly applicable or effective in developing country like Ethiopia without modification. Therefore, in order to understand the economic events in low income countries, most of their components must be changed or modified so that the model captures some salient features of low income economies. Consequently, in order to show the role of public intervention for the achievement of development objectives in developing countries considering the constraints are the corner stone for the efficiency of fiscal policy. It can be illustrated using simple framework as follows.

2.2 Empirical literature review

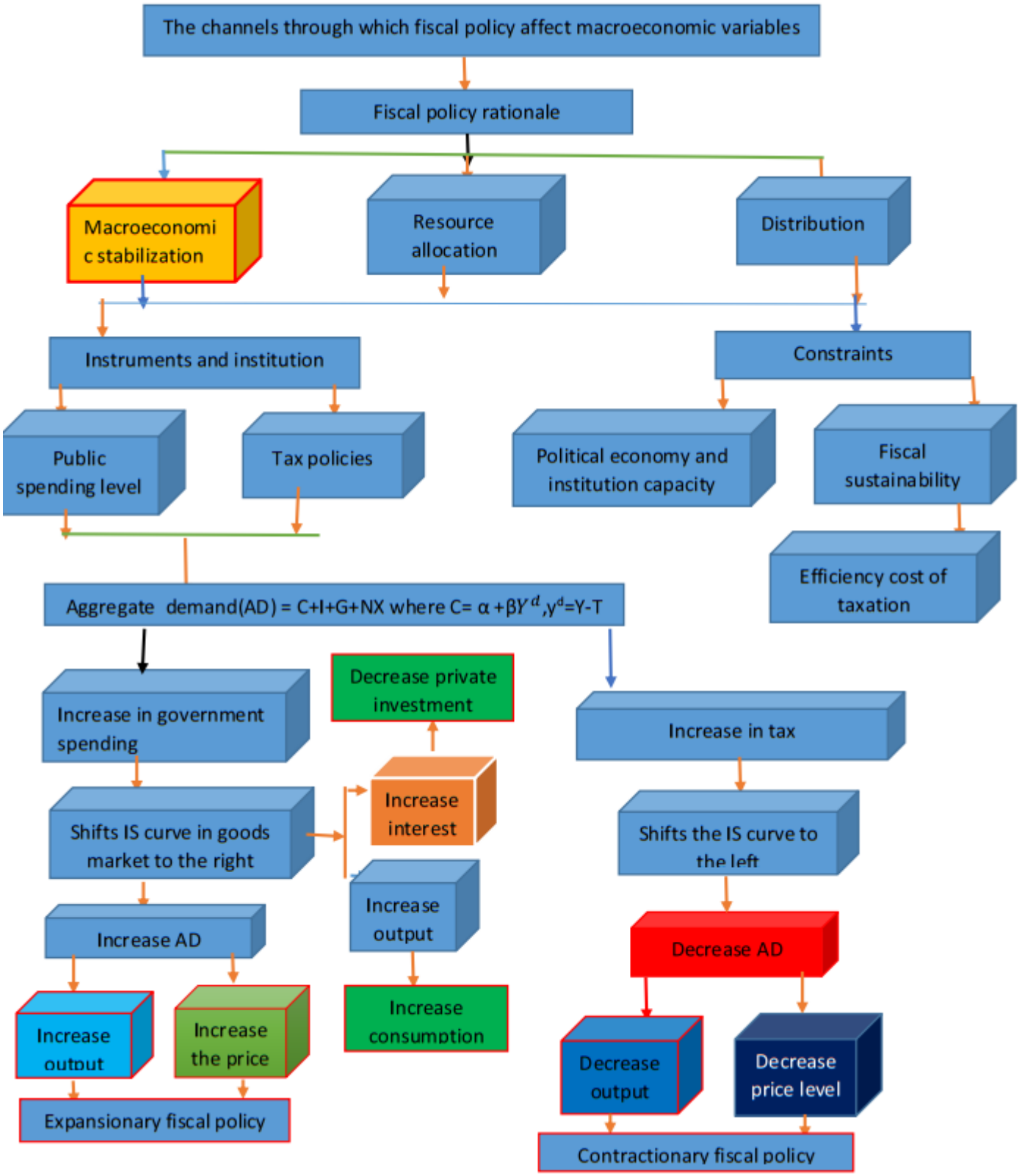
This section presents the review of empirical literatures on studies related to the theme of this study carried out across countries. The section begins by first presenting a review of cross country empirical literatures before narrowing it down to the Ethiopian context. At the end of the section, a summary of major findings from the empirical literature review is presented. Under this topic the researcher is going to review the empirical literature in two ways one based on the effect of fiscal policy shock on macroeconomic variable, the second is based on the econometric model and the type of data used.

2.2.1 Cross country empirical literature

The international evidence on the effects of fiscal policy shock on macroeconomic variables were mixed. For instance, Mountford & Uhlig (2009) find that a net-revenue shock has a negligible effect on prices and no significant results on output in the US when controlling for the business cycle and for monetary policy shocks, while Canzoneri, Cumby, Diba, et al. (2002) find the inflation response to a net-tax increase is negative, although very small, after an initial minor positive effect.

Marcellino (2006) reports non-significant effects on inflation of positive tax shocks in France, Germany and Spain, while inflation significantly increases in Italy in the short run. Perotti (2005) finds that, especially in the post-1980 period, the impact of a tax shock on prices is

Figure 2.1: Channels of fiscal policy to affect macroeconomic variables



Source: Own construction based on Keynesian framework

very small, typically negative or zero, while after three years there is evidence of a positive effect in UK and Australia, although only in the latter the effect is large. Whereas the effects of positive net tax shock on output varies widely depending on the country and the length of period considered.

Conversely, Giuliodori and Beetsma (2005) finding shows largely non-significant inflation responses to net-tax shocks and they report negative output response to a positive tax shock only in Germany, while non-significant in France and Italy. Finally, Beetsma, Giuliodori, and Klaassen (2006) discover negative output response in the EU. In theory it could be expected that a positive shock to net taxes increase government saving in short term, thereby putting downward pressure on interest rates. However, the empirical evidence is unclear in this respect.

In addition, other study carried out to examine the empirical relationship between fiscal policy and economic growth in developing Asian countries. This study signifies that compared to developed economies, the region's overall level of taxes and government spending have significant effect on economic growth whereas property taxes were found to exert more impact on economic growth than direct taxes (Arnelyn et al., 2014).

Another study conducted by Ravnik and Žilic (2011) on the dynamic effects of fiscal policy shocks in Croatia investigating the impact of fiscal policy shocks on economic activity (using industrial production as proxy variable for output price levels and short term interest rates. The outcome of the study reveals that the response of interest rate to fiscal shock was strong while the response of inflation to fiscal policy were weak. But the response of inflation to shock in government revenue was strong and the response of interest rate was weak. By the same token, a shock in government expenditure led to a reduction in industrial production whereas a shock in government revenue resulted in an increase in output.

After WWII Blanchard and Perotti (2002) explored the dynamic effect of fiscal policy shock on economic activity of U.S by employing SVAR approach and quarterly time series data that run from 1947Q1 to 1997Q4. The finding of the study shows that positive shock in government spending result in a positive effect on output but positive shock in revenue negatively affect output. Consequently, the effect of positive innovations in government spending and government revenue were explored to crowd out private investment. The main limit of their study was that they do not give any explanation or channel of transmission to explain the impulse responses of American economy to a fiscal shock. Even if some other studies are applied to the USA, the comparison with(Blanchard & Perotti, 2002) will be confined to the "statistical" outcomes and to the identification method used.

W. Kim (2006), following the SVAR approach of Blanchard and Perotti (2002), using quarterly data based on the monthly statistical survey of the Bank of Korea from 1970 to 2000, found that government spending shocks have a positive effect on GDP and tax shocks have a negative effect, which is similar to Blanchard and Perotti (2002) finding. He also suggests that tax cuts are more effective way than government spending increases to stimulate the economy.

Hur (2007) estimates the effects of fiscal policy with quarterly data using the SVAR approach and extends the three-variable model to four variables by adding the real effective exchange rate as a proxy for external shocks. He suggests that the size and significance of the estimated fiscal multipliers in Korea are small and the effects of fiscal policy disperse very fast.

Furthermore, Kofi Ocran (2011) analyzed the impact of fiscal policy variables on economic growth in south Africa by using VAR model and quarterly time series data starting from 1990 to 2004. The investigation of his study shows that government consumption expenditures and

gross capital formation have a positive effect on economic growth but the government consumption expenditures impact on economic growth offset the effect of gross capital formation. In addition, positive shocks to tax receipts had a positive effect on economic growth although the size of the budget deficit was found not to have a significant impact on growth outcomes.

Studies on fiscal policy shocks in developing countries are relatively scarce. Papers focusing on fiscal policy in developing countries usually follow (Favero & Giavazzi, 2009). These studies are interesting with regard to the effects of fiscal policy based on the initial situation of the fiscal balance, the initial debt level and the composition of the fiscal measure considered.

Additionally, another study conducted in Lesotho on the macroeconomic effect of fiscal policy shocks on output gap, consumer price index, private and public gross fixed capital formation and the interest spread using SVAR and annual time series data from 1982 to 2015. The main result of his study shows that a positive shock to government expenditures leads to a significant positive response in inflation. However, the effect on all other variable included in the model is insignificant. A positive shock to government revenue has no impact on the output gap and the interest rate spread but results in an increase in consumer price index, government expenditure as well as public and private gross fixed capital formation (Amane, et al, 2016).

Another study conducted in Nigeria investigate the effects of fiscal policy shocks on output and unemployment under Keynesian framework by employing the SVAR methodology using annual time series data spanning from 1981-2015. The result of the study reveals that shock in public expenditure have a positive long lasting effect on output. Revenue shock was found to exert a positive effect but lower than the effect of public expenditure on output. However, the effect of revenue shock on unemployment was found to be negative but short lived (Abubakar, 2016).

2.2.2 The effect of fiscal policy on output: empirical evidence

The positive shock of government spending had significant effect on output as most of empirical evidence shows.For instance,(Blanchard & Perotti, 2002; Burriel et al., 2009) for US and (de Castro Fernández & Hernández de Cos, 2006) for Spain; (Tenhofen, Wolff, & Heppke-Falk, 2010) and Perotti for Austria, Italy, Germany and for OCED countries using SVAR method and employing different period of data sets and found that the positive shocks in government spending had expansionary effect on output. Here, the magnitude of response was different.

Most studies found that output positively responded to an increase in total government spending. Moreover, the responses depended on the type of spending. For instance, in US (Burriel et al., 2009) and (Daude, Melguizo, & Neut, 2010) found that a positive shock of capital spending increased output more than a positive shock of current spending. In contrast to this finding (de Castro Fernández, 2003) and (de Castro Fernández & Hernández de Cos, 2006) found that an increase in current spending increased output more than capital spending.

Further, the structure of the economy determines the response of output to shocks in total government spending and its components that is current spending and capital spending. Because, in US the shock in capital spending had increased output more than the shock in current spending as of (Burriel et al., 2009). On the other side in Spain the shock in current spending had increased output more than the shock in capital spending as of (de Castro Fernández & Hernández de Cos, 2006).

2.2.3 Effects of total tax shocks and its components on output

Most studies have found negative responses to positive total tax shocks. For instance, for US (Blanchard & Perotti, 2002; Burriel et al., 2009; Canzoneri, Cumby, Diba, et al., 2002) all of them found that an increase in total tax decreased output. Moreover, (de Castro Fernández, 2003), and (de Castro Fernández & Hernández de Cos, 2006) using data from Spain found that an increase in total tax revenue had a delayed negative effect on output. Furthermore, (Burriel et al., 2009) with Euro areas data, (Ramos & Roca-Sagales, 2008) with UK data, (Kuttner & Posen, 2002) with Japanese data, found that output responded negatively to a positive total tax shocks.

Some studies have considered the effect of taxation by type. For example, (Arin, Koray, et al., 2005), using VAR with long run restrictions for the U.S economy, found that an increase in total tax, corporate income tax, indirect tax had significantly negative effect on output but increase in personal income tax had positive effect on output.

Additionally, Arin et al. (2005) for Canada using SVAR and dividing tax into four categories. Accordingly, they found that the increase in personal income tax, social security tax, indirect tax statistically and significantly decreased output, an increase in corporate income tax increased output. They reasoned that an increase in corporate income tax led firms to shift from equity to bond financing, interest payment was tax deductible.

(de Castro Fernández & Hernández de Cos, 2006) de Castro Fernández and Hernández de Cos (2006) investigated the effect of taxation by dividing taxes into direct and indirect. Employing data from Spain they found the effect of direct tax shock had delayed negative effect on output that is the response of output became negative after eighth quarter. Nevertheless, they discovered indirect taxes had a negative though insignificant impact on output.

2.2.4 The effect of fiscal policy shocks on interest rate

The effect of changes in government spending on interest rates has never been consistent. For instance, some studies found positive effect interest rate from change in government spending. Fatás and Mihov (2003) using VAR with Cholesky decomposition from 1960:1 to 2005:4, found that the positive response of interest rates to an increase in total government spending remained statistically significant for two quarters.

Caldara and Kamps (2008) discovered a significantly positive response of interest rates to an increase in total government spending until the fourth quarter. Additionally, (Burriel et al., 2009) found that an increase in capital spending had a significantly positive effect on interest rates for two quarters for US using SVAR method.

The effect of tax shocks on interest rates studied similar to government spending shocks. For instance, Burriel et al. (2009); Favero and Giavazzi (2009); Arin et al. (2005); Canzoneri et al. (2002) for US found the effect of tax shocks on interest rate, so that they discovered positive shocks in total tax has positive effect using SVAR method. However, the magnitude of the response was different across the study.

2.2.5 Effects of fiscal policy on prices

Fatás and Mihov (2003), using VAR with Cholesky decomposition found that prices responded negatively from the positive shock of total government spending for US. Consequently, Burriel et al. (2009) Using SVAR in the Euro areas found that the shock in current spending and capital spending had positive effect on inflation.

de Castro Fernández (2003); de Castro Fernández and Hernández de Cos (2006) using SVAR approach for Spain discovered positive effect of total government spending on prices. Moreover, Giordano et al (2007) using SVAR method found significant positive effect from an increase in total government spending on inflation. Also they investigated the effect of capital spending and current spending obtained significant positive effect.

2.2.6 Effects of tax and tax components shocks on inflation

The positive shocks in tax had negative effect on inflation. For instance, for US (Canzoneri et al., 2002; Burriel et al., 2009; de Castro Fernández, 2003) for Spain founded that inflation responded negatively to positive tax shocks. Other studies investigated the effect of tax shocks by dividing into components. For example, Arin et al. (2005) using SVAR method found inflation would fall as a result of increase in personal income tax, indirect tax and social security tax in Canada. However, increase in corporate income tax had positive effect on inflation.

There are few number of study in Ethiopia concerning the effect of fiscal policy on macroeconomic variables using SVAR approach. For instance, the study by Mathewos (2015) investigates the macroeconomic effects of fiscal policy shocks in Ethiopia employing SVAR model and using quarterly data that run from 1999Q1 to 2013Q4. The model used in this study is built on the recent popular identification approach and also include the effect of debt feedback rule. The study also discussed the dynamic responses of output, inflation, cost of debt and nominal exchange rate to the government expenditure and revenue shocks. Consequently, the 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 for Ethiopia. Besides, shocks in government spending have an expansionary effect on output; lead to quick rise in prices; produce small varied effect on cost of debt; deteriorate nominal exchange rate in the long run and make debt to GDP ratio increase.

Another study that empirically characterize the dynamic effects of net government spending, net tax revenue including the components of government spending on key macroeconomic variables conducted by(Asfaw, 2012) using quarterly data spanning from 1998/99Q1 to 2010/11Q4 and SVAR models and employed the Blanchard and Perotti (2002) approach in order to identify the structural innovations. He estimated impulse responses and variance decomposition to trace out the dynamic effects and unveil the relative importance of shocks in explaining the endogenous variable in the models. The outcome of his study reveal that government expenditure shocks are expansionary and have inflationary impact at least in the short term. On the other hand, tax shocks have positive effect on output through increasing expenditures but have little effect on inflation.

The last but not least study conducted by Gemechu (2017) investigate the macroeconomic effects of fiscal policy shocks in Ethiopia by employing a Bayesian auto Regression model and using quarterly data running from 2000/01Q1 to 2015/16Q4. The study examined the dynamic response of output, inflation, interest rate and exchange rate to fiscal policy shocks.

The result of the study shows that government spending shock had positive impact on output and inflation but the magnitude of the effect was very small. The instant response of the interest rate to government spending shock was negative but ended with small positive effect and the nominal exchange rate showed deterioration. On the other hand, government revenue shocks had positive effect on real GDP and exchange rate but the response was negative to shocks. The inflation response to the net tax was medium and negative where as its effect on interest rate was positive and permanent. Moreover, positive shock to recurrent expenditure had a persistent positive impact on real output and had no inflationary impact. The recurrent expenditure shock rise interest rate slightly in short run and exchange rate response to recurrent expenditure shock was small and negative. In opposite the shock of capital expenditure was insignificant on output.

Further few studies conducted in Ethiopia investigates the effects of fiscal policy shock on macroeconomic variables employing different time period and econometric approach. Asfaw (2012) reports a positive shock of net tax revenue have positive impact on output and little effect on inflation. Mathewos (2015) found a positive shock in net tax revenue have small positive effect on output and negative effect on inflation. Finally, Gemechu (2017) find the government revenue shock has positive effect on output and negative effect on inflation. The result on the effect of output as a result of tax revenue shock by aforementioned researchers are similar. But the effect of tax revenue shock on inflation shows different result.

In summary the empirical literature shows most of the studies conducted by other countries and Ethiopia investigate the effect of fiscal policy on macroeconomic variable using aggregate fiscal policy variables. However fiscal policy variables have different components so that investigating the effects of Fiscal policy at aggregate level does not show the separate impact of each components of fiscal policy variables on macroeconomic variables. As a result, it is difficult for policy maker to understand which fiscal policy variable is affecting the economy the most compared to other variables. Consequently, this study contributes by investigating the dynamic effect of fiscal policy shock on macroeconomic variables by disaggregating the fiscal policy variables into their components and provide some empirical evidence on the components of government expenditure and tax revenue. By the same token this paper also fills the gap left unfilled by previous paper conducted in Ethiopia concerning the effect of fiscal policy. [1]

[1]The empirical study on the effect of fiscal policy variables on macroeconomic variables shows controversial result

Chapter 3

Fiscal policy in Ethiopia

3.1 Overall Economic Performance of Ethiopia

The World Bank published a biannual Global Outlook in 2017 which indicates that three Sub-Saharan African countries (Ethiopia, Ghana and Côte d'Ivoire) are in the top five countries of the world's fastest-growing economies. Similarly, to other LDCs, Ethiopia's growth performance was unsteady and low during the 1980s. By the end of the 1990s, Ethiopia, the second most populous country in Sub-Saharan Africa, was considered to be one of the poorest countries in the world but now stands out as one of the few countries in Africa to have achieved accelerated and sustainable economic growth in the 21st century. Since 2004, Ethiopia's remarkable average annual economic growth has been estimated at 10.6%, which outperforms that of China, which is estimated at 10.2%. Ethiopia's growth is approximately double the regional average and is becoming one of the world's fastest growing economies (World Economic Outlook, 2017).

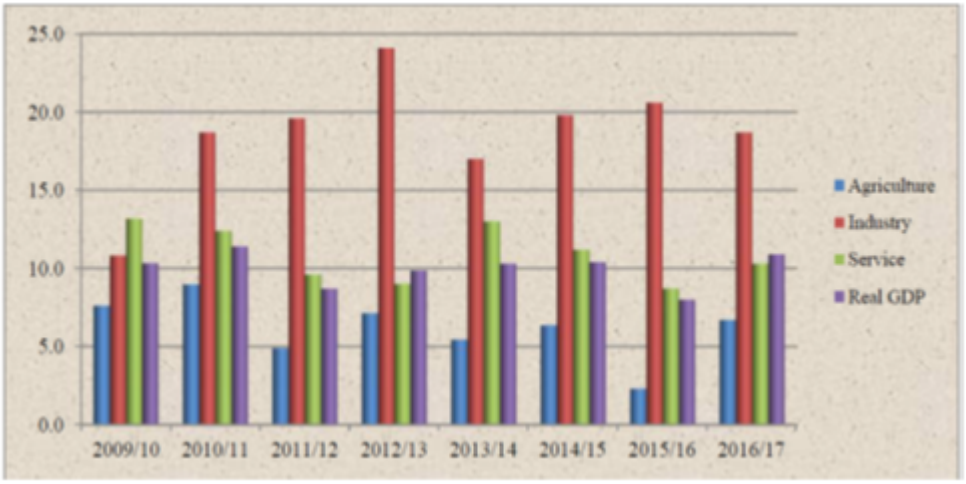
The Ethiopian economy has recovered from the El Niño induced drought and regained its growth trajectory in 2016/17, registering a 10.9 percent expansion compared to 8 percent in 2015/16. This was made possible as a result of 18.6 percent growth in industrial output, 10.3 percent rise in service sector and 6.7 percent expansion in agriculture. Accordingly, the share of industry in GDP rose sharply to 25 percent in 2016/17 from 16.7 percent while that of agriculture largely remained at around 36 percent. In contrast, the share of service sector dropped to 39 percent from 47.3 percent a year ago. This gradual but steady shift in the structure of the economy reflects the government's policy of developing manufacturing sector and promoting export-led growth while continuing to give due attention to modernizing the agriculture sector which has dominated for long the country's economic base (NBE, 2017).

Ethiopia's Economy experienced strong broad based growth averaging 10.3% a year from 2006/07 to 2016/17, compared to a regional average of 5.4%. Ethiopia's gross domestic product (GDP) is estimated to have rebounded to 10.9% in 2017. Agriculture, construction and services accounted for most of the growth with modest contribution from the manufacturing sector.

Despite the recent uptick, inflation has been kept within single digit level largely aided by tight monetary and prudent fiscal policy stance. Accordingly, the annual average headline inflation slowed down to 7.2% in 2016/17 from 9.7% registered in the preceding year primarily due to the decline in both food & non-alcoholic beverages inflation and nonfood inflation. Annual headline inflation however, rose to 8.8 percent from 7.5% as food inflation increased by 4 percentage point despite 1.8 percentage point drop in non-food inflation.

Fiscal policy has been geared towards increasing tax revenue through strengthening tax administration and enforcement, while covering a greater proportion of government expenditures from domestic resources. These government expenditures have largely focused on growth enhancing capital expenditure and pro-poor social spending programs and promoting safety nets. Thus, domestic revenue registered 11.3 percent annual growth while general government expenditure

Figure 3.1: Real GDP growth by major sectors



Source: Taken from National Planing Commision Annual report

increased by 20.6 percent resulting in the budget deficit equivalent to 3.3 percent of GDP, compared to 3.5 percent of GDP target (NBE, 2017).

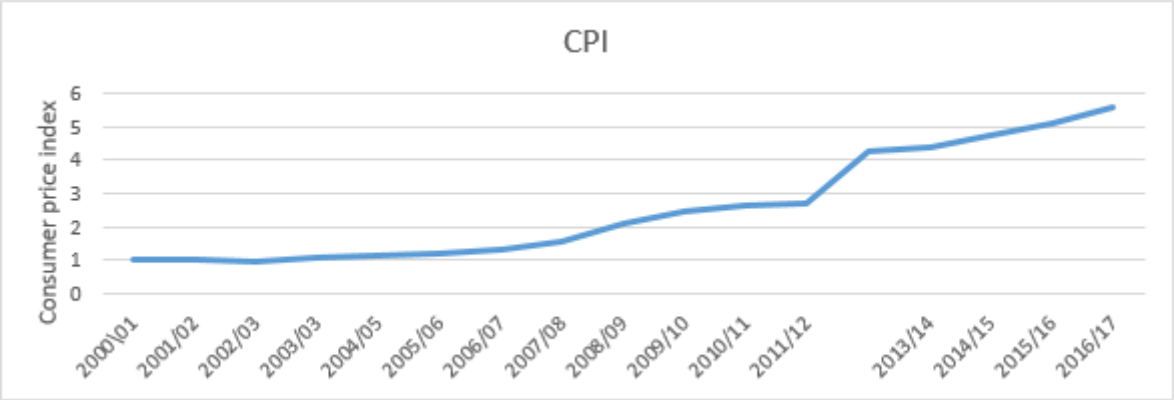
3.2 Economic Growth

The Ethiopian economy which had exhibited 9.9 percent average annual growth during 2012/13-2016/17, registered 10.9 percent growth in 2016/17, depicting recovery from challenging macroeconomic and weather conditions of the previous year. The registered growth rate in real GDP was 0.2 percentage point lower than base case scenario GTPII target set for the fiscal year although it was significantly higher than 2.6 percent average growth estimated for Sub-Saharan Africa (World Economic Outlook [WEO], 2017).

The growth in real GDP was mainly attributed to 10.3 percent growth in services, 6.7 percent in agriculture and 18.7 percent in industrial sectors. Nominal GDP per capita rose to USD 863 depicting 7.8 percent improvement over the previous year. The Ethiopian economy is projected to grow 11.1 percent in 2017/18 in contrast to IMF's forecast of 3.7 percent growth for the world and 3.4 percent for Sub-Saharan Africa (SSA) (WEO, 2017).

In 2016/17, the agricultural sector exhibited 6.7 percent growth rate which showed recovery from El-Nino effect of the previous year which merely saw 2.3 percent expansion. Yet, it was 1.3 percentage point lower than the 8 percent target for the year. Total grain production during the fiscal year reached 290.4 million quintals, of which cereal production accounted for 87.4 percent, pulses 9.7 percent and oil seeds 2.9 percent. Cereals production went up by 9.8 percent over the preceding year owing to 2.5 percent expansion in cultivated land area and improvement in productivity. Similarly, production of pulses and oilseeds improved by 1.6 and 6.9 percent though cultivated land area shrank by 6.2 and 6.3 percent, respectively during the same period.

Figure 3.2: Trends of inflation in Ethiopia



Source: Own computation using data from NBE

3.3 Inflation

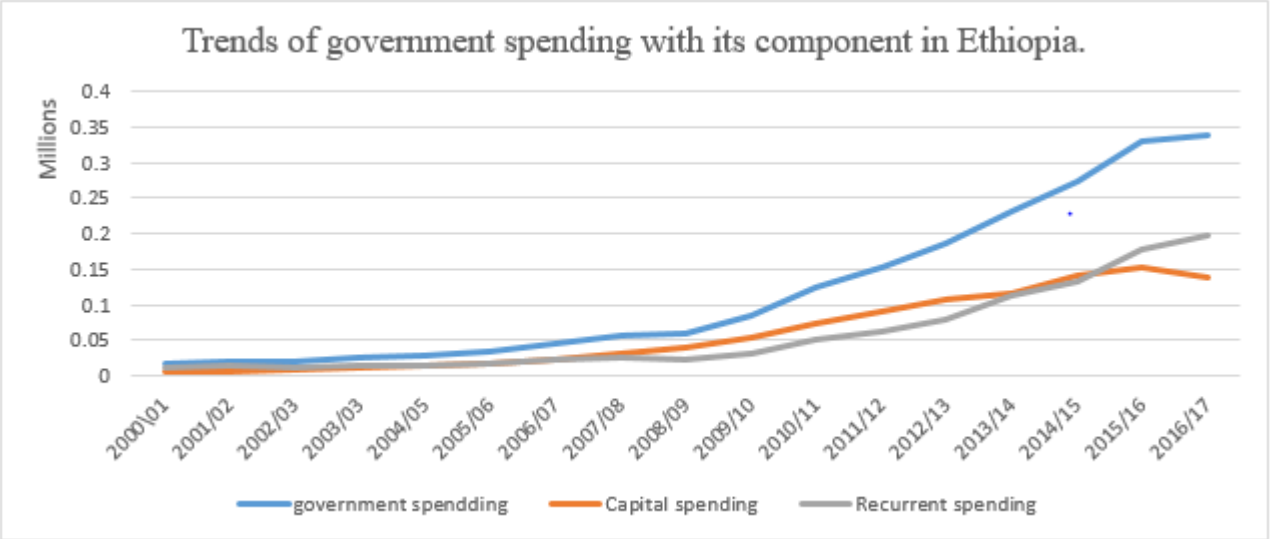
Inflation surpassed single digit since September 2017. In April 2018, annual general price level increased by 13.7 percent, food prices by 16.1 percent and prices of non-food items by 10.8 percent. Figure 3.2 depicts trends in general, food and nonfood inflation since 2000/01 until 2016/17. There is an obvious upward pressure on inflation after the devaluation of the birr by 15 percent in October 2017, but the magnitude was not very high which could be attributed to the monetary tightening that paralleled the devaluation. In 2017, inflation rate for Ethiopia's was 9.9 %. Though Ethiopia inflation rate fluctuated substantially in recent years, it tended to increase through 2000/01 - 2016/17 period ending at 9.9 % in 2017.

3.4 The trends of government finance in Ethiopia

Government (public) expenditures are generally categorized into expenditures on administration, defense, internal securities, health, education, foreign affairs, etc. and has both capital and recurrent components. Capital expenditure refers to the amount spent in the acquisition of fixed (productive) assets (whose useful life extends beyond the accounting or fiscal year), as well as expenditure incurred in the upgrade/improvement of existing fixed assets such as lands, building, roads, machines and equipment, etc., including intangible assets. Expenditure in research also falls within this component of government expenditure. Capital expenditure is usually seen as expenditure creating future benefits, as there could be some lags between when it is incurred and when it takes effect on the economy.

Recurrent expenditure on the other hand refers to expenditure on purchase of goods and services, wages and salaries, operations as well as current grants and subsidies (usually classified as transfer payments). Recurrent expenditure, excluding transfer payments, is also referred to as government final consumption expenditure. The annual budget spells out the direction of the expected expenditure, as it contains details of the proposed expenditure for each year, though the actual expenditures may differ from the budget figures due, for example, to extra-budgetary expenditures or allocations during the course of the fiscal year.

Figure 3.3: Trends of government expenditure and its component



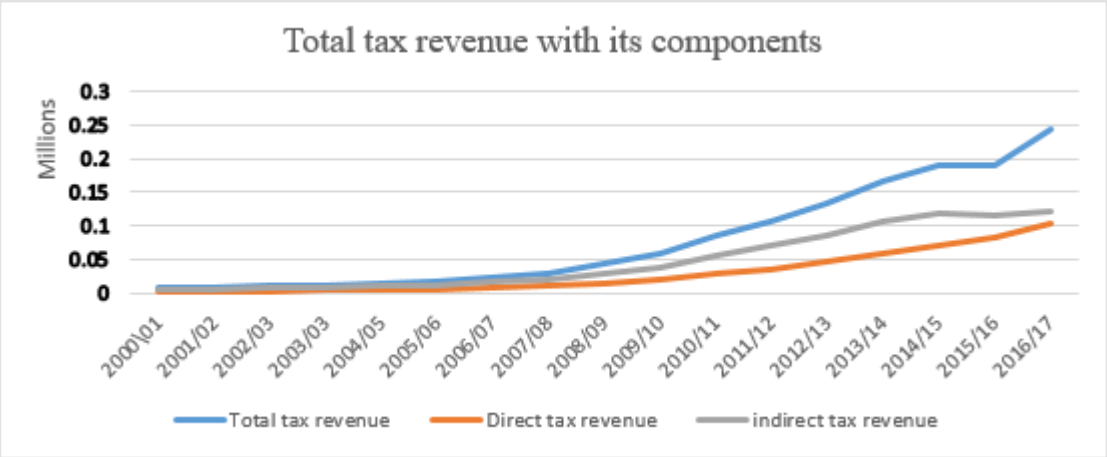
Source: Own computation using data from NBE

The overall performance of fiscal policy operations of the general government during 2016/17 F.Y resulted in birr 60.1 billion deficit, compared to birr 29.2 billion deficit a year earlier. The total revenue including grants depicted a 10.4% annual growth. While, revenue to GDP ratio decreased to 14.2% from 15.1% last year. The general government expenditure in the review period also rose by 20.6% as a result of growth in both current and capital expenditures. The ratio of expenditure to GDP slightly increased to 18.2% from 17.9% of last year.

As it can be seen from the figure 3.3 that Ethiopia's federal government's capital and recurrent expenditures trended upwards in most of the 2007/08 to2014/15 period, with capital expenditures rising faster than recurrent expenditures up to 2014/15. However, the trend of capital spending declined during 2015/16 to 2016/17. Data sourced from the NBE reveals that capital expenditure exceeded recurrent expenditures. Specifically, the capital expenditures in the 2007/08 to 2014/15 periods was more than the current expenditure in each year. The reason was the government has tended to favor capital spending more than recurrent spending. This could be attributed to various factors, for instance, expansion of infrastructure like roads, water supply and electricity supply and etc.

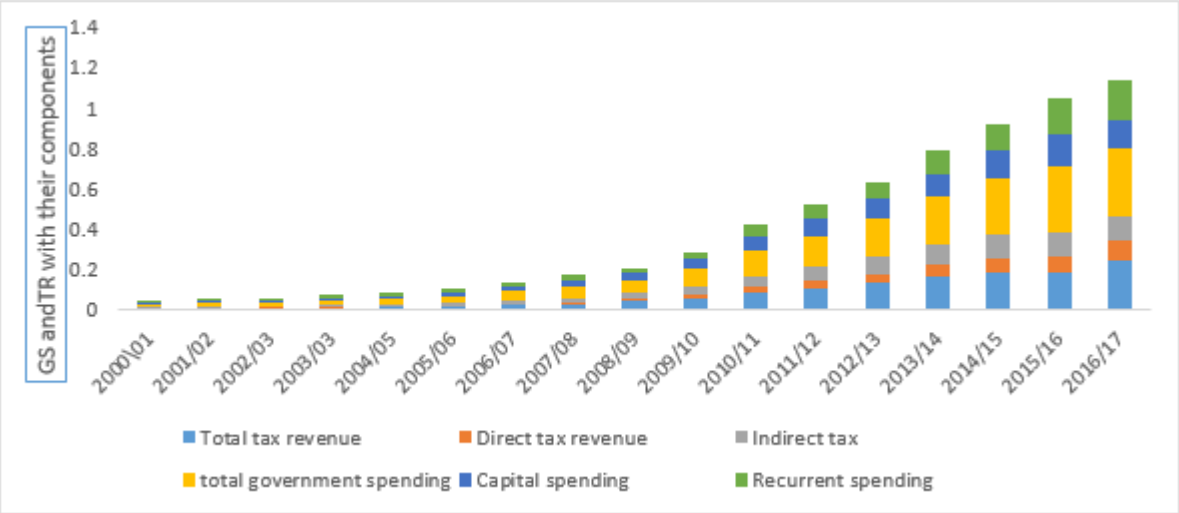
Total tax revenue increase when its component increase. As shown on the figure 3.4 the growth of total tax revenue was constant from 2000/01 to 2006/07. But after 2006/07 the growth of total tax revenue had increased as a result of the increase of its components. Compared to the growth of direct tax the growth of indirect tax is greater than direct tax. This is because of the introduction of VAT to Ethiopia in 2003/4. The growth of total government expenditure is greater than the growth of tax revenue. The government collects tax revenue in the form of both direct and indirect taxes. A large amount of tax revenue was collected in the form of indirect tax. The compositions of taxes that contribute more for the income of the nation is indirect tax as it is shown on Figure 3.5. The share of indirect taxes is the dominant one throughout the years. In the case of government spending components the growth of capital expenditure is greater than recurrent expenditure.

Figure 3.4: Trends of tax revenue and its components



Source: Own computation using data from NBE

Figure 3.5: Trends of tax revenue and expenditure with its components



Source: Own computation using data from NBE

Chapter 4

Methodology

4.1 Methodology and model specification

4.1.1 Data Set and Sample size

This study employed a quarterly data set of government expenditure (capital expenditure and current expenditure), tax revenue (direct and indirect tax revenue), real GDP, inflation proxied by a consumer price index, and interest rate over the period of 2000/01Q1 to 2016/17Q4, which in total gives 68 observations. The use of quarterly data offers many advantages over annual data. It allows capturing intra-year dynamics and gives the possibility for larger samples so as to avoid the vanishing degrees of freedom in estimation (Martins, 2010).

The data on government expenditure was obtained from the Minister of Finance and Economic Cooperation (MoFEC), and the data for government revenue including its components obtained from national bank of Ethiopia (NBE), the data on consumer price index obtained from Central Statically Agency (CSA), and the data on real GDP obtained from Minster of Finance and Economic Cooperation (MoFEC) and the data on interest rate obtained from National Bank of Ethiopia(NBE). However, there is no officially recorded quarterly data on these variables in the country. Hence, this study opts to generate the corresponding quarterly data following the approaches adopted in the previous literature.

This study adopted the (SVAR) methodology first proposed by (Blanchard & Perotti, 2002) for analysis. This methodology adopted because it allows us to impose restrictions on the model framework based on economic theory and also retrieve the responses of the variables to structural shocks.

As Enders (2005) stated, the aim of SVAR is to use economic theory to recover the structural innovations from the reduced form residuals. (Sims, Stock, Watson, et al., 1990) criticized the idea of a single system of the equation used in economic analysis and further stated that variables should not be classified as dependent and independent variables, but rather variables should be termed as endogenous variables.

As an alternative, Sims introduced the VAR method of data analysis, where each endogenous variable is determined by its own lags and the lags of other variables in the system. However, using VAR for policy analysis faced different challenges because it is often difficult to draw any conclusion from a large number of coefficient estimates in a VAR system, vector autoregressive have the status of reduced form; thus, it is difficult to summarize the dynamic properties of the data, and the parameters do not have any economic meaning and are subject to the so-called Lucas critique.

As a result, Enders (2005) noted, without restriction on certain parameters in the model, the structural system are unidentified. Unlike VAR under SVAR , identification is via the imposition of restrictions on the structural parameters using economic theory. In the SVAR methodology,

Figure 4.1: Source of data and data description

Variable	description	data source
NGERt	net government expenditure	MoFEC
NTRT	net tax revenue	MoFEC
KE	capital expenditure	MoFEC
CE	current expenditure	MoFEC
DT	direct tax	NBE
IT	indirect tax	NBE
Rt	Interest rate	NBE
Y	real GDP	MoFEC
Inf	Inflation	CSA

restrictions on the structural parameters are done by the researcher himself using economic theory as a backing. It is indeed clear that more economic meaning is expected in the SVAR methodology than VAR. It is thus imperative to state that under the SVAR methodology, more emphasis is on the structural errors rather than coefficient estimates.

4.2 Model specification and Estimation

The empirical literature on the effect of fiscal policy shock on macroeconomic variables can be grouped into three. The first category was concerned with the evolution of the macroeconomic impact of large reductions in the budget deficit. The second classification deals with the stabilizing capacity of fiscal policy variables. The third group of literature concerned with the dynamic effect of discretionary fiscal policy shock on macroeconomic variables. Discretionary fiscal policy is defined as a change or a reaction to fiscal policy that does not reflect a reaction to the current economic conditions (Fatás & Mihov, 2003). The third group of literature has been recently revitalized due to the empirical framework of SVAR of (Blanchard & Perotti, 2002).

Most of the previously conducted study in Ethiopia was based on the third category of fiscal policy literature which deals with the dynamic effect of fiscal policy shock on macroeconomic variables. So the current study would be conducted based on the third category. By applying the SVAR model to study the dynamic effect of fiscal policy shock on macroeconomic variables by disaggregating the fiscal policy variables into components.

4.3 The Structural VAR Model

The SVAR approach is better to study the effects of fiscal policy than monetary policy for two reasons. The first is that there are many factors which contribute to the movements in budgetary variables, in other words, there are exogenous fiscal shocks, particularly with respect

to GDP. The second reason is that the lags in decision and implementation of fiscal policy. Thus, with enough institutional information about the tax and transfer systems and the timing of tax collections, lets one to construct estimates of the automatic effects of unexpected movements in economic activity on fiscal policy variables, and, by implication, obtain estimates of fiscal policy shocks (Blanchard & Perotti, 2002).

4.4 Identification Strategy

This study identification strategy follows (Blanchard & Perotti, 2002). Denoting the vector of endogenous variables by $\mathbf{y}_t$ and the vectors of reduced form residuals by $\mathbf{u}_t$. So that the VAR representation is given as:

$$\mathbf{y}_t = A_1\mathbf{y}_{t-1} + \cdots + A_p\mathbf{y}_{t-p} + \mathbf{u}_t \tag{4.1}$$

Where $\mathbf{y}_t$ is vector of endogenous variables $A_j^{*'s}$ (j = 1. . . .p) are a $[N \times N]$ coefficient matrices and $\mathbf{u}_t$ is $(N \times 1)$ vector of the reduced form innovation which are assumed to be independently and identically distributed with covariance matrix equal to identity matrix for the purpose of just identification. In the benchmark specification $\mathbf{y}_t$ and $\mathbf{u}_t$ consists of the following variables.

$$\mathbf{y_t} = (g^t, T^t, y^t, p^t, r^t) \tag{4.2}$$

$$\mathbf{u^t} = (u_t^g, u_t^T, u_t^y, u_t^p, u_t^r) \tag{4.3}$$

Also, we can write equation (4.1) using lag operator

$$\mathbf{y_t} = A(L)\mathbf{y_{t-1}} + \mathbf{u}_t \tag{4.4}$$

Where $\mathbf{y_t}$ is $(N \times 1)$ vector of endogenous variables $A(L)$ is $(N \times N)$ matrix lag polynomial and $\mathbf{u_t}$ is $(N \times 1)$ is vector of reduced form innovations, which are distributed independently and identically with variance covariance matrix $\Sigma_u = E(u_t\mathbf{u}_t^{'})$ the so called AB model of Amisano and Gianni(1997) suggests the following relations between $\mathbf{u}_t$ and the objects of ultimate interest; the structural shocks $\mathbf{e}_t$.

$$A\mathbf{u}_t = B\mathbf{e}_t \tag{4.5}$$

Where the (NXN) matrices A and B describe the instantaneous relation between the variables and the linear relationship between the structural shocks and the reduced form residuals, respectively. The structural shocks are assumed to be orthogonal in order to investigate the impact of isolated shocks.

Consequently, the SVAR form can be obtained by pre-multiplying (4.1) by A.

$$A\mathbf{y}_t = A_1^*\mathbf{y}_{t-1} + ... + A_p^*\mathbf{y}_{t-p} + \mathbf{e}_t \tag{4.6}$$

where $A_j^* = AA_j(j = 1...p)$ and $\mathbf{e}_t = A\mathbf{u}_t$

The specification of this study start by expressing the reduced form innovations of government spending and net tax revenue equations as linear combinations of the structural fiscal policy shocks $\mathbf{e}_t^g$ and $\mathbf{e}_t^T$ to these variables and innovations of the other reduced form equations of the VAR , namely $\mathbf{u}_t^y, \mathbf{u}_t^p$ and $\mathbf{u}_t^r$. This leads to the following formal representation of the reduced form.

$$\mathbf{u}_t^g = \alpha_y^g u_t^y + \alpha_p^g u_t^p + \alpha_r^g u_t^r + \beta_T^g e_t^T + e_t^g \tag{4.7}$$

$$\mathbf{u}_t^T = \alpha_y^T u_t^y + \alpha_p^T u_t^p + \alpha_r^T u_t^r + \beta_g^T e_t^T + e_t^T \tag{4.8}$$

As mentioned by (Perotti, 2005), in this framework the coefficient$\alpha_j^{i\prime}s$ measure both the automatic response of fiscal variable i to the macroeconomic variable j and the systematic discretionary response of fiscal policy variables i to the macroeconomic variable j. The coefficient $\beta_j^{i\prime}s$ captures the discretionary fiscal policy shocks , these are structural fiscal policy shocks.

It should also be noted that we avoid using the Cholesky decomposition method. Regardless of the order of fiscal variables; Cholesky orthogonalization will not provide a consistent estimate of the structural shocks if α_j^i are different from zero.

Direct evidence on the conduct of fiscal policy suggests the existence of decision lags in the sense that it is not possible to understand about GDP shock, decide what fiscal policy measure to take in response, pass these measure through the legislature and implement them within three months as pointed by Blanchard and Perotti (2002). Thus, the discretionary change in a variable i in response to a change in variable j is zero. As a consequence, in quarterly data systematic discretionary components of $\mathbf{u}_t^T$ and $\mathbf{u}_t^g$ will be zero. The coefficient α_j^i will only reflect the automatic response to economic activities. Because the reduced form residuals are correlated with the $e_t^\prime s$ so, it is not possible to estimate the $\alpha_j^{i\prime}s$ by ordinary least square.

Therefore, we need to construct the elasticities of fiscal policy variables i to the macroeconomic variables j to compute cyclically adjusted reduced form fiscal policy shocks.

$$\mathbf{u}_t^{g,CA} = u_t^g - \alpha_y^g u_t^y - \alpha_p^g u_t^p - \alpha_r^g u_t^r = \beta_T^g e_t^T + e_t^g \tag{4.9}$$

$$\mathbf{u}_t^{T,CA} = u_t^T - \alpha_y^T u_t^y - \alpha_p^T u_t^p - \alpha_r^T u_t^r = \beta_g^T e_t^g + e_t^T \tag{4.10}$$

In this study, the recursive approach was considered which restricts B to a k-dimensional identity matrix and A to a lower triangular matrix with unit diagonal, which implies the decomposition of the variance-covariance matrix. The recursive approach implies a causal ordering of the model variables. Following, Cladara and Kamps (2008) this study decide the relative ordering of the fiscal policy variables first to identify the structural shocks. While imposing $\beta_g^T = 0$ postulates the priority of tax decisions, β_T^g can be set to zero if government decision are supposed to come first, It might be hard to find plausible arguments that fully justify any of these orderings. In the baseline specification, the later assumption is employed. The reverse ordering does not affect the results given the low correlation between reduced form fiscal shocks.

Consequently, it is possible to estimateβ_g^T by ordinary least square from the following equations.

$$\mathbf{u}_t^{g,CA} = \mathbf{e}_t^g \tag{4.11}$$

$$\mathbf{u}_t^{T,CA} = \beta_g^T \mathbf{e}_t^g + \mathbf{e}_t^T \tag{4.12}$$

Finally, the coefficients of the equations for the macroeconomic variables will be recursively determined by means of instrumental variables regressions with respect to real GDP the following equation was employed.

$$\mathbf{u}_t^y = \gamma_g^y u_t^g + \gamma_T^y u_t^T + e_t^y \tag{4.13}$$

Using e_t^T and e_t^g as instruments for u_t^T and u_t^g respectively. Likewise, the price equation

$$\mathbf{u}_t^p = \gamma_g^p u_t^g + \gamma_T^p u_t^T + \gamma_y^p u_t^y + e_t^p \tag{4.14}$$

Can be estimated by using e_t^T, e_t^g and e_t^y as instruments. Finally, the interest rate equation is.

$$\mathbf{u}_t^r = \gamma_g^r u_t^g + \gamma_T^r u_t^T + \gamma_y^r u_t^y + \gamma_p^r u_t^p + e_t^r \tag{4.15}$$

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

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ \gamma_g^y & \gamma_T^y & 1 & 0 & 0 \\ \gamma_g^p & \gamma_T^p & \gamma_y^p & 1 & 0 \\ \gamma_g^r & \gamma_T^r & \gamma_y^r & \gamma_p^r & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^T \\ u_t^y \\ u_t^p \\ u_t^r \end{bmatrix} = \begin{bmatrix} \beta_g^g & 0 & 0 & 0 & 0 \\ \beta_g^T & \beta_T^T & 0 & 0 & 0 \\ 0 & 0 & \beta_y^y & 0 & 0 \\ 0 & 0 & 0 & \beta_p^p & 0 \\ 0 & 0 & 0 & 0 & \beta_r^r \end{bmatrix} \begin{bmatrix} e_t^g \\ e_t^T \\ e_t^y \\ e_t^p \\ e_t^r \end{bmatrix} \tag{4.16}$$

As it is shown in the above matrix the order of the variables are as follows: spending is ordered first, tax revenue is ordered second, the output is ordered third, inflation is ordered fourth and the interest rate is ordered last. This particular ordering of the variables has the following implications: Government spending does not react contemporaneously to shocks to other variables in the system. Because, government spending is predetermined by the parliament. Hence, it does not influence the movement of the business cycle in the short run.

Next, tax revenue does not react contemporaneously to government spending and interest rate shocks. Because based on causal ordering the exogenous relation between tax revenue and government expenditure assumed to be zero. It also does not contemporaneously affected by interest rate hence interest payment does not include in tax revenue data. But it is affected exogenously by output and inflation elasticity.

Output does not react contemporaneously to inflation and interest rate shocks but is affected contemporaneously by government spending shocks, inflation does not react contemporaneously to interest rate shocks, but affected contemporaneously by government spending, tax revenue, and output shocks, and the interest rate is affected contemporaneously by all shocks in the system.

The above system is not identified. To fully identify the system, it needs additional restriction based on economic theory. Unlike the recursive approach, the Blanchard and Perrotti approach do not involve imposing only zero restrictions on parameters in the system in order to achieve identifications rather they consider the economic theory behind the restrictions. For this purpose, regresses the components of tax revenue on their respective tax base, obtaining an aggregate value for the output elasticity of tax revenue and an aggregate value for the inflation elasticity of net tax revenue. Following, (Blanchard & Perotti, 2002) and (Caldara & Kamps, 2008) this study estimated the exogenous elasticity between fiscal policy variables and macroeconomic variables to achieve full identification of the system.

4.5 The elasticity of tax revenue and expenditure

Following, Blanchard and Perotti (2002) identification scheme, this study first identify a five variable VAR model, which includes total government spending, total net taxes, GDP, a measure of inflation and the interest rate as a benchmark. Thereafter, this study proposes a structural decomposition of total net taxes and expenditure into two components: direct taxes, indirect taxes, and current expenditure, capital expenditure respectively. The paper provides estimates of the responses of macroeconomic aggregates to innovations in different tax groups and expenditure groups by replacing total net taxes with each tax components separately.

4.5.1 Government expenditure elasticity to output

Following Tenhofen et al. (2010) this study assume that direct government expenditure does not respond to real GDP within a quarter as expenditure is predetermined in a budgetary plan and therefore rather inflexible in the short run. This is because there is always an implementation lag after a macroeconomic surprise. For one thing, policymakers may not even realize there is a problem, because of data lag. A lot of economic data is not published for a month or a quarter after the period it applies. For the same reason, this assumption is applicable to the Ethiopian economy. Thus why this study assumes zero elasticity of government expenditure to real GDP.

4.5.2 Interest rate elasticity

Following Perotti (2005) the interest rate semi-elasticity of both net taxes and government spending sets to 0 ($\alpha_r^T = \alpha_r^g = 0$). Because no fiscal policy is sensitive to the interest rate contemporaneously. In particular changing interest rates has only very gradually effects on government expenditure via interest payments on its debt. Given that interest payments on government debt are excluded from the definitions of government net taxes and spending, the semi-elasticities of these two variables with respect to interest rate, and innovations are set to zero.

4.5.3 Price elasticity of government spending

(Perotti, 2005) discussed the wage component of current government spending do not indexed to the price change within a quarter. Hence, he assumed the wage component of government spending to have an elasticity of -1 to the change in price. Whereas, the non-wage component

of government spending is likely to be effectively indexed to the price change within a quarter, it takes elasticity closer to zero. As a result, it seems reasonable to assume the elasticity of government spending to price below zero.

Following Perotti (2005) others also calculated the price elasticity of price to direct government expenditure. For instance, Tenhofen et al. (2010) obtained -1 based on (Kremer et al., 2006). In Ethiopia Asfaw (2012) and Mathewos (2015) applied the Perotti (2005) assumption. As a result, this study also applies the same assumption hence the assumption of Perotti (2005) more likely fit with Ethiopia.

4.5.4 The elasticity of tax revenue to output

Following the leading studies in the literature, the elasticities of taxes to GDP is constructed by obtaining data from NBE. Unlike the elasticity of direct government expenditure to output; the elasticity of tax revenue to output is composed of different components of tax. So that the determination of exogenous elasticity of tax revenue to change output requires regression analysis.

In order to obtain the exogenous elasticity tax revenue to output, this paper employed the methodology that had been employed by Blanchard and Perotti (2002)(Blanchard & Perotti, 2002). This methodology is standard in the literature for instance, (Daude et al., 2010; Burriel et al., 2009; Perotti, 2005; de Castro Fernández & Hernández de Cos, 2006) among others. Additionally, Unal (2011) following the same methodology with aforementioned researcher calculated the exogenous elasticity for tax revenue to change in output and the exogenous elasticity of tax revenue components to change in output for OCED countries.

The calculation of elasticity of net tax revenue to GDP is composed of the elasticity of each tax category to their base, and the elasticity of each tax base to GDP. This is because changes in GDP affect tax revenue differently through the different components of GDP. As a result, the researcher classifies tax revenue into different components based on the availability of data on each category. For instance, Ravnik and Žilic (2011) for Croatia calculated the elasticity of tax revenue based on five broad classifications of tax revenue: income taxes, profit taxes, social contributions, value-added taxes, and excise taxes. Blanchard and Perotti (2002) considered four categories of taxes to calculate the exogenous elasticity of tax revenue to output: indirect taxes, personal income taxes, corporate income taxes, and social security taxes.

Similarly, Asfaw (2012) and Mathewos (2015) estimated the exogenous elasticity of tax revenue to output for Ethiopia classifying tax revenue into three components: direct tax, indirect tax, and import tax. Consequently, this study also uses a similar methodology with Asfaw (2012) and Mathewos (2015). However, unlike them here the classification of tax revenue components is into two: direct tax and indirect because of the availability of quarterly data on these components of tax revenue and by assuming other components of tax revenue also found in this component of tax classification.

Quarterly data on direct and indirect taxes are obtained from national bank of Ethiopia and the data on private consumption is obtained from NBE and changed to quarterly data by interpolating. Subsequently, the contemporaneous output elasticity of net taxes can be calculated based on the following formula.

Table 4.1: Exogenous elasticity of tax revenue change in output

Category of tax revenue	$\varepsilon_{B_i}^{T_i}$	$\varepsilon_y^{B_i}$	$\frac{T_i}{T}$	$\varepsilon_{B_i}^{T_i} \times \varepsilon_y^{B_i} \times \frac{T_i}{T}$
Real direct tax	1.063	1.0	0.37	0.39
Real indirect tax	0.745	1.063	0.6	0.475
$\alpha_y^t = \sum_{i=1}^{n} \varepsilon_{B_i}^{T_i} \times \varepsilon_y^{B_i} \times \frac{T_i}{T} = 0.865$				

Source: own computation using data from NBE

$$\alpha_y^T = \sum_{i=1}^{n} \varepsilon_{B_i}^{T_i} \times \varepsilon_y^{B_i} \times \frac{T_i}{T} \tag{4.17}$$

Where α_y^T is the output elasticity of net tax, $\varepsilon_{B_i}^{T_i}$ is the elasticity of each category of taxes to their respective tax bases, $\varepsilon_y^{B_i}$ is the elasticity of each tax bases to output and $\frac{T_i}{T}$ measures the weight of type i tax in the sum of taxes, $T = \sum_{i=1}^{n} T_i$. Finally, to arrive to intended result of the ax revenue elasticity of output the following regression equation is employed.

$$\log A = \beta_0 + \beta_1 \log B \tag{4.18}$$

Where the coefficient $\beta_1$measures the automatic elasticity of variable A (in our case, it is individual taxes and or tax bases) with respect to a variable B (in our case, it is each tax bases and or output). Then the intended coefficients for each tax are estimated using OLS estimation.

As it is displayed in the above table the estimated results for tax revenue elasticity to change in output is 0.865. Comparing with previous literature it is medium for Ethiopia. For instance, (Perotti, 2005) in estimating the effects of fiscal policy for OECD countries found a tax elasticity of output, 1.85 for the USA, 0.76 for the UK, 0.81 for Australia and 1.86 for Canada.

Unal, 2011) using disaggregated SVAR analysis estimated exogenous elasticity for OCED countries. For instance, exogenous elasticity of tax revenue to change in output for the US is 1.1, for France is 1, for Canada 1, and 1.1 for the UK. Furthermore, he estimated the exogenous elasticity of disaggregated components of tax revenue accordingly he obtained 0.6 direct tax elasticity to change in output for the US, 1.2 for Canada, 0.6 for France, and 1.4 for the UK. Consequently, he also calculated the indirect tax elasticity to change in output for these countries 0.9 for the US, 0.7 for Canada, 0.7 for France, 1.1 for the UK.

(Tenhofen et al., 2010) also estimated the exogenous elasticity for fiscal policy variables during the investigation of the macroeconomic effects of exogenous fiscal policy shock in Germany employing the disaggregated SVAR analysis. Accordingly, they obtained 0.95 exogenous elasticity of net tax revenue to change in output which includes 0.92 of indirect elasticity of tax revenue and 1.62 of direct tax elasticity to change in output.

(Caprioli & Momigliano, 2011) for Italy found a value of 0.3. For Newzland, (Parkyn & Vehbi, 2014) obtained an elasticity of 1.0. In the case of Spain(de Castro Fernández & Hernández de Cos, 2006) have calculated a value of 0.62. Moreover, (Asfaw, 2012) and(Mathewos, 2015)

Table 4.2: The exogenous elasticity of tax revenue to change in price

Category of tax revenue	$\varepsilon_p^{T_i}$	$\frac{T_i}{T}$	$\varepsilon_p^{T_i} \times \frac{T_i}{T}$
Real direct tax	1.036	0.37	0.383
Real indirect tax	0.793	0.6	0.475
$\alpha_p^t = \sum_{i=1}^{n} \varepsilon_p^{T_i} \times \frac{T_i}{T}$	= 0.85		

Source: Own computation using data from NBE

calculated 0.55 and 0.233 for Ethiopia respectively. So compared to aforementioned the result that found by this study was medium that means it was not too large compared to OCED countries and it is not too low compared to the result of (Asfaw, 2012) and (Mathewos, 2015)for Ethiopia. [1]

4.5.5 The exogenous elasticity of tax revenue to change in price

In order to estimate the price elasticity of tax revenue, this paper follows the same methodology used to determine the output elasticity that developed by(Perotti, 2005) and (de Castro Fernández & Hernández de Cos, 2006). These authors assumed that the elasticity of indirect and profit taxes relative to the change in price is zero. In contrast to them, (Mathewos, 2015) estimated the elasticity of each category of taxes to change the price. Following (Mathewos, 2015) this paper also calculate the elasticity of tax revenue to change in price by employing the regression equation.

$$\alpha_p^T = \sum_{i=1}^{n} \varepsilon_p^{T_i} \times \frac{T_i}{T} \tag{4.19}$$

The contemporaneous elasticity of each category of tax is estimated based on the following regression equation.

$$\log T_i = \beta_0 + \beta_1 \log CPI \tag{4.20}$$

Where β_1 measures the automatic elasticity of type i tax category to the change in consumer price index. Consumer price index is used as the proxy for inflation. The same weight of each category of taxes as used for output elasticity is also applied with the price.

This study calculated the price elasticity of tax revenue to change in price including the disaggregated components of tax revenue. As it is shown in the above table the elasticities of the aggregated fiscal variables are derived by weighting the elasticities of their subcomponents with their relative amounts. Net tax revenue, for instance, responds to price by 0.85. This number contains 1.036 price elasticity of direct tax and 0.793 indirect taxes.

[1]The exogenous elasticity for this study is estimated following (Mathewos, 2015) and (Asfaw, 2012) in Ethiopia

Similar to exogenous elasticity of tax revenue to change in output this result is also medium when compared with what was indicated in the literature of other countries. For instance,(Caprioli & Momigliano, 2011) calculated 0.4 tax revenue elasticity to change in price for Italy, (Parkyn & Vehbi, 2014) obtained 0.2 for Newzland, (de Castro Fernández & Hernández de Cos, 2006) estimated 0.78 for Spain and 0.89 for Crocia in (Ravnik & Žilić, 2011). Moreover, (Asfaw, 2012) and (Mathewos, 2015) estimated the tax revenue elasticity to change in price 0.34 and 0.144 respectively.

Further,(Unal, 2011) calculated the exogenous elasticity of tax revenue and its components to change in price for OCED countries. Accordingly, he obtained -0.1 for the US, 0 for Canada, 0 for France, and 0.1 for the UK. And also –0.4 direct tax elasticity for the US, 0.2 for Canada, -0.4 for France and 0.4 for the UK. Finally, he estimated the indirect tax elasticity to change in price -0.4 for the US, -0.3 for Canada, -0.3 for France and 0.1 for the UK.

After imposing the above-estimated restrictions on the parameter values the relationship between the reduced-form residual and the structural shocks can be written in matrix form as.

$$\begin{bmatrix} 1 & 0 & 0 & -0.5 & 0 \\ 0 & 1 & -0.86 & -0.85 & 0 \\ \gamma_g^y & \gamma_T^y & 1 & 0 & 0 \\ \gamma_g^p & \gamma_T^p & \gamma_y^p & 1 & 0 \\ \gamma_g^r & \gamma_T^r & \gamma_y^r & \gamma_p^r & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^T \\ u_t^y \\ u_t^p \\ u_t^r \end{bmatrix} = \begin{bmatrix} \beta_g^g & 0 & 0 & 0 & 0 \\ \beta_g^T & \beta_T^T & 0 & 0 & 0 \\ 0 & 0 & \beta_y^y & 0 & 0 \\ 0 & 0 & 0 & \beta_p^p & 0 \\ 0 & 0 & 0 & 0 & \beta_r^r \end{bmatrix} \begin{bmatrix} e_t^g \\ e_t^T \\ e_t^y \\ e_t^p \\ e_t^r \end{bmatrix} \tag{4.21}$$

4.6 SVAR specification for disaggregated components of government expenditure

In the first SVAR specification, we include the net government expenditure and net government revenue as for fiscal policy variables. But now we disaggregate the net government expenditure into capital expenditure and current expenditure to see the separate effect of the government expenditure component on macroeconomic variables. These two government expenditure components add up to our previous net government expenditure variable, which is dropped.

1. The current spending, which was the first transitory shock in this ordering of the variables; reacted immediately only to a shock itself and no other transitory shocks could contemporaneously impact on it. This corresponds to the idea of (Blanchard & Perotti, 2002) that it generally takes longer than one quarter for government to implement the new policy. Moreover, current spending can have a contemporaneous effect on all other variables in the system. However, to identify the model we have assumed the exogenous elasticity between the two components of government expenditure as zero.

2. Tax revenue reacted immediately to shocks from output, inflation and itself. This idea corresponds to(Caldara & Kamps, 2008) who argue that movement in tax, unlike government spending relates to the business cycle. Thus, shocks of output can have a contemporaneous effect on tax. However, this was not a discretionary response of tax to this variable; rather it was an automatic response of tax or elasticity of tax to output.

3. Output reacted immediately to shocks from itself, current spending, capital spending. This corresponds to the idea of (Perotti, 2005) that current and capital expenditure is the components of GDP. so it is possible for current and capital expenditure to have a contemporaneous effect on output.

4. The capital spending which was the second transitory shock in this ordering of the variables; reacted immediately only to a shock itself and no other transitory shocks could contemporaneously impact on it.

Following, the aforementioned assumption and (Tenhofen et al., 2010) the relationship between reduced residual and structural shocks expressed in matrix form as follows.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & -0.86 & 0.85 & 0 \\ \gamma_{ce}^{y} & \gamma_{ke}^{y} & \gamma_{T}^{y} & 1 & 0 & 0 \\ \gamma_{ce}^{p} & \gamma_{ke}^{p} & \gamma_{T}^{p} & \gamma_{y}^{p} & 1 & 0 \\ \gamma_{ce}^{r} & \gamma_{ke}^{r} & \gamma_{T}^{r} & \gamma_{y}^{r} & \gamma_{p}^{r} & 1 \end{bmatrix} \begin{bmatrix} u_t^{ce} \\ u_t^{ke} \\ u_t^{T} \\ u_t^{y} \\ u_t^{p} \\ u_t^{r} \end{bmatrix} = \begin{bmatrix} \beta_{ce}^{ce} & 0 & 0 & 0 & 0 & 0 \\ \beta_{ce}^{ke} & \beta_{ke}^{ke} & 0 & 0 & 0 & 0 \\ \beta_{ce}^{T} & \beta_{ke}^{T} & \beta_{T}^{T} & 0 & 0 & 0 \\ 0 & 0 & 0 & \beta_{y}^{y} & 0 & 0 \\ 0 & 0 & 0 & 0 & \beta_{p}^{p} & 0 \\ 0 & 0 & 0 & 0 & 0 & \beta_{r}^{r} \end{bmatrix} \begin{bmatrix} e_t^{ce} \\ e_t^{ke} \\ e_t^{T} \\ e_t^{y} \\ e_t^{p} \\ e_t^{r} \end{bmatrix} \tag{4.22}$$

4.7 Disaggregating the components of tax revenue

This study investigated the dynamic effect of fiscal policy shock on macroeconomic variables by disaggregating the tax revenue components into direct tax and indirect tax. To do this the aggregate level of tax revenue was dropped. Because as the number of variable increase the degree of freedom decrease so in order to generate meaningful estimate it requires additional data set. However, getting large data set in most of developing countries including Ethiopia is the greatest challenge for the researcher. Consequently, to solve this problem the study dropped the aggregate variable to see the effects of disaggregated components of the fiscal policy variables on macroeconomic variables. Consistent with the previous specifications, this study postulated the priority of spending decision relative to the two tax revenue categories. Among those two tax revenue components, this study order indirect taxes first and then direct tax comes latter. The specification of SVAR is similar to disaggregated components of expenditure.

The variables under consideration were ordered starting from the exogenous variables. Therefore, following the same principles as above section, this part also ordered the government spending first because the government spending more plausibly predetermined in the national budget and very unlikely to respond to business cycle within the quarter. The tax revenue components are ordered next from tax revenue components indirect tax ordered before direct tax. The components of tax revenue affected by their own shocks as well as by the shocks in other variables expect the shocks of government spending. Real output ordered next, as it is assumed to output is affected by it is own shocks and contemporaneously by the shocks in government spending and components of tax revenue. The assumption used in this study was in line with the Keynesian traditional framework that says an increase in government spending increase output and an increase in tax revenue decrease output.

Next, this study assumed that inflation does not react contemporaneously to the interest rate. But, affected by government spending, indirect tax, direct tax, real output and by its own shocks.

Chapter 5

Result and Discussion

5.1 Stationarity

The first step in any time series analysis is to test whether a variable is stationary or not and also determine the order of integration of the variable. To do this, the Augmented Dickey-Fuller (ADF) test for unit root was applied. The problem with using non-stationary variables is the potentials to encounter a spurious regression or fake relationship between the variables. When the variables are not stationary, they may move together due to the economic cycle in the absence of a real relationship between them. However, it is common for most macroeconomic variables to be non- stationary (Nelson & Plosser, 1982). A random walk model is the classic example of a non-stationary time series, and a test for stationarity, such as the Augmented Dickey-Fuller test is at our disposal.

The null hypothesis of unit root is rejected if the test statistic is less than the test critical values corresponding to the significance level. The bold figures in the table show the test statistic and critical values. The bold highlighted values indicate the stationarity of the variables. As it is shown on AppendixA_0 all variables are stationary at first difference and with intercept.

However, there is an issue of whether the variables in a VAR need to be stationary. Sims et al. (1990) recommend against differencing even if the variables contain a unit root. They argued that the goal of a VAR analysis is to determine the interrelationships among the variables, not to determine the parameter estimates. Since the objective of this study is policy analysis using impulse response function and forecast error variance decomposition, stationarity of the variables are not a big issue.

Further, Sims et al. (1990) argue that if one estimates a level VAR model including non-stationary variables and his end purpose is estimating the impulse response function to capture the dynamic responses of non-policy variables due to unexpected shocks in the policy variables, the shocks can be identified by Cholesky decomposition method that imposes recursive structure on the model.

Alternatively, the policy shock can be identified by imposing economic theory-driven restrictions on the contemporaneous relationships among the variables. So, the level VAR captures rich dynamic relationships among the variables that provide valuable insight on policy analysis based on the dynamic response of non-policy variables.

Moreover, Brooks (2014) state that if one wants to examine the statistical significance of the coefficient; all of the components in the VAR must be stationary. However, if the purpose of VAR estimation is purely to examine the relationships between the variables; differencing will through information on any long-run relationships between the series away. As a result, running the VAR model with non- stationary variables has become common in VAR literature. Including (Blanchard & Perotti, 2002; de Castro Fernández & Hernández de Cos, 2006; Parkyn & Vehbi, 2014) used the level VAR to examine the interrelationship between fiscal policy variable and

Table 5.1: Stationarity test result

	ADF test					PP test				
Variable	1%	5%	10%	t-statistic	Interecpt	1%	5%	10%	Adj.t-stat	Order
ΔLRGD	-2.60	**-1.95**	-1.61	**-8.68**	✓	-2.60	**-1.95**	-1.61	**-8.69**	I(1)
ΔCPI	-4.11	**-3.48**	-3.17	**-5.10**	✓	-4.10	**-3.48**	-3.17	**-5.26**	I(1)
ΔIT	-3.53	**-2.91**	-2.59	**-8.04**	✓	-3.53	**-2.91**	-2.59	**-10.69**	I(1)
ΔDT	-4.13	**-3.49**	-3.17	**-5.07**	✓	-3.53	**-2.91**	-2.59	**-12.26**	I(1)
Δr	-3.54	**-2.91**	-2.91	**-3.48**	✓	-2.60	**-1.95**	-1.61	**-3.26**	I(1)
ΔTR	-4.11	**-3.48**	-3.17	**-7.04**	✓	-4.10	**-3.48**	-3.17	**-20.78**	I(1)
ΔGEX	-4.11	**-3.48**	-3.17	**-21.7**	✓	-4.10	**-3.48**	-3.17	**-49.01**	I(1)
ΔCE	-4.12	**-3.49**	-3.17	**-4.87**	✓	-4.10	**-3.48**	-3.17	**-45.89**	I(1)
ΔKE	-4.11	**-3.48**	-3.17	**-22.9**	✓	-4.10	**-3.48**	-3.17	**-42.44**	I(1)

Source: own computation

macroeconomic variables. Following them, (Asfaw, 2012) and (Mathewos, 2015) also used the level VAR in Ethiopia. Following the same way, the current study also employed level SVAR.

5.1.1 Lag Selection Criteria

In econometric analysis, the number of lags to include in a model has a lot of impact on the result of the analysis; it becomes necessary to include the optimal lag in running our models. There are several lag selection criteria, the number of lags suggested by the majority of the different criteria is considered to be the optimal lag length to include. Those criteria include the final prediction error (FPE), the Akaike information criteria (AIC), the Schwarz information criteria (SIC) and the Hannan-Quinn information criteria (HQ). According to (Lütkepohl & Poskitt, 1991), the model with the smallest information criteria will be chosen. Lutkepohl also stated that the AIC and FPE may be more suitable for models with small samples than SIC and HQ though they are consistent in picking the right optimal lag.

According to Caldara and Kamps (2008), the standard lag length for quarterly data is four. Some studies set the maximum lag- length at four. Following them, this study also set the maximum Lag- length at four.

After testing a possible lag- length for each model by AIC, SIC, HQ, LR and FPE suitable lag –length was chosen. Accordingly, in the five variable baseline model, starting from 4 lags all criteria choose two as optimal lag length.

5.1.2 Post-estimation diagnostic test

After running VAR model, there are some diagnostic tests which are vital for ensuring that the result obtained from VAR estimation can be used for forecasting or policy analysis. Important post-estimation tests which are mostly performed on the residual of VAR model are LM test for residual autocorrelation, Jarque Bera test for residual multivariate normality and White test for the presence of heteroscedasticity.

Testing for autocorrelation helps to identify any relationships that may exist between the current values of the regression residuals and any of its lagged values (Brooks, 2019). The null hypothesis of the LM test for autocorrelation is that the residuals are not serially correlated, while the alternative is that the residual is serially correlated. Accordingly, in the two lag model, there was no evidence of autocorrelation at lag one and two at 5% level of confidence. The result is shown in appendix A_1.

The Jarque –Bera normality test is used to determine whether the regression errors are normally distributed under the null hypothesis of normally distributed errors the test static has a chi-square distribution. Thus, if the jarque –Bera statistic is significant that is when P- value is less than 0.05; the null hypothesis of normality is rejected at the 5% level of significance (Brooks, 2019). In this study for five variables baseline model, the joint hypothesis of JB test shows the variables are not normally distributed because the P-values of these tests were less than 0.05. The results of this tests were shown in the appendix A_3.

Furthermore, the test for heteroscedasticity investigates whether the variance of errors in the model are constant or not. White's (1980) stated that the residuals are homoskedasticitic and independent of the regressors;if the White test statistic is insignificant, i e P- value is greater than 0.05. Accordingly, the heteroscedasticity test of this study shows the variance of error

terms are constant because the P- value is greater than 0.05 which is shown in appendix A_4.

Finally, the test for VAR stability is vital if the system is supposed to be used for forecasting and policy analysis. Thus, the test for stability checks whether the roots of the autoregressive characteristic polynomial lies inside the unit circle. If all inverse roots of the autoregressive polynomial lie inside the unit circle the VAR is considered as stable and can be used for policy analysis. In this study using five variable as baseline model, all the inverse roots of the autoregressive charactestic polynomial are lies inside the unit root circle which is shown in the appendix A_5.

5.2 Impulse Response Functions

An impulse response function traces the effect of one standard deviation shock to one of the innovation on current and future values of the endogenous variables. A shock to the i^{th} variables directly affects the i^{th} variables, and also transmitted to all of the endogenous variables through the dynamic structure of the VAR (Sims et al., 1990). Thus, for each variable from each equation, a unit shock to the error is analyzed in order to determine the effects upon the VAR system over time. In this study the impulse response function revealed the sign, size and persistence of the shocks.

In econometrics literature there are two common approaches in order to estimate the impulse response functions. These are the generalized impulse response functions and the Cholesky decomposition. The main advantage of the generalized impulse response is that it does not require orthogonalization of innovation, and is invariant of the ordering to the variables in VAR (Pesaran and Shin, 1998 cited in Berga, 2012).

However, this study uses the Cholesky decomposition because it incorporates a small sample degree of freedom adjustment when estimating the residual covariance matrix used to derive Cholesky factor (Lütkepohl & Poskitt, 1991).

Finally, impulse response functions are typically illustrated by graphs that provide a visual representation of responses where the horizontal axis in all graphs shows time period (a quarter in our case). Points on the graph above zero displays positive response, while points below zero represents a negative response. In this study, all variables (except interest rate, which is a percentage) were transformed to log because this can transform the data to percentage changes and make interpretation of the results, such as elasticity more economically meaningful.

In this study, the impulse response function is plotted for the first ten quarters only. Since the objective of this study is investigating the interrelationship between fiscal policy variables and macroeconomic variables we estimate SVAR in levels; due to this, we may face the problem of unit root or near to unit root problem. For this purpose, Lütkepohl (2005) shows that an estimated long period ahead impulse response is inconsistents, that is, they tend to random variables and not reflect the true impulse responses. Thus, in such setting confidence in impulse response for a longer period ahead does not seem to be advisable, and thus impulse responses for this study is generated only for ten quarter.

5.3 The effects of government spending shock on macroeconomic variables

Under this section, this study discussed the response of macroeconomic variables to one standard deviation shock(innovation) to government spending using the impulse response functions. On the graph of the impulse response, the dashed lines represent the intervals of two standard deviations while the solid line represents the impulse functions. Moreover, while interpreting the fiscal policy variable shocks on macroeconomic variables we should have in mind that shocks from government expenditure or tax revenue are not caused by any of the variables in the model, because the structural shocks are derived from the residual of the SVAR equations.

The response of LTR to LTEX one standard deviation shock(innovation) to government expenditure temporarily increases tax revenue. This positive response gradually declines until the fourth quarters. Before hitting the steady-state value, it increases positively once again up to fifth quarters and remains in a positive region after fifth quarter.

As it is shown on Figure 5.1 the response of RGDP to one standard deviation shock(innovation) to government spending is positive. The positive relationship between government spending and output is in line with theory and some empirical studies. Based on the Keynesian theory, fiscal policy can derive the economy because the increased government spending or tax cuts have a multiplier effect by stimulating additional household demand for consumer goods. These results are also consistent with the finding of (Blanchard & Perotti, 2002; Perotti, 2005; Mountford & Uhlig, 2009; Krusec, 2003). They used the sample of the country from the U.S, OCED, European Union, Germany, and Spain. They found that a positive shock in government spending has a positive impact on output. These results are also consistent with the research by (Schclarek, 2007) who used a sample of developing countries as well as the applications of macro models for Indonesia's economy.

Moreover, (Abubakar, 2016) for Nigeria and (Mathewos, 2015; Asfaw, 2012; Gemechu, 2017), for Ethiopia obtained consistent results with the Keynesian theory, that is, shocking in government spending has an expansionary impact on output.

As it can be observed from the figure 5.1 initially the response of inflation to one standard deviation shocks in government spending is positive in the first quarter. Then after the response is negative until the third quarter. But after the third quarter the response gradually increase,and becomes positive in the fourth period. This implies the positive shocks in government spending has delayed positive effect on inflation.

Government spending would increase money supply within an economy (when government spends heavily on public goods such as constructions of roads, schools, industrial parks etc it will need workers to do these projects, this will increase employment. When more people go to the job then their purchasing capacity and spending increases). Increase in money supply means people will be getting higher income which result in higher demand for goods and services. When demand increases price will increase according to demand law. In line with this finding, (Gemechu, 2017) also obtained a positive response of inflation to government spending shock. In addition to (Gemechu, 2017) for Ethiopia.(de Castro Fernández & Hernández de Cos, 2006) found a significantly positive response of inflation after a positive shock in government spending for Spain.

As shown on figure 5.1 the response of interest rate to a one standard deviation shock(innovation) in government spending is initially negative to the shock until the third period. However, after

the third period, the response of interest rate to government spending shock is positive. After the third period, an increase in government spending resulted in crowding out effect of private investment. Which means an increase in government spending not financed by taxes will lead to a budget deficit.

[1]

5.4 The effect of tax revenue shocks on macroeconomic variables

As it can seen from the figure 5.2 the response of output to one standard deviation shocks in tax revenue is negative to the shocks until the ninth quarter. But after the ninth quarter the response is positive. Thus, initially an increase in total tax revenue has a negative effect on output. This result is similar with the result obtained by (Blanchard & Perotti, 2002; Burriel et al., 2009; Canzoneri et al., 2002) for US. Which was an increase in total tax revenue has negative effect on output in the short run. Additionally, the result that obtained by (de Castro Fernández, 2003) and (de Castro Fernández & Hernández de Cos, 2006) also similar with the results of this study.

The response of inflation to one standard deviation shock in tax revenues is positive. As shown on the figure 5.2, the effect of tax revenue shock on inflation is positive through out the period. If the government put up taxes, this will leads to higher prices and therefore consumer price index will increase. So, the finding that says the tax shock increase will affect inflation is less consistent with the goals of fiscal policy to influence aggregate demand.

According to Hermawan and Munro (2008) increase in tax revenue will affect the consumption decisions of economic actors so that it will decrease aggregate demand consequently price will decrease. However, in contrast to these argument an increase in tax revenue can increases the production cost to the manufacturer, thus causing an increase in selling price of goods to consumers.

Therefore, to strengthen this argument further study is needed to explore the impact of tax increase on producer's prices. It is also possible to consider other factors that cause inflation beyond the tax increase, such as imported inflation, output gap, monetary policy and structural policy of the government.

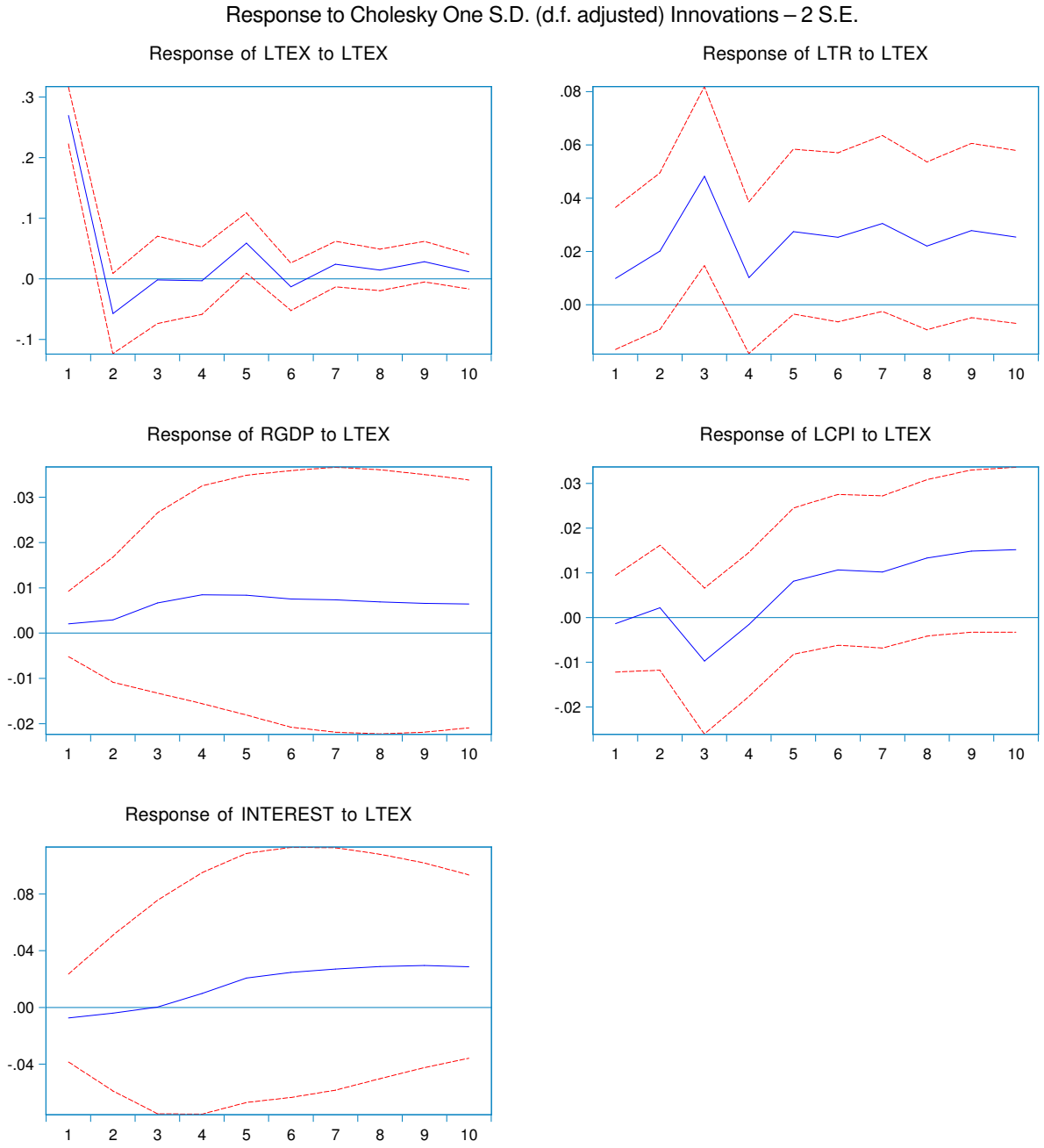
The response of interest rate to a one standard deviation shock in tax revenue is positive throughout the period.

5.5 The effects of disaggregated components of government spending

Under this section, this study investigated the effects of different components of fiscal policy variables on macroeconomic variables. In the previous section of this study, five variables

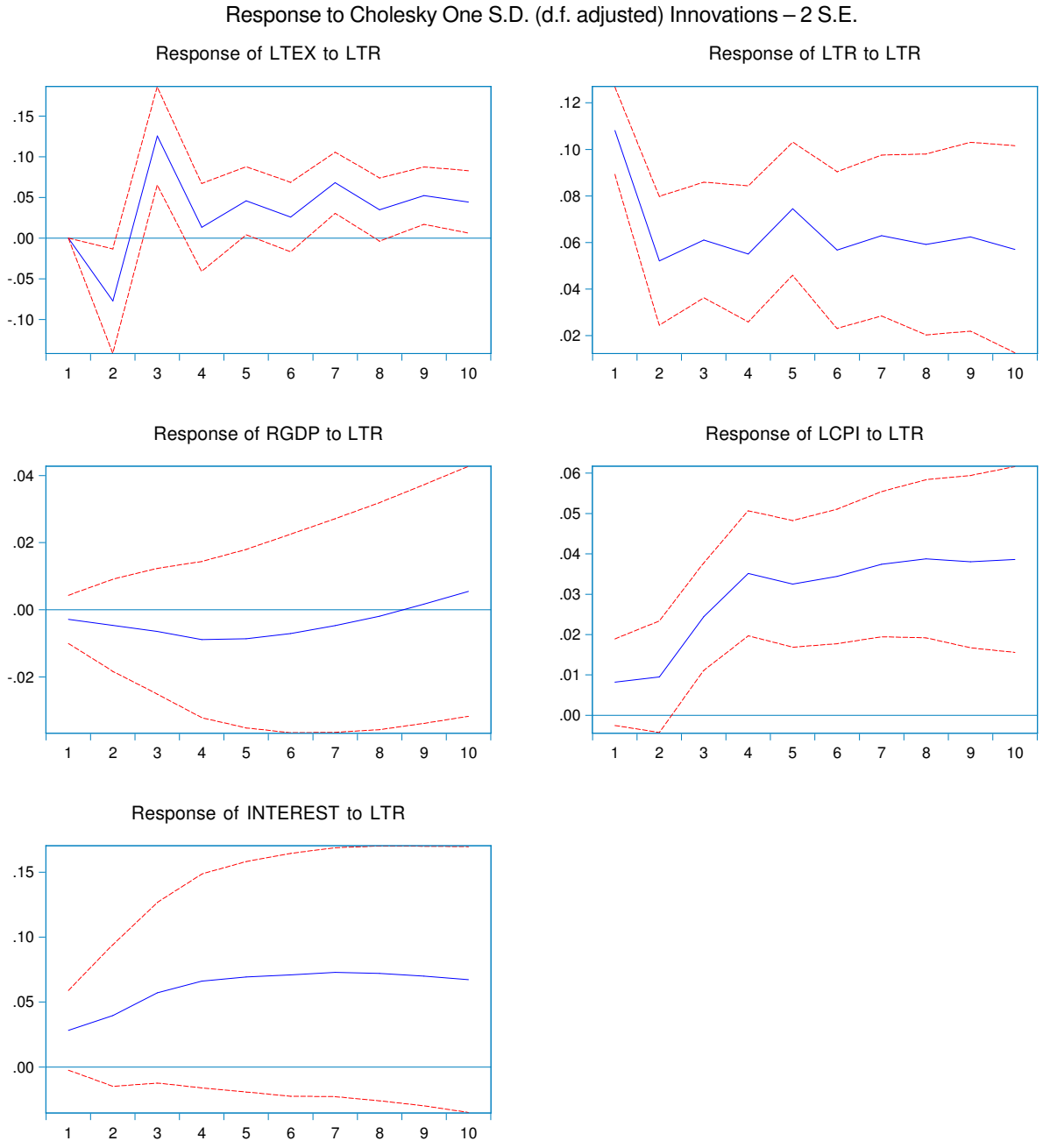
[1](Lütkepohl, 2005) shows that estimated long period ahead impulse responses are inconsistent, i.e., they tend to random variables and not to the true impulse responses. Thus, in such a setting confidence in impulse responses for longer periods ahead does not seem to be advisable.

Figure 5.1: Response of macroeconomic variables to an increase in government spending



Source: Own computation using Eviews 10

Figure 5.2: The effect of tax revenue shocks on macroeconomic variables



Source: Own computation using Eviews 10

SVAR model were considered. But now this study examined the effects of fiscal policy variables using six variables SVAR model by splitting the government expenditure into recurrent and capital expenditures. Consequently, to identify the model additional restrictions and ordering of the variables were required. Accordingly, further restrictions were imposed by the additional exogenous elasticities and the economic theory assumptions.

The next step is to undertake various post-estimation diagnostic tests which are crucial of importance for further analysis. This is because the result obtained from such tests could affect the validity and robustness of the impulse response functions and variance decomposition results. Accordingly, choosing appropriate lag length is vital before estimating a VAR model because the VAR results highly sensitive to the number of lags included for endogenous variables in estimation. So, the optimal lag was selected by using lag length selection criteria of LR, FPE, AIC, SIC, and HQ. Accordingly, SIC, and HQ criteria select two as optimal lag length where a maximum lag length of four is used to start with. The result is shown in appendix B_1.

The test for stability shows that all roots of characteristics polynomial lies inside the unit root circle which suggests that the VAR is stable. The result is shown in appendix B_2. Concerning the other tests, the LM test indicates that the model is free from autocorrelation problem at lag one the p- value is greater than 0.05 and at lag two the p- value is grater than 0.01. So, we reject the altenative hypothesis ,and the results are shown in appendix B_3. For heteroscedasticity test white test is used. The results of the test shows that there is no problem of heteroscedasticity at 5% signifigance level, and the result is shown in appendix B_4. Finally, Jarque Bera test shows non normal distribution which is shown in appendix B_5.

5.5.1 Shocks to current expenditures

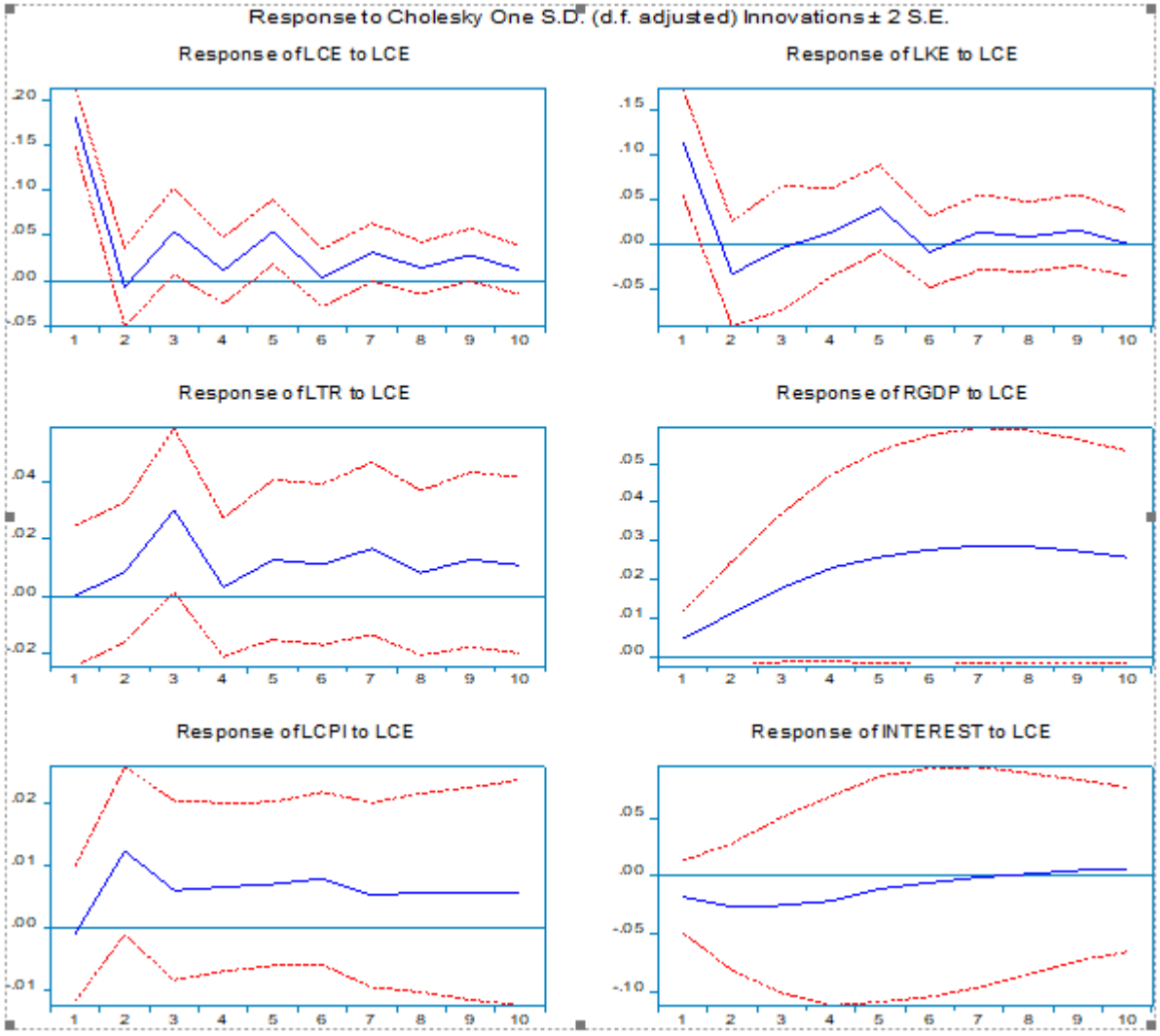
As it is displayed on the figure 5.3 the response of output to one standard deviation impulse in recurrent expenditure is positive. When recurrent government expenditure increases; it increases consumers' income which in turn increase consumer spending on goods and services. As a result, consumption increases which is one component of aggregate demand. Increase in aggregate demand increases output.

Initially, the response of inflation to one standard deviation shock in recurrent expenditure is positive and increasing for the first two periods. However, after period two it gradually declines up to the third period. Afterward the response of inflation to the impulse is somewhat constant. Higher current government expenditure will lead to demand-pull inflation if the supply is irresponsive to increased expenditure. Because, the increase in current expenditure means increasing wages and salaries of workers, which makes workers to have higher income. Higher income leads to higher consumption, then increase aggregate demand which leads price to increase in the short run. However, when supply is responsive to increased demand; increased expenditure does not leads to inflation.

Interest rate response to one standard deviation shocks in government recurrent expenditures is negative for the first seven quarter. This implies that an increase in recurrent expenditure does not result in crowding out effect of private investment. In contrast to, total government spending that affect interest rate positively, the positive shocks in recurrent expenditure has negative effect on interest rate. So, investigating the separate effects of government spending on macroeconomic variables are better to more understand the effect of fiscal policy shocks. [2]

[2] A positive shocks of recurrent spending has negative effect on interest rate. Similar results were obtained by (Perotti, 2005; Burriel et al., 2009; Favero & Giavazzi, 2009; Arin et al., 2005) for US.

Figure 5.3: Response of macroeconomic variables to an increase in current Spending



Source: Own computation using Eviews 10

5.5.2 Shocks to capital spending

As it can be observed from figure 5.4 the response of output to one standard deviation shocks in government capital spending is negative throughout the ten quarter.

The reason is that in those economies, where public spending is rightly channeled toward capital component and carefully utilized as they were used to lay foundations for sustainable growth, to provide a conducive environment for private business to operate by providing facilities that complement private capitals like stable power supply and improved other infrastructures spending has positive effect on output both in short run and long run. However, in Ethiopia, allocations on capital projects are either siphoned, diverted, mismanaged or corrupted. This is why the increase in capital spending has a negative impact on output in the short run.

A positive shock of capital spending has a positive effect on inflation for all ten quarters. This is because in most of developing countries including Ethiopia in the short-run increase in capital expenditure directly contribute to the aggregate demand coupled with slower supply response due to several productions, infrastructure and policy bottlenecks. Finally, this leads to price to rise.

The response of interest rate to one standard deviation shocks in capital spending is negative for most of the quarters. As it can be seen on the figure 5.4 initially the response is almost negligible for the first two quarter followed by negative response until the ninth quarters. However, after the ninth quarter, the response is positive. This is because initially, a positive shock in capital spending is ineffective to affect aggregate demand because of different production and infrastructural bottlenecks. [3]

5.6 The effects of disaggregated components of tax revenue on macroeconomic variables

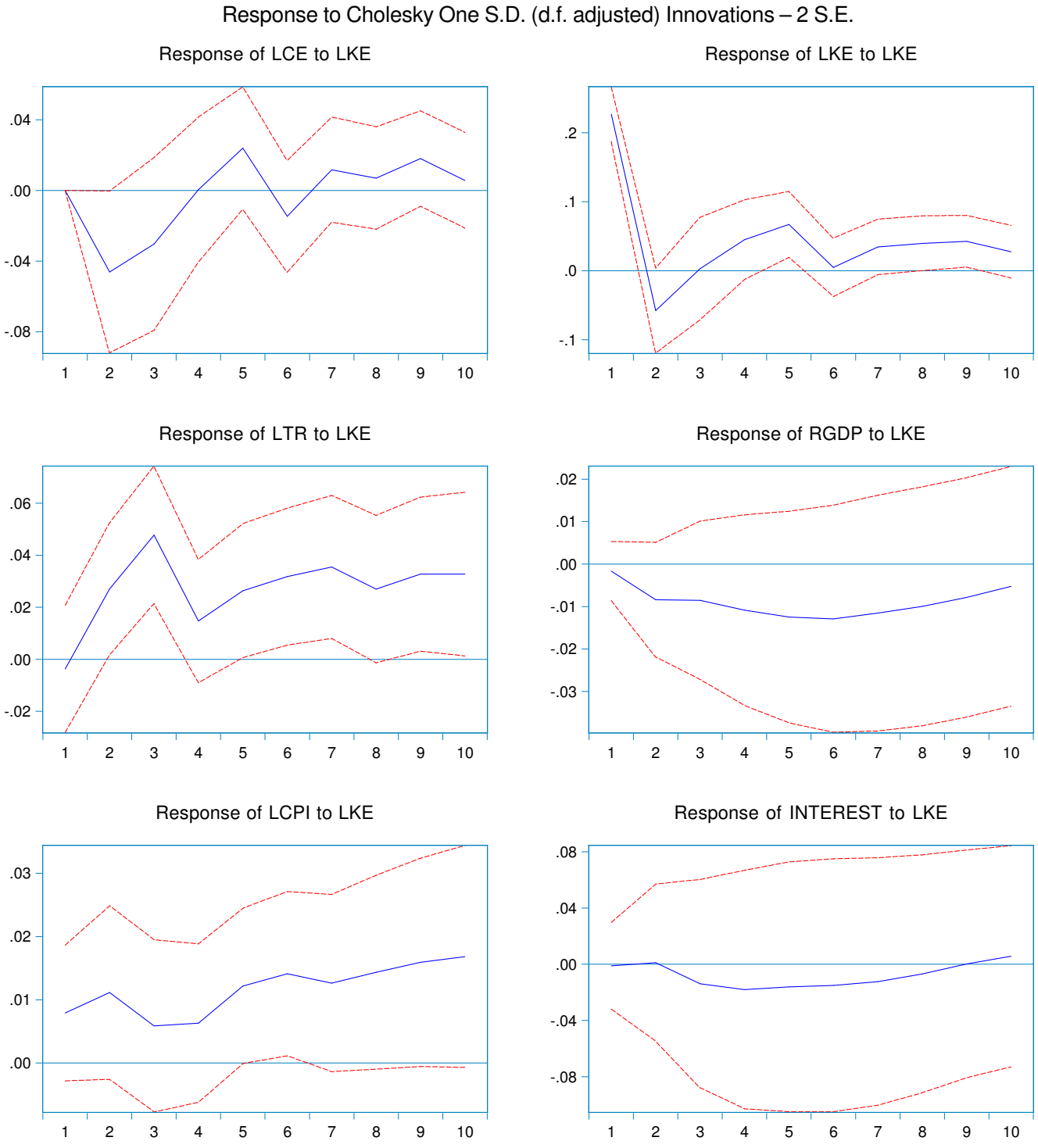
Under this section, the researcher investigated the effects of disaggregated components of tax revenue shocks on macroeconomic variables that is indirect tax and a direct tax on real GDP, inflation which is proxied by consumer price index and interest rate. To see the response of these macroeconomic variables the impulse response function is used. The variables were ordered following (Tenhofen et al., 2010) starting from government expenditure, indirect tax, direct tax, RGDP, inflation and interest rate.

The next task is to undertake pre and post-estimation test for this part of the SVAR specification. Following the same principles that are employed in another section of this study; in this part of the SVAR specification, this study determined the optimal lag length based on information criteria. Accordingly, two lag is determined by all criteria starting maximum lag of four. The result is shown in appendix C_1.

After estimating VAR models the next task is post-estimation diagnostic tests which are vital for ensuring the result obtained from VAR estimation can be used for forecasting or policy analysis. Important post-estimation tests which are mostly performed on residuals of the VAR model are LM test for autocorrelation, Jarque- Bera test for residual multivariate normality, White test for the presence of heteroscedasticity in the VAR residuals and test for the VAR

[3]Ilzetzki (2011) found that government expenditure has a stronger output effect in high-income countries than in developing countries

Figure 5.4: Response of macroeconomic variables to an increase in capital Spending



Source: Own computation using Eviews 10

stability. Accordingly, the test for autocorrelation shows there is no serial correlation up to lag two. The result is shown in appendixC_3.

Furthermore, white test for heteroscedasticity fails to reject the null hypothesis of homoscedastic variance at 10% level of significance. The result is shown in appendixC_4. However, the Jarque-Bera test rejects the null hypothesis of normality indicating that the residual non normal. The result for multivariate normality test is shown in appendixC_5.

Finally, the test for stability shows all inverse roots of autoregressive characteristic polynomial lie inside the unit circle which suggests that the VAR is stable. Stability of the system confirms that impulse response functions can be used to examine the dynamic effects of fiscal policy shocks on macroeconomic variables using disaggregate components of tax revenue. The result for VAR stability test is shown in appendixC_2.

5.6.1 Shocks to indirect taxes

The response of RGDP to one standard deviation shocks in indirect taxes as shown on figure 5.5 is negative. The shock from indirect tax has a transitory negative effect on output in the short run. The negative response of output to indirect tax shocks is unexpected finding considering shifting of the world from direct tax to indirect tax. However, this finding was strengthened by some existing empirics.

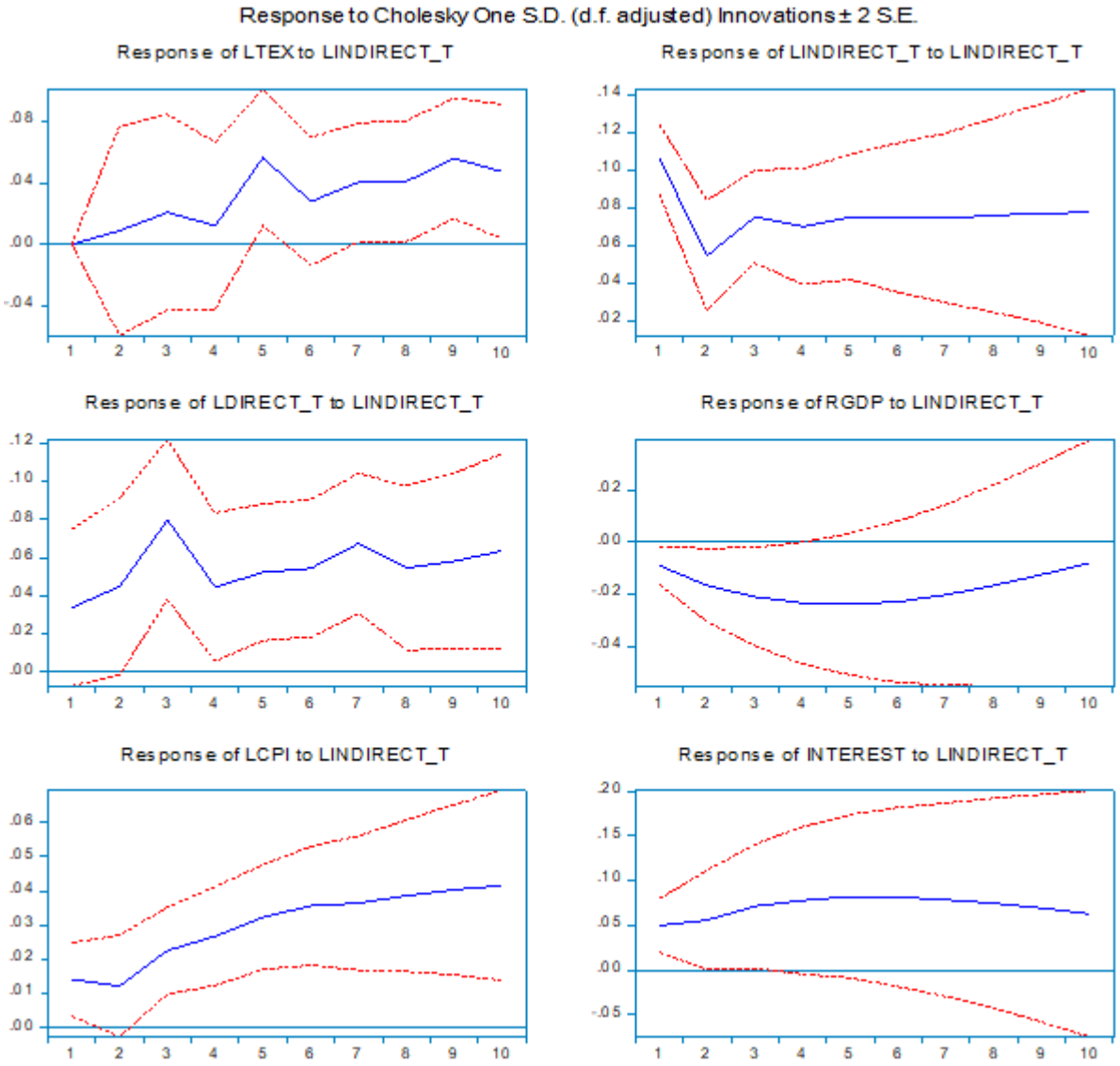
For instance,(Mahaphan, 2013) for Thailand obtained the negative response of output to indirect tax shocks. Moreover, (Unal, 2011) found out the response of GDP to indirect tax shock is negative for five countries. Because, the lower the purchasing power of real after-tax wages, indirect taxes lead to a strong incentive to curtail investment. In addition to the aforementioned empirics, in(Ilaboya & Mgbame, 2012) investigation of indirect tax was found to have a negative and insignificant relationship with the real economic growth rate in Nigeria

The response of inflation to one standard deviation shocks in indirect tax is positive. Thus, the shock to indirect tax has a positive effect on inflation. The indirect taxes cause an increase in the price all around. The increase in the price of raw materials, finished goods and other factors of production creates inflationary trends in the economy. Hence, indirect taxes are added to the selling price of raw materials it can cause cost-push inflation. In theory, indirect taxes influence the consumption /leisure choice of the household too. However, it appears unlikely because, under indirect taxes, taxpayers don't feel the burden of the tax. Because, indirect taxes do not create consciousness in the minds of the people. This is, why people don't adjust their consumption level with the increased indirect tax.

As a result, people increase their expenditure to consume the level of consumption as before rather than decreasing consumption as theory says. In line with this finding Mozdzierz (2017) found the effect of indirect tax shocks on inflation for selected EU countries such as Romania, Hungary, Greece, and the Baltic countries. He concluded that the structure of the tax system with a high proportion of indirect taxes has a positive influence on the prices.

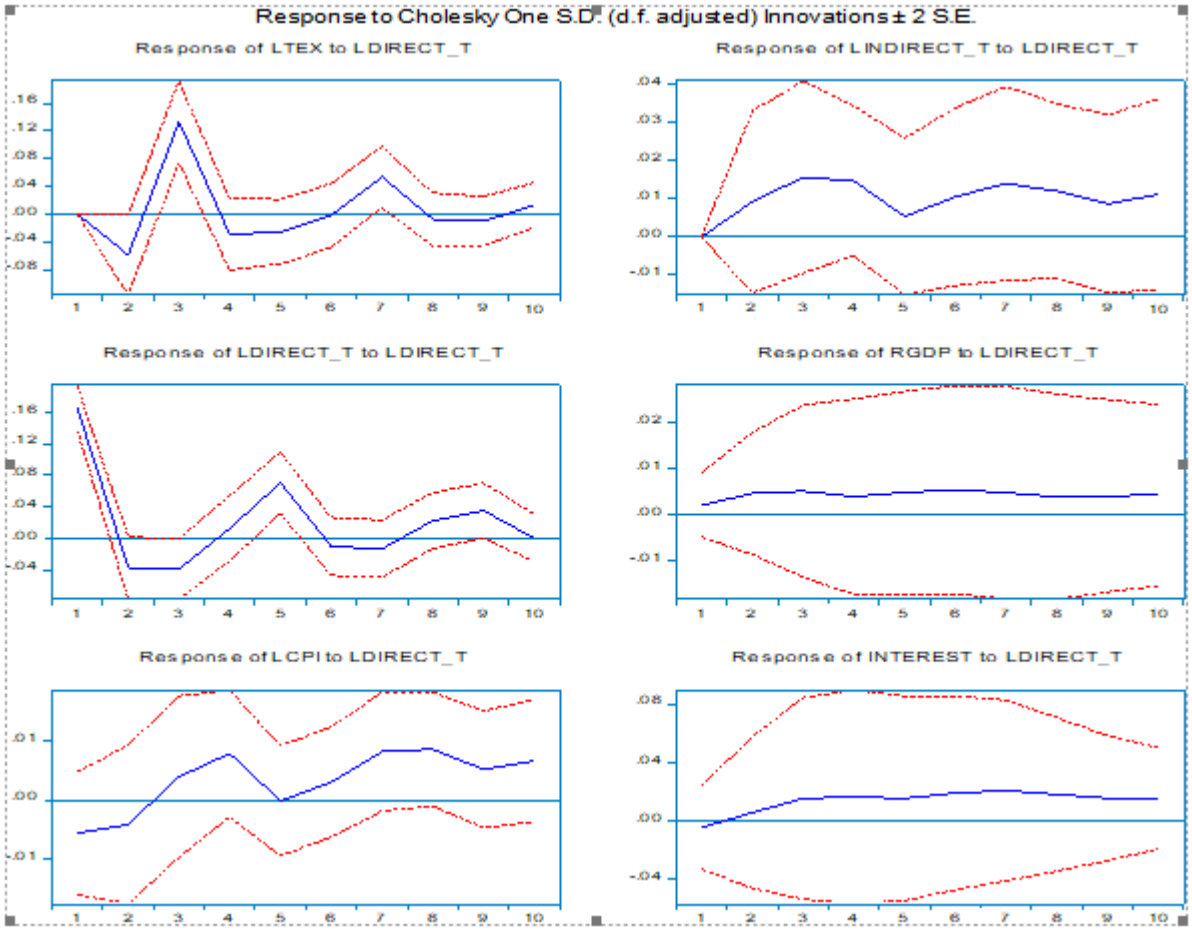
Finally, the response of interest rate to one standard shock in indirect taxes is positive.

Figure 5.5: Response of macroeconomic variables to an increase in indirect tax



Source: Own computation using Eviews 10

Figure 5.6: Response of macroeconomic variables to an increase in direct taxes



Source: Own computation using Eviews 10

5.6.2 Shocks to direct taxes

The response of RGDP to direct taxes shocks indicated that a positive shock in the level of direct taxes would have a positive impact on RGDP starting with the first quarter of forecasting time period up to the third quarter. As it is revealed on the figure 5.6 As soon as a positive shock occurs within the structure of direct taxes, it would have a positive impact on RGDP and then maintain a constant positive level over a medium or long term. In line with this finding(Stoilova & Patonov, 2013) determined an empirical study for analyzing the impact of taxes on economic growth. It has been demonstrated that the impact of direct taxes on economic growth was significant because of the fact that direct tax is more cost effective. Additionally, Geetanjali, et al (2017) investigated that a positive shock to direct taxes had a positive impact on the gross domestic product in India.

The response of inflation to one standard deviation shocks to direct tax is negative for the first three quarters. After the third period the response is positive with a fluctuating response to the impulse. This implies the positive shocks to direct taxes has delayed positive effect on inflation.

Finally, the response of interest rate to direct tax shock is negative for the first quarter. However, after the first period, the response of interest rate to direct tax shock is found to be positive.

Table 5.2: FEV decomposition of output

Period	S.E.	LTEX	LTR	RGDP	LCPI	INTEREST
1	0.269812	0.478297	0.965218	98.55648	0.000000	0.000000
2	0.288028	0.389991	0.922805	98.67191	0.002486	0.012810
3	0.315303	0.811414	1.017984	98.11936	0.030703	0.020542
4	0.320310	1.099992	1.288585	97.43425	0.161276	0.015899
5	0.330262	1.185300	1.342172	97.08462	0.375525	0.012386
6	0.333230	1.173840	1.264032	96.82364	0.704422	0.034065
7	0.342259	1.172971	1.126560	96.47295	1.118339	0.109178
8	0.345999	1.171021	0.987343	96.00278	1.581903	0.256952
9	0.352201	1.176626	0.894094	95.38561	2.061255	0.482412
10	0.356317	1.195442	0.903829	94.57946	2.542368	0.778904

Source: own Computation using Eviews 10

5.7 Forecast error variance decomposition

While impulse response functions trace the effects of a shock to an endogenous variable on the variables in the VAR, variance decomposition decomposes variation in an endogenous variable into the component shocks to the endogenous variables in the VAR. More specifically, it highlights the proportion of the movements in the dependent variables that are a result of their own shocks, versus shocks from the other variables(Lütkepohl, 2005).

Table 5.2 shows that output shocks explain more than 98% of their forecast errors variance at first period. However, this proportion decreases and becomes 94.6% after tenth period. Net government spending and net tax revenue shocks explain, respectively, about 0.47% and 0.96% of the forecast error variance in output after one quarter. The proportion of forecast error variance of output due to net government spending shocks not only persist but also increases slightly to 1.195% by the end of tenth quarter. However, the proportion of forecast error variance of output due to net tax revenue decreases to 0.9% by the end of tenth quarter.

Forecast error variance decomposition analysis as presented in table 5.2 shows that the tax revenue shock is greater in explaining the change in output up to the sixth period but by the seventh –period it is overtaken by government spending shock . After seventh period the price shock is greater next to its own shock in explaining the forecast error variance of output. Fluctuations in output are explained more by changes in the output itself.

Net government spending explains 0.096% of the forecast error variance in inflation by the end of quarter one. The proportion increases to 6.064% by the end of tenth period. This is consistent with the result in the impulse response that is initially net government spending has a small inflationary impact. Net tax revenue shocks explain about 3.47% of the forecast error variance of inflation by the end of first quarter. It rapidly rises to 60.1% by the end of the tenth quarter. This indicates that net tax revenue shocks are very important in explaining the forecast error variance of inflation than net government spending.

As can be seen from the table (5.3) the forecast error variance decomposition of inflation (CPI) is explained more by change in tax revenue than the shocks in government spending. Fluctuations in inflation are explained more by changes in itself and tax revenue variable. After the sixth period, the effects of tax revenue shocks in explaining fluctuation in inflation increased

Table 5.3: FEV decomposition of inflation

Period	S.E.	LTEX	LTR	RGDP	LCPI	INTEREST
1	0.269812	0.096238	3.479477	1.260849	95.16344	0.000000
2	0.288028	0.196483	4.560966	2.289677	92.70104	0.251835
3	0.315303	2.029766	15.20606	2.945989	79.48668	0.331496
4	0.320310	1.522247	29.41002	2.639366	66.12270	0.305670
5	0.330262	2.045156	36.80292	2.245328	58.63657	0.270029
6	0.333230	2.890783	43.27095	1.906512	51.70290	0.228856
7	0.342259	3.389286	49.32876	1.644137	45.43961	0.198204
8	0.345999	4.278071	54.03659	1.485542	40.02841	0.171387
9	0.352201	5.250076	57.36494	1.427455	35.79744	0.160086
10	0.356317	6.064985	60.10204	1.418482	32.22473	0.189764

Source: own computation using Eviews 10

Source: Own computation using Eviews 10

compared to the shock to itself.

About 0.35% of the forecast error variance in interest rate is explained by shocks from net government spending by the end of period one. But, the proportion of forecast error variance in interest rate due to net government expenditure increases to 1.4% after the tenth period. This is in line with neoclassical theory that says increased government spending has crowding out effect of private investment in the long run. Whereas, 5% forecast error variance in interest rate is explained by the shock in net tax revenue by the end of the first quarter. Compared to the shock in net government spending, the shock in net tax revenue is greater in explaining the forecast error variance in interest rate in the short run.

Furthermore, about 17.65% of the forecast error variance in interest rate is explained by shock from inflation in one quarter. However, the proportions of forecast error variance of interest rate due to the shock of inflation rapidly declined,and became about 5.95 percent in the 10^{th}quarter. Whereas 76.88percent of the forecast error variance in interest rate is explained by shock from itself in one quarter. This proportion rapidly increased to 84.63 percent in quarter four and declines to 78.23 percent after two and half years.

5.8 FEV decomposition of disaggregated component of fiscal policy variables

While impulse response functions provide information on the size and sign of the shocks in fiscal policy variables, they give no information on the importance of the respective shocks for the forecast error variance of the variables. In contrast, variance decompositions (VD) indicate the percentage contribution of the different shocks to the variance of the T-step ahead forecast errors of the variables. So that, under this section this study investigates the respective contribution of different shock with a disaggregated component of fiscal policy variables.

The forecast error variance decomposition analysis for the output shows that in the first quarter, a shock to government recurrent spending contributes 2.5%, while the government capital expenditures and net tax revenue contributes 0.33% and 1.66% respectively. Consequently,

Table 5.4: Forecast error variance decomposition of interest rate

Period	S.E.	LTEX	LTR	RGDP	LCPI	INTEREST
1	0.269812	0.350350	5.001115	0.109566	17.65627	76.88270
2	0.288028	0.139085	4.554366	0.051509	13.08812	82.16692
3	0.315303	0.071465	5.568441	0.028561	10.21534	84.11619
4	0.320310	0.109920	6.505593	0.068516	8.680534	84.63544
5	0.330262	0.296569	7.327855	0.188833	7.724495	84.46225
6	0.333230	0.500071	8.205448	0.389627	7.082325	83.82253
7	0.342259	0.713807	9.253300	0.671707	6.638460	82.72273
8	0.345999	0.944823	10.34978	1.029565	6.336203	81.33963
9	0.352201	1.185581	11.45491	1.441876	6.118089	79.79954
10	0.356317	1.409043	12.52672	1.877317	5.955440	78.23148

Source : own computation

Source: Own computation using Eviews 10

the contribution of recurrent government spending shock increases rapidly to 15.5% after two and a half years in explaining forecast error variation in output.

After the second quarter the contribution of capital expenditures increase slightly in explaining variation in output up to the seventh quarter but afterwards it declines. While the contribution of net tax revenue increases up to sixth quarter in explaining variation in output but after sixth quarter the contribution declines and became 2.644%. Output contributes much for its own variation which amounts to be 95.5% in the first quarter and it becomes around 78.3% by the end of the forecast horizon. Compared to government capital expenditure the contribution of government recurrent expenditure is greater in explaining variation in output.

The shock in government recurrent expenditure has a contribution to the forecast error variation in inflation about 0.04% and 3.64% in the first quarter and tenth quarter ahead forecast horizons, respectively. The contribution of government recurrent expenditure in explaining the variation of inflation is very low compared to its contribution in explaining the variation of output. Government capital expenditure contributes 3.2% to the variation in inflation in

Table 5.5: The FEV decomposition of RGDP with respect to components of government spending

Period	S.E.	LCE	LKE	LTR	RGDP	LCPI	INTEREST
1	0.028675	2.498397	0.330935	1.664413	95.50625	0.000000	0.000000
2	0.056873	4.553545	2.257754	2.040300	91.05741	0.021216	0.069774
3	0.083669	6.614338	2.089218	2.453499	88.69644	0.022624	0.123878
4	0.108315	8.431262	2.254026	2.919692	86.23461	0.018585	0.141822
5	0.129532	9.857652	2.506722	3.029647	84.44821	0.036790	0.120974
6	0.147151	11.18053	2.710283	3.038515	82.89692	0.079989	0.093762
7	0.161374	12.46562	2.766066	3.011397	81.50985	0.148587	0.098479
8	0.172607	13.62503	2.750363	2.933721	80.28940	0.239825	0.161666
9	0.181252	14.63687	2.682477	2.798128	79.24892	0.341962	0.291640
10	0.187783	15.51361	2.577005	2.644457	78.33573	0.449780	0.479421

Source: Own computation using Eviews 10

Table 5.6: FEV decomposition of inflation with the type of government spending

Period	S.E.	LCE	LKE	LTR	RGDP	LCPI	INTEREST
1	0.044023	0.047065	3.217961	0.117996	0.346390	96.27059	0.000000
2	0.059012	4.409238	5.350631	0.079113	0.593758	89.42777	0.139488
3	0.065326	4.444449	5.175705	2.794929	1.243606	86.15534	0.185971
4	0.071738	4.521475	5.062491	12.74164	1.390111	76.11938	0.164896
5	0.077649	4.683738	6.780292	19.66467	1.261202	67.33579	0.274301
6	0.084448	4.838731	8.525178	26.82056	1.077432	58.17629	0.561806
7	0.091250	4.479433	9.218711	34.16140	0.923831	50.34973	0.866890
8	0.098909	4.138398	9.950848	41.02290	0.834713	43.00790	1.045237
9	0.106034	3.870113	10.91192	45.82807	0.850080	37.46829	1.071524
10	0.113187	3.644901	11.78586	49.77199	0.923765	32.88395	0.989530

Source: own computation using Eviews 10

Source: Own computation Using Eviews 10

Table 5.7: The variance decomposition of interest rate with respect disaggregated components of government spending

Period	S.E.	LCE	LKE	LTR	RGDP	LCPI	INTEREST
1	0.126828	2.004351	0.007992	7.599605	0.628964	21.78524	67.97384
2	0.231626	1.935559	0.004699	9.092042	0.428308	15.81111	72.72828
3	0.327458	1.568343	0.180423	11.92072	0.245627	12.25567	73.82922
4	0.405763	1.302356	0.315276	14.13324	0.180209	10.08302	73.98590
5	0.465360	1.047521	0.359862	15.84984	0.294879	8.784219	73.66368
6	0.507976	0.892010	0.389774	17.23559	0.565918	7.963254	72.95345
7	0.537423	0.797353	0.400965	18.63390	0.956664	7.390906	71.82022
8	0.556419	0.744946	0.389316	19.83787	1.419948	7.009339	70.59858
9	0.568283	0.721370	0.373239	20.86784	1.887619	6.756475	69.39346
10	0.575522	0.712555	0.373562	21.70162	2.295319	6.593536	68.32341

Source: own computation using Eviews 10

Source: Own computation using Eviews 10

the first quarter. The contribution rapidly increases to 11.78% after tenth quarters. Net tax revenue shocks contributed 0.11% of the variation in inflation in the first quarter however, its contribution increases to 49.77% by the end tenth quarter (2.5 years). The forecast error variation in inflation is more explained by the shock in government capital expenditure compared to government recurrent expenditures as shown in the table 5.6

Lastly, inflation explains 96.27% of its own variation in the first quarter, 58.17% by the end of sixth quarter and 32.88 percent after two and a half years. This indicates the increase in consumer prices is mainly attributed to its own variation.

The shock in current expenditure contributes 2% in explaining the variation in interest rate in the first quarter. However, the contribution slightly decreased and reached 0.71% by tenth quarter. Whereas, the contribution of government capital expenditure shock is 0.0079% in explaining variation in interest rate in the first period, which is very small compared to government recurrent expenditure shock. Relatively, the contribution of government capital expenditure shock increased after the tenth quarter and became 0.37%.

The shock in net tax revenue contributes about 7.6% to forecast error variance in interest rate

Table 5.8: FEV decomposition of RGDP with tax revenue components

Period	S.E.	LTEX	LINDIREC T_T	LDIRECT_ T	RGDP	LCPI	INTEREST
1	0.029820	0.885940	9.240903	0.565694	89.30746	0.000000	0.000000
2	0.058305	0.804864	10.59263	0.808132	87.77369	0.011335	0.009347
3	0.085556	1.306456	10.98433	0.753106	86.80064	0.132959	0.022505
4	0.110244	1.696969	11.13761	0.588915	86.18904	0.363510	0.023953
5	0.131841	1.886065	11.07510	0.552186	85.79657	0.673175	0.016907
6	0.150149	1.888574	10.87773	0.562574	85.55521	1.092721	0.023190
7	0.165296	1.876710	10.47908	0.552726	85.44122	1.584202	0.066055
8	0.177652	1.855609	9.950743	0.530020	85.43840	2.060080	0.165149
9	0.187642	1.818826	9.361690	0.525834	85.48731	2.473883	0.332457
10	0.195657	1.776957	8.775473	0.534229	85.52219	2.825036	0.566118

Source: Own computation using Eviews 10

Table 5.9: FEV decomposition of inflation with a tax revenue component

Period	S.E.	LTEX	LINDIREC T_T	LDIRECT_ T	RGDP	LCPI	INTEREST
1	0.044686	0.008422	9.994944	1.522637	4.144382	84.32962	0.000000
2	0.059596	0.091754	9.797351	1.319554	6.183272	82.38715	0.220921
3	0.070343	1.793839	17.31946	1.269190	7.826631	71.50887	0.282009
4	0.079097	1.600128	25.14927	2.008090	8.470010	62.48377	0.288735
5	0.087101	1.401489	34.49380	1.656045	8.563937	53.64482	0.239905
6	0.095201	1.847155	42.87795	1.492523	8.404574	45.17572	0.202080
7	0.102900	1.961727	49.22495	1.923097	8.043523	38.67251	0.174195
8	0.110862	2.378255	54.51013	2.265433	7.369232	33.32688	0.150071
9	0.118886	3.077663	58.94118	2.166031	6.617617	29.05974	0.137771
10	0.127003	3.701111	62.34771	2.174763	5.895614	25.70711	0.173698

Source: Own computation using Eviews 10

by the end of the first period. The contribution of the shock in net tax revenue rises rapidly to 21.7% in the tenth period. This indicates that the shock in net tax revenue is greater in explaining the variation in interest rate compared to the government expenditure components.

5.8.1 FEVD of macroeconomic variables with respect to types of tax revenue

The contribution of indirect tax is greater in explaining variation in output compared to direct tax in the short run. The proportion of both indirect and direct tax decreases in explaining the variation in output as a forecast horizon increases. For instance, as shown in table 5.8 indirect tax explains 9.24% of the variations in output in the first quarter but this proportions fell to 8.77% by the end of the tenth quarter. The contribution of direct tax is 0.56% in explaining the variation in output in the first period. This proportions fell to 0.53% by the seventh period.

Variance decomposition analysis presented in the table (5.9) shows that indirect tax shocks are greater in explaining the variation in inflation than a direct tax. About 9.99% of the variation in inflation is explained by the shock of indirect tax in the first quarter. This proportion

Table 5.10: FEV decomposition of interest rate with a tax revenue component

Period	S.E.	LTEX	LINDIREC T_T	LDIRECT_ T	RGDP	LCPI	INTEREST
1	0.126503	0.008349	15.52041	0.132942	1.392911	11.86869	71.07670
2	0.226176	0.209735	10.98635	0.103368	0.939589	10.56342	77.19754
3	0.317451	0.422399	10.63167	0.286300	0.558897	9.038523	79.06221
4	0.393724	0.835692	10.81981	0.359942	0.363501	8.022369	79.59869
5	0.453830	1.293861	11.43540	0.385300	0.311947	7.177417	79.39607
6	0.498081	1.671724	12.18281	0.466972	0.348752	6.516416	78.81333
7	0.528840	1.966091	13.01811	0.568239	0.436949	6.039444	77.97116
8	0.549100	2.249626	13.92042	0.635564	0.544050	5.698485	76.95186
9	0.561645	2.504765	14.82664	0.683895	0.639408	5.462202	75.88309
10	0.569055	2.702525	15.66808	0.739370	0.707568	5.321964	74.86049

Source: Own computation using Eviews 10

increased rapidly up to the tenth quarter and stands 62.34% by the end of forecast horizon. While the shock to direct tax explains 1.52% of the variation in inflation at the instant period, this proportion slightly increased and become 2.5% by the end of the tenth period.

The variation in interest rate is more explained by the shock in indirect tax compared to the direct tax. About 15.52% of the variation in interest rate is explained by the shock in indirect tax in the first quarter. This proportion is fell to 10.63% in the third period but after this period the proportion of indirect tax shock increased slightly to 15.66% by the end of forecast horizon. Whereas, the shock in direct tax explains 0.13% of the variation in interest rate in the first period. This proportion increased to 0.73% after the tenth period.

5.9 Vector Error Correction Model

According to(Enders, 1995) , the VAR model with a first difference may not be correct specification when non-stationary data are co-integrated because an error correction missed from the VAR. As a result, considering a VECM is more appropriate hence it considers the variables that are co-integrated and also includes error correction.

Alongside the economic interpretation of co-integration which states that if two or more series are linked to form an equilibrium relationship spanning the long run, then even though the series themselves may contain stochastic trends they will nevertheless have closely overtime and difference between them will be stable(Harris, 1995).

As a result, variables cannot move independently of each other. The omission of the long run relationship by running a VAR with first difference entails a misspecification error. Hence estimating by VAR in first difference is inappropriate if there is at least one co-integrating relation in the model (Enders, 1995). So, The VECM form is a more convenient model setup for co-integration analysis.

$$\Delta \mathbf{y}_t = \Pi \mathbf{y}_{t-1} + \Gamma_1 \Delta \mathbf{y}_{t-1} + ... + \Gamma_{p-1} \Delta \mathbf{y}_{t-p+1} + \mathbf{u}_t \tag{5.1}$$

Here $\Pi = -(I_K - A_1 - ... - A_p)$ and $\Gamma_i = -(A_{i+1} + ... + A_p)$ for $i = 1, ..., p-1$.

The VECM is obtained from the levels VAR by dickey fuller re-parameterization. Because Δy_t

Table 5.11: Johansen cointegration test results

Hypothesize No.of CE(s)	Eigenvalue	Trace statistic		Max.Eigen statistic	
		stat stic	CV	stat stic	CV
None*	0.592	102.9	69.82	58.347	33.88

Note: * indicate the number of co-integration

Source: Own computation using Eviews

Table 5.12: VECM analysis result for baseline model

Variables	rgdp(-1)	Ltex(-1)	Lcpi(-1)	L tr(-1)	interest(-1)	c onstant
longruncoeff	1	−4.20	−1.45	3.89	0.11	−2.53
		[−8.32679]	[−1.055]	[5.59]	[0.6445]	
						C oiEq1
shortruncoeff	0.694	−0.013	−0.027	0.0122	0.0139	−0.0299
	[7.446]	[−1.11]	[−0.3457]	[0.4168]	[0.695]	[−6.9929]

Note: the number in [](parenthesis) indicates the t-statistic

Source: Own computation using Eviews 10

does not contain stochastic trends by our assumption that all variables can be at most $I(1)$, and the term Πy_{t-1} is the only one that includes $I(1)$ variables. Hence, Πy_{t-1} must also be $I(0)$. Thus, it contains the co-integrating relations.

The $\Gamma_{j^s}(j = 1, ..., p-1)$ are often referred to as the short-run or short-term parameters, and Πy_{t-1} is sometimes called the long-run or long-term part. The $\alpha\beta y_{t-1}$ term represents the long run relation ships between variables in levels.

Johansen's approach to testing for co-integration was used to estimate the long-run parameter and test the hypothesis. Before beginning the process, a lag- length test was employed to find the possible optimal lag length. Accordingly, in five variables base line model, starting from four lags, all criteria choose two lags as optimum lag value.

Both Trace and Max-eigenvalue test statistic indicates 1 co-integrating equations at the 0.05 level of significance. The results of the Johansen co-integration test points to one long run relationship among the variables. Such a result suggests that vector error correction model could be estimated to take the co-integration relation into account. Accordingly, the VECM analysis results are given as follows:

For easier interpretation we can rewrite the long run equilibrium relationship normalized on $RGDP$ as:

$$RGDP = 2.53 + 4.20LTEX + 1.45LCP - 3.88LTR - 0.107\text{interest rate}$$

The results of VECM analysis in table 5.12 reveals that the ECM term is correctly signed. The value of error correction coefficient is 2.986% and is significant.This indicates that 2.986% of the short run disequilibrium of the RGDP corrected each other. In other words previous year

error will be corrected in the following year at an adjustment rate of 2.986%. RGDP adjusts to its long run equilibrium at speed of 2.986%.

The VECM analysis indicates that government spending and tax revenue are significant in determining economic growth in the long run. A 1% increase in government spending leads to an increase of 4.2% in RGDP. On the other hand 1% increase of total tax revenue leads to fall of 3.88% in national output in Ethiopia. This finding is in line with Keynesian theory that says expansionary fiscal policy (increasing government spending or tax cuts) promotes economic growth by stimulating additional household demand for consumer goods. As a result, producers must increase their production, which requires firms to hire workers because of increased purchases and lower unemployment, people have more money to spend and increase their consumption. This consumption- production cycle leads to multiplier effect resulting in an overall increase in output. By the same token the increase in tax revenue decreases the growth of output which meets the theoretical framework of contractionary fiscal policy.

The normalized adjustment coefficient for RGDP is -0.02986 which is significant as shown in table 5.12. In the short run the relation between government spending and RGDP is positive after normalized which is the same direction in the long run. However, the effect of government spending on output in the short run is insignificant. The reason is that, in the short run the increase in government spending does not affect output contemporaneously because of budget approval and implementation time lags. Moreover, the effect of total tax revenue on output is insignificant in the short run but it has the same direction with the long run effect.[4]

5.10 VECM analysis for the components of government spending

The first step in this model is to test for the Optimal lag-length. Accordingly the two optimal lag was chosen because the statistics for autocorrelation and heteroscedasticity were better than the others. There was no evidence of autocorrelation and heteroscedasticity in the two-lag model at the 95%level of confidence. The next step is to test for presence of co-integration. The results of trace of statistic shows 3 co-integrated vectors and the results of maximum eigenvalues shows presence of 1 co-integrating vector. So, when trace statistic and maximum eigenvalues produce little contradicting result the researcher should give more importance to trace statistics because, trace statistic considers all of the smallest eigenvalues, it holds more power than maximum eigenvalue statistic. Moreover, a Monte carlo comparison shows in the case of small sample DGP trace tests is superior to that of maximum eigenvalue test(Lütkepohl, 2005). Following, this study used 3 co-integrated vectors which is suggested by trace test.

For easier interpretation rewrite the long run equilibrium relationship normalized on RGDP as follows:

$$RGDP = 3.2645 + 1.53LCE + 2.99LKE - 3.398LTR$$

As can be seen from the table 5.14 the long run coefficient of both recurrent spending and capital spending is positive and significant after normalized on RGDP. 1% increase in recurrent government spending leads to 1.53% increase in real GDP. Further, the VECM result reveals

[4]For detial result of the VECM model see Appendix E_2

Table 5.13: co-integration test for government spending components

Eigenvalue	Trace		max.eigen value		
		Statistic	Cr Value	Statistic	CV
None*	0.6267	144.72	95.7537	64.050	40.078
At most 1*	0.3672	80.669	69.819		
At most 2*	0.2842	50.9278	47.86		

Note: * indicates the number of co-integration
Source: Own computation using Eviews 10

Table 5.14: long run relations of variables with RGDP

	RGDP(-1)	LCE(-1)	LKE(-1)	LTR(-1)	constant
longruncoeff	1	−1.531834	−2.995216	3.398025	−3.26488
		[−3.14483]	[−7.01302]	[6.94140]	
	D(RGDP(-1)	D(LCE(-1)	D(LKE(-1)	D(LTR(-1)	CoinEq1
shortruncoeff	0.68362	0.007395	−0.024061	−0.010195	−0.01994
	[7.41219]	[0.41576]	[−1.66889]	[−0.31278]	[−14.7195]

Note: the number in [](parenthesis) indicates the value of t-statistic
Source: Own computation using Eviews 10

that capital expenditure has significant impact on economic growth in the long run. As shown in the table 1% increase in capital expenditure leads to 2.99% increase in real GDP in the long run. In the short run the effect of capital spending on economic growth is insignificant as shown on table 5.14. This is because in the short run there are various kinds of bottlenecks like implementation lag, corruption, lack of strong governance on capital projects these and other bottlenecks make capital spending to be insignificant in the short run. However, in the long run the effect of capital spending is positive and significant. This might be due to the improvement of short run bottlenecks. Finally, the the error correction term is negative and statistically significant implies previous year error will be corrected in the following year at the speed of 1.994% which signifies convergence of RGDP to its long run equilibrium.[5]

Rewriting the long run equilibrium relationship normalized on inflation as follows:

$$LCPI = -1.269 - 0.159LCE + 0.0019LKE + 0.7157LTR$$

As can be seen in the table 5.15 the effects of both recurrent and capital government spending is insignificant in affecting inflation in the long run. However, in the short run the effect of recurrent spending is significant on inflation. The reason for this might be the shift of both recurrent and capital spending on the productive activities that increase the aggregate supply

[5]See the details of the result on appendix E_6

Table 5.15: Long run relations of variables with inflation

Variables	LCPI(-1)	LCE(-1)	LKE(-1)	LTR(-1)	Constant
Longruncoef	1	0.1585	−0.002	−0.716	1.269
		[1.125]	[−0.015]	[−5.034]	
					CointEq2
shortruncoff	0.116	0.063	−0.015	−0.111	**-0.1798**
	[0.8634]	[2.28]	[−0.675]	[−2.199]	**[-3.7077]**

Note: The number in [](parenthesis) indicates the value of t- statistic
Source: Own computation using Eviews 10

Table 5.16: Long run relations of variables with interest rate

Variables	interest(-1)	Lce(-1)	Lke(-1)	Ltr(-1)	constant
Longruncoeff	1	1.085	10.71	−10.9	−10.2
		[0.900]	[10.13]	[−8.98]	
					CointEq3
Shortruncoef	0.6620	−0.1395	0.059	−0.132	−0.0496
	[6.325]	[−1.826]	[0.95]	[−0.944]	[−2.5166]

Note: The number in [ ] (parenthesis) indicates the value of t- statistic
Source: Own computation using Eviews 10

with the increased aggregate demand. In the short run increase in government spending leads the aggregate demand to rise which directly contribute to inflation hence in the short run the response of aggregate supply to government spending lags behind. This due to infrastructural and managerial constraint that mostly characterize developing countries like Ethiopia. However, in the long run the improvement of those constraint leads aggregate supply to respond positively. The positive response of aggregate supply offsets the inflationary pressure created by the shock of aggregate demand in the short run. Therefore, it can be argued that in the long run the effects of capital and recurrent spending on inflation have been null in Ethiopia. On the other hand, the effect of total tax in both short run and the long run on inflation is positive and significant. This might be because of as tax increase the cost of production increase which leads aggregate supply to shift to the left. Finally creates shortage of supply compared to the demand for goods and service in the market which leads price to rise. Finally, inflation is adjusted to its long run equilibrium at speed of 17.98%.[6]

Rewriting the long run coefficients of variables normalized on interest rate as follows:

[6]Detial result is shown on appendix E_6

Table 5.17: Co-integration test for tax revenue components

Hypothesized No.CE(s)	Eigenvalue	Trace		Max.egenvalue	
		statistic	CV	Statistic	CV
None*	0.608	151.1	95.8	60.9	40.1
At most 1*	0.522	90.14	69.8	48.0	33.9

Note: * indicates the number of co-integration

Source: Own computation using Eviews 10

$$\text{interest rate} = 10.2 - 1.085LCE - 10.7LKE + 10.88LTR$$

As shown in the table 5.16 the effect of recurrent government spending on interest rate in both short run and long run is insignificant. In the short run recurrent government expenditure has crowding out effect on private investment. In contrast to recurrent spending the long run effect of capital spending on interest rate is negative and significant. Other things remain constant 1% increase in capital spending leads to 10.7% decrease in interest rate in the long run. This finding contradict with the theoretical framework that says increasing in government capital spending result in crowding out of private investment. However, unlike the theoretical framework capital spending or public investment can directly or indirectly create favorable condition for private investment, for instance, by providing infrastructure such as roads highways, sewage systems. Better facilities may increase the productivity private investment and reduce the cost production of private sectors, a positive impact on the profitability of private investment would result in crowding in effect of private investment. In addition to, theoretical justification for crowding in effects of private investment there are also empirical support. For instance,(Barro, 1990; Ahmed & Miller, 2000) found that, capital spending on non-infrastructure projects crowding out private investment in the long run whereas increased capital spending on infrastructure leads crowding in private investment. Moreover, for Ethiopia(Hailu, 2015) found that capital government spending have crowding in effect on private investment whereas the effect of recurrent government spending have crowding out effect on private investment in the short run.[7]

5.11 VECM analysis result for the components of tax revenue

As can seen from the table 5.17, both the trace statistic and maximum eigenvalue statistic suggest the existence of two co-integrating vectors.

Rewriting long run coefficient of tax revenue components normalized on RGDP as follows:

$$RGDP = 8.586 + 0.941LTEX - 1.549LINDIRECTTAX + 1.15LDIRECTTAX - 0.161Inr$$

[7]For detail discussion of crowding in and out effect of private investment as a result of government spending and its components shocks see,(Hailu, 2015; Ahmed & Miller, 2000; Barro, 1990)

Table 5.18: Long run relations of tax revenue components with RGDP

Variables	rgdp(-1)	Ltex(-1)	Lindirect(-1)	Ldirect(-1)	interest(-1)	constant
longruncoeff	1	−0.94	1.55	−1.15	0.16	−8.59
		[−6.45]	[6.32]	[−5.996]	[3.832]	
						CoiEq1
Shortruncoeff	0.684	−0.016	−0.01	0.001	0.014	−0.132
	[7.112]	[−1.20]	[−0.275]	[0.054]	[0.671]	[−6.3682]

Note: The number in [ ](parenthesis) indicates t- value

Source: Own computation using Eviews 10

Table 5.19: Long run relations of tax revenue components with inflation

Variables	Lcpi(-1)	Ltex(-1)	Lindirect(-1)	Ldirect(-1)	interst(-1)	constant
longruncoeff	1	3.95191	0.19346	−3.955	0.1537	−12.503
		[8.10596]	[0.23616]	[−6.1688]	1.09184	
						CoEqn2
Shortruncoeff	0.06728	0.06413	−0.06318	−0.02892	0.03469	−0.0125
	[0.46057]	[2.96045]	[−1.02791]	[−0.94566]	[1.05261]	[−2.08495]

As shown on figure 5.18 indirect tax has negative and significant effect on economic growth in the long run. Due to 1% increase in indirect taxes economic growth would decrease by 1.549% other things remain constant. This finding is in line with the finding of(Ilaboya & Mgbame, 2012) for Nigeria. In the same vein, (Harberger,(1964), Greenidge & Darkes (2009), Musanga (2007), cited in (Ilaboya & Mgbame, 2012) found that an increase in indirect tax compared to direct tax reduces economic growth in both short run and long run. Whereas the direct taxes has positive and significant effect on economic growth in the long run. Due to 1% increase in direct tax economic growth would increase by 1.15% other things remain constant. Nevertheless, the short run effect of direct tax on economic growth is insignificant. At aggregate level the effect of total tax revenue on economic growth was negative in the long run. However, after disaggregating total tax revenue into its components the effect become different. Therefore, investigating the effects of disaggregated components of tax revenue on macroeconomic variables are advisable rather than dealing with aggregate level of fiscal policy variables.[8]

Rewriting long run coefficient of tax revenue components normalized on inflation as follows:

[8]For more discussion concerning the negative effect of indirect tax on economic growth compared to the increase of direct tax see Harberger(1964), Koch,Schoeman & Van- Tonder (2005)

$$LCPI = 12.5 - 3.95\text{Ltex} - 0.19\text{Lindirecttax} + 3.95\text{Ldirecttax}$$

As shown on Table 5.19 indirect tax has negative and insignificant effect on inflation in both short run and long run. This is because indirect taxes are deterrents on the use of specific business, service and products. So taxing a product or services are making it expensive, which will lead to immediate decrease in consumption and long term decrease in inflation. Whereas, direct tax have positive and significant effect on inflation in the long run. Due to 1% increase in direct taxes inflation would increase by 3.95% in Ethiopia other things remain constant. Nevertheless, in the short run the effect of direct tax on inflation is insignificant. The effects of direct tax can be positive or negative based the composition of direct taxes. For instance, if the proportion of employment income tax is higher it might have negative effect on inflation in the long run. This because, increased employment income tax leads reduction of disposable income which result in decline of household consumption spending and long run decrease in inflation. On the other hand, if higher proportion of direct taxes are collected from business, direct taxes have positive effect on inflation. This might be seen in two ways: One due to increased cost of production to business firms which leads cost pull inflation. On the other hand, business firms shifts the burden of tax to consumer by increasing the price of goods.[9]

[9]In Ethiopia the business income tax contributes 62% to direct tax which the highest contribution compared to personal income tax and rental income tax. About 36% of direct tax is collected from personal income tax and 2% from rental tax. Source is own computation using the data from NBE.

Chapter 6

Conclusion and policy implications

6.1 Conclusion

This chapter presents a summary of the thesis and draws conclusions about how fiscal policy affects the macro-economy of Ethiopia, especially the effect of shocks in fiscal policy variables on macroeconomic variables. The investigation was carried out by examining the effects of changes in government spending and taxation, by type, on GDP, the price level and the interest rate.

This study used quarterly macroeconomic data which included 9 variables for the period 2000/01Q1–2016/17Q4. From the review of the literature, the effects of an expansionary fiscal policy on GDP were found to be positive in most studies in the case of a total government spending shock. Nevertheless, considering government spending by type, there is still controversy about the effect of current spending and capital spending; for example, some studies found that an increase in capital spending increased output more than an increase in current spending, while some found the opposite.

The first objective of this study was to investigate the effect of shocks in total government spending and total tax on output, price level, and interest rate. Accordingly, output responded positively to positive shocks of total government spending. Inflation and interest rate also positively responded to a positive shock in total government spending though they negatively responded at the beginning(in the first three and fourth quarters).

In the case of tax revenue shocks the effect on output is negative up to the eighth quarter but after, output responded positively to the shock. In the same manner, inflation and interest rate positively responded to total tax revenue shock[1].

The second research objective examined the effects of government spending and tax, by type, on output, price level, and interest rate. The shock in recurrent government expenditure is positively affected output and has an inflationary impact but the interest rate negatively responded to the shocks in recurrent government expenditure. In contrast to recurrent government spending shock, output negatively responded to capital spending shocks. Whereas, the effect of shock in capital spending on inflation and interest rate is similar to the effect of shocks in recurrent expenditure. This finding is in line with the finding of de Castro Fernández, and Hernández de Cos (2006) for Spain that is the shock in recurrent spending increased output more than the shock in capital spending.

In the case of taxation shock by type, output responded positively to a positive shock to direct tax. Inflation responded negatively for the first two quarters to a positive shock to direct tax.

[1] A negative response of output to an increase in total tax has generally been found in many studies (e.g. (Blanchard & Perotti, 2002; Caldara & Kamps, 2008; Tenhofen et al., 2010). Additionally, Damane et al, (2016) found that the shock in tax revenue has no significant impact on output and interest rate but increase consumer price index for Lesotho. The positive effect of tax revenue shock on output was also found for example by(Abubakar, 2016; Daude et al., 2010)

But after the second quarter, the response is positive. In a similar manner, the interest rate responded positively to direct tax shock.[2]. In terms of the indirect tax shocks, output responded negatively to a positive shock from indirect tax. This finding is in line with the finding of de Castro Fernández (2003) and Arin et al. (2005)(Arin et al., 2005) that was positive shocks in indirect tax had a negative effect of on output. Inflation and interest rate positively responded to indirect tax shocks in Ethiopia.

The third research objective is to examine the variation of macroeconomic variables due to the effects of fiscal policy shocks. Accordingly, the shocks in government spending and recurrent government spending explain more proportions of the variation in output; compared to the positive shocks in capital expenditures. By the same token, a positive shock in net tax revenue and direct tax explained more percentage of variation in output up to fifth quarter compared to the indirect tax shocks.The proportions of variation in inflation is more explained by the shocks in capital expenditure compared to the shocks in current and net government spending. Similarly, the shocks in indirect tax and net tax revenue explain more proportion of variation in inflation compared to the direct tax. Moreover, the variation in interest rate was more explained by the shocks in indirect tax and net tax revenue. From expenditure components, the shock in recurrent expenditure explains more the variation in the interest rate.

The fourth objective of the research is to investigate the dynamic effects of fiscal policy variables on macroeconomic variables. In doing so, this study employed a VECM approach to obtain the short run and long run effects fiscal policy variables. Accordingly, the government expenditure has a positive effect in both the short run and a long run on output. However, the short-run effect of government spending on output is insignificant. In contrast to government expenditure increase in tax revenue has a negative effect on output in both the short run and long run but the short effect is insignificant. When considering the disaggregated components of government spending, both recurrent and capital spending has a positive and significant effect on output in the long run. Nevertheless, their short-run effect on output is insignificant. In addition, the recurrent spending has a negative effect on inflation in the short run but the effect, in the long run, is insignificant. On the other side, the effect of capital spending on inflation is positive. However, it is insignificant in both short run and long run. In the same vein, in the short recurrent spending has a positive effect on interest rate even though it is insignificant which implies crowding out of the private investment. However, in the long run, the effect becomes negative. On the other side, capital spending has a negative effect on the interest rate in both the short run and long run which implies crowding in private investment in Ethiopia. In considering the subcategory of tax revenue indirect tax has negative and significant on output in the long run but in the short run, it has a positive and insignificant effect on output. In contrast to indirect tax, the direct tax has a positive and significant effect on output in the long run and has a negative effect in the short run. Further, the indirect tax has a positive effect on inflation in the short run and has a negative effect in the long run. However, in both period the effect is insignificant. On the other side, the direct tax has inflationary pressure in both the short run and long run even though it is insignificant in the short run.

[2]some studies have found that output responded positively to an increase in direct tax shock for example (Tenhofen et al., 2010; Bargicho, 2016; Arin et al., 2005)

6.2 Policy implications

Based on the aforementioned finding this study recommends the following points. First, each kind of tax and government spending results in a different effect on the economy. For example, the positive effect of current spending on output is stronger and longer than the effect of capital spending. Moreover, an increase in some taxes, such as indirect tax, yielded negative effects on output, while the result from an increase in direct tax did not. As a result, the kind of spending and taxation should be considered as it can be misleading to use only total tax and total spending to judge fiscal policy.

As found by many studies the positive shocks in government spending has an expansionary effect on output. But also it leads the price level to raise that means it had an inflationary effect. Considering the disaggregate components of government expenditure the shocks in current spending had an expansionary effect on output and little effect on inflation. In contrast, the shocks in capital spending had a negative effect on output in the short term. The effect on inflation is positive and significant. As a result, using net government spending and capital spending is not recommendable to control price stability in the economy. So, it is better to use government recurrent expenditure for stabilization purpose because it has an expansionary effect on the output with little effect on inflation in the short run.

In the case of taxation, a positive shock in net tax revenue had a negative effect on output. But increases the price level which results in inflation. Considering, the components of tax revenue, positive shocks in indirect tax has a negative effect on output. Whereas, the effect of indirect tax shocks on inflation is positive. On the other hand, a positive shock to direct taxes has an expansionary effect on output and has little effect on inflation in the long run. As a result, it is better to use direct tax in the long run as a policy instrument.

6.3 Suggestions for the future research direction

This study does not investigate the effect of the components of current spending and capital spending. Knowing the effect of each component of current spending and capital spending could improve the effectiveness of fiscal policy; e.g. if we know what components of current spending are more effective, we can choose to place more importance on those components so that the multiplier of recurrent spending can be higher. Moreover, total government spending in this study is classified by using the economic distinction between recurrent and government capital spending. To understand the effect of fiscal policy better, other classifications of government spending should be examined.

Furthermore, this study only investigates two components of tax revenue: direct and indirect taxes. So, in order to understand the effect of fiscal policy including additional classification of tax revenue and also investigating the components of indirect tax and direct tax have paramount importance. It is better to focus more on components of tax revenue which has a distortionary and expansionary effects on output and inflation.

This study also can be extended by considering components of GDP such as investment, consumption and trade balance; as well as other external balance such as real effective exchange rate and also its better to include debt fed back in further study. Likewise, it would be useful to investigate the effect of fiscal policy shocks on macro and micro economic variables using an advanced model like new Keynesian DSGE model.

Moreover, extending this study by incorporating the issue of cross- border effects of fiscal policy shocks on macroeconomic variables is better to get more insight about the effects of fiscal policy.

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APPENDIX

AppendixA_1:Autocorrelation test

LRE* stat	df	Prob.	Rao F-stat	df	Prob.
33.22352	25	0.1256	1.365471	(25, 172.4)	0.1270
65.46456	50	0.0700	1.359787	(50, 190.4)	0.0738

AppendixA_2 optimal lag selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1.503707	NA	7.68e-07	0.109259	0.277922	0.175704
1	389.3874	703.0393	9.15e-12	-11.23086	-10.21888	-10.83219
2	457.7128	**113.1638***	**2.40e-12***	**-12.58477***	**-10.72948***	**-11.85388***
3	479.6313	32.87777	2.74e-12	-12.48848	-9.789873	-11.42536
4	499.7937	27.09323	3.42e-12	-12.33730	-8.795385	-10.94196

AppendixA_3 VAR residual normality test

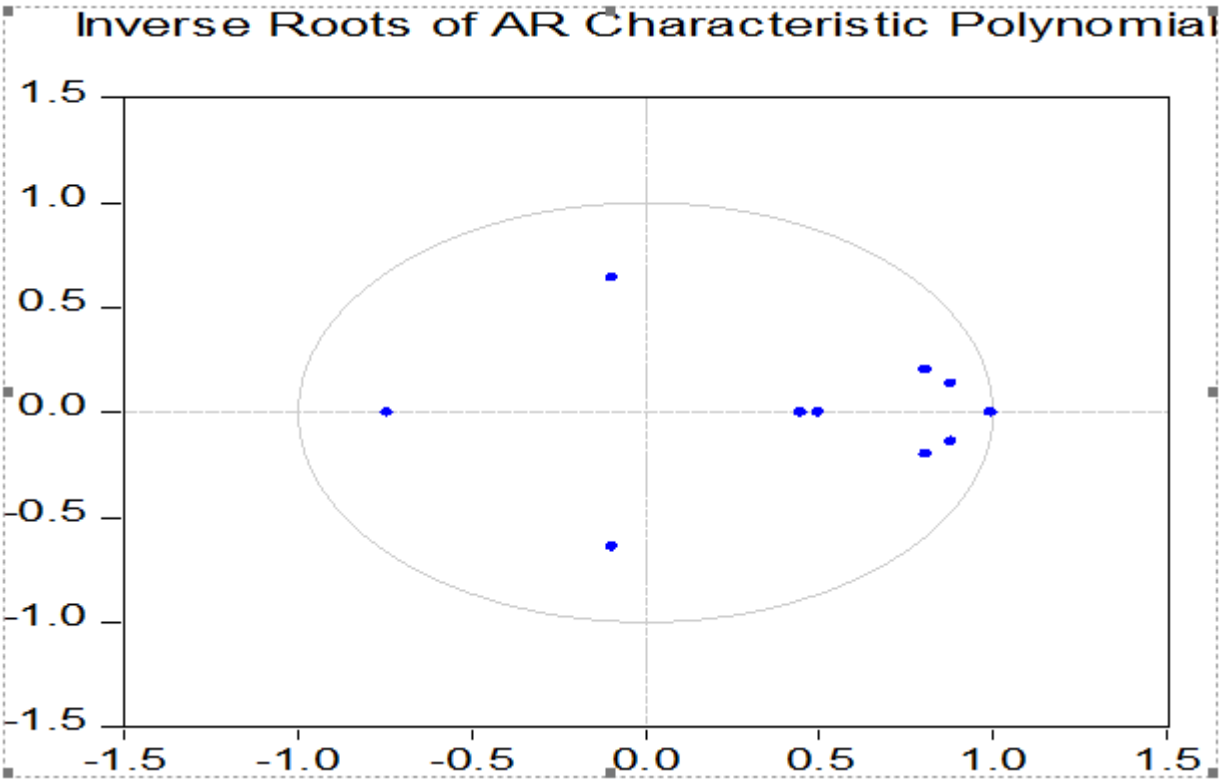
Component	Jarque-Bera	df	Prob.
1	249.8408	2	0.0000
2	2.439768	2	0.2953
3	3477.837	2	0.0000
4	90.00473	2	0.0000
5	79.39145	2	0.0000
Joint	3899.513	10	0.0000

Appendix A_4VAR residual Heteroskedasticity Tests

Joint test:

Chi-sq	df	Prob.
938.6974	885	0.1025

Appendix A_5Model stability test

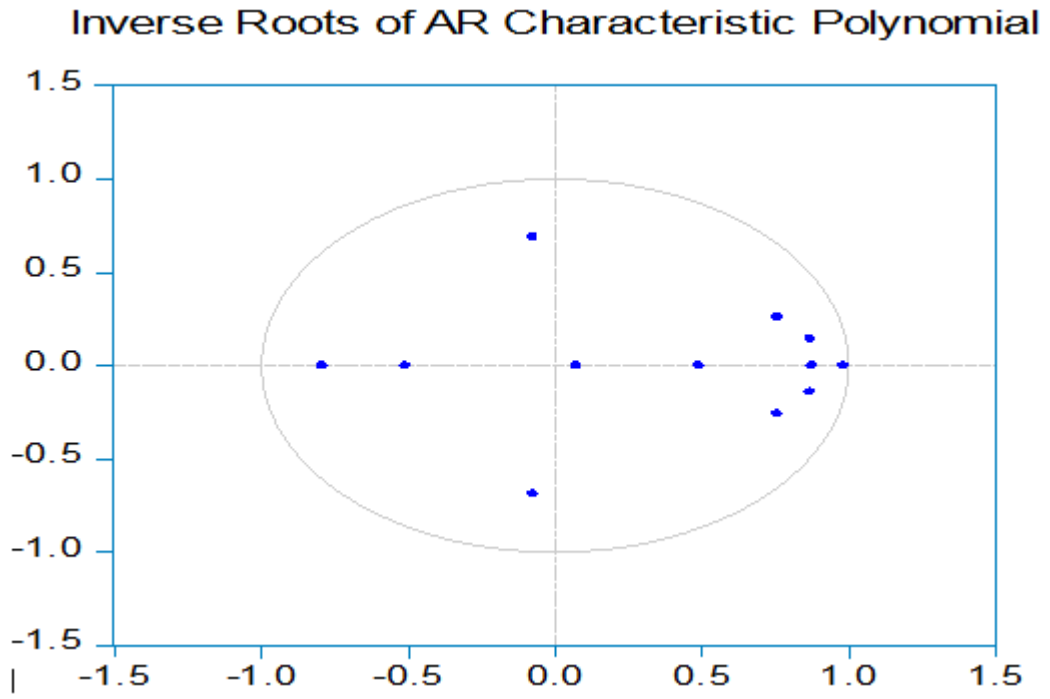


Appendix B pre and post-estimation test result for disaggregated component effects of fiscal policy

AppendixB_1 optimal lag selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-74.73008	NA	5.02e-07	2.522815	2.725210	2.602549
1	343.1362	744.3243	3.32e-12	-9.410506	-7.993739	-8.852370
2	428.8945	136.6773	7.21e-13	-10.96545	-8.334313*	-9.928914*
3	460.0974	43.87913	9.04e-13	-10.81554	-6.970033	-9.300603
4	526.4542	80.87235*	4.08e-13*	-11.76419*	-6.704312	-9.770851

Appendix B_2 VAR stability test



AppendixB_3 test for autocorrelation

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	43.62097	36	0.1791	1.238384	(36, 187.2)	0.1824
2	55.80409	36	0.0187	1.634207	(36, 187.2)	0.0194

Appendix$B4$ test for heteroscedasticity

Joint test:

Chi-sq	df	Prob.
552.1894	504	0.0677

AppendixB_5 Test For Normality

Component	Jarque-Bera	df	Prob.
1	8.283395	2	0.0159
2	2.288880	2	0.3184
3	1.011689	2	0.6030
4	1917.507	2	0.0000
5	83.13249	2	0.0000
6	14.85046	2	0.0006
Joint	2027.074	12	0.0000

AB matrix identification and Estimation

Structural VAR is just-identified

Model: Ae = Bu where E[uu']=I

A =

1	0	0	0	0	0
0	1	0	0	0	0
0	0	1	-0.86	-0.85	0
C(1)	C(4)	C(7)	1	0	0
C(2)	C(5)	C(8)	C(10)	1	0
C(3)	C(6)	C(9)	C(11)	C(12)	1

B =

C(13)	0	0	0	0	0
C(14)	C(16)	0	0	0	0
C(15)	C(17)	C(18)	0	0	0
0	0	0	C(19)	0	0
0	0	0	0	C(20)	0
0	0	0	0	0	C(21)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	-0.030933	0.022047	-1.403016	0.1606
C(2)	0.032470	0.035446	0.916064	0.3596
C(3)	0.069824	0.081296	0.858884	0.3904
C(4)	0.009090	0.015729	0.577915	0.5633
C(5)	-0.034447	0.024927	-1.381920	0.1670
C(6)	0.045453	0.057898	0.785057	0.4324
C(7)	0.110878	0.039376	2.815881	0.0049
C(8)	0.124450	0.060777	2.047653	0.0406
C(9)	-0.340386	0.131057	-2.597241	0.0094
C(10)	-0.228989	0.213191	-1.074106	0.2828
C(11)	-0.232219	0.460125	-0.504688	0.6138
C(12)	-1.370460	0.297978	-4.599200	0.0000
C(13)	0.180843	0.015740	11.48912	0.0000
C(14)	0.113563	0.029615	3.834655	0.0001
C(15)	-0.002823	0.013671	-0.206459	0.8364
C(16)	0.226796	0.019740	11.48912	0.0000
C(17)	-0.009010	0.013647	-0.660259	0.5091
C(18)	0.110682	0.009634	11.48912	0.0000
C(19)	0.028957	0.002705	10.70314	0.0000
C(20)	0.045787	0.004451	10.28735	0.0000
C(21)	0.104565	0.009101	11.48912	0.0000
Log likelihood	393.7576			

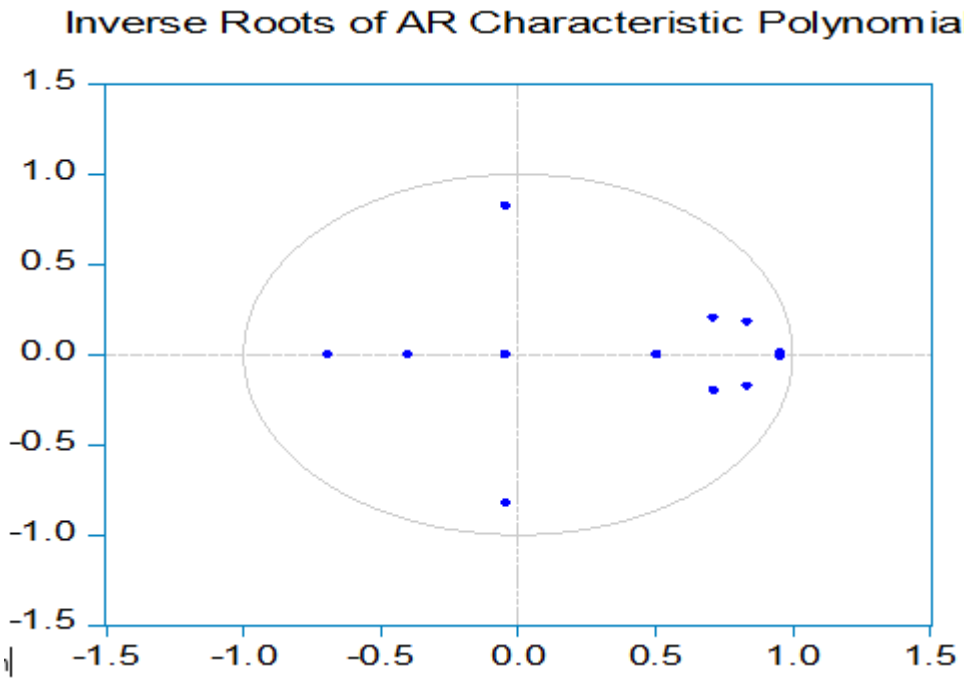
Appendix Cpost estimation diagnostic test results

AppendixC_1Optimal lag selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-83.74938	NA	6.66e-07	2.804668	3.007063	2.884402
1	340.4861	755.6694	3.60e-12	-9.327690	-7.910923	-8.769554
2	425.8255	136.0096*	7.93e-13*	-10.86955*	-8.238407*	-9.833007*
3	460.0133	48.07662	9.06e-13	-10.81291	-6.967404	-9.297974
4	495.6334	43.41203	1.07e-12	-10.80104	-5.741162	-8.807701

* indicates lag order selected by the criterion

Appendix$C2$ VAR stability test



AppendixC_3 autocorrelation test

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	44.32378	36	0.1607	1.260582	(36, 187.2)	0.1639
2	88.10692	72	0.0954	1.263339	(72, 201.7)	0.1050

AppendixC_4Test For Heteroscadesticity

Joint test:

Chi-sq	df	Prob.
561.8818	504	0.0377

Appendix$C5$ test for normality

Component	Jarque-Bera	df	Prob.
1	447.0356	2	0.0000
2	3.715798	2	0.1560
3	3.475056	2	0.1760
4	2412.511	2	0.0000
5	52.34165	2	0.0000
6	29.03193	2	0.0000
Joint	2948.111	12	0.0000

Appendix $_C6AB$ matrix restriction for identification of SVAR

Model: Ae = Bu where E[uu']=I

A =

1	0	0	0	-0.5	0
0	1	0	-1	-1.04	0
0	0	1	-1.06	-0.793	0
C(1)	C(4)	C(7)	1	0	0
C(2)	C(5)	C(8)	C(10)	1	0
C(3)	C(6)	C(9)	C(11)	C(12)	1

B =

C(13)	0	0	0	0	0
C(14)	C(16)	0	0	0	0
C(15)	C(17)	C(18)	0	0	0
0	0	0	C(19)	0	0
0	0	0	0	C(20)	0
0	0	0	0	0	C(21)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	-0.020065	0.014708	-1.364298	0.1725
C(2)	0.021092	0.021723	0.970952	0.3316
C(3)	0.017771	0.052398	0.339159	0.7345
C(4)	0.179005	0.040181	4.454929	0.0000
C(5)	-0.061632	0.058617	-1.051437	0.2931
C(6)	-0.343114	0.144235	-2.378853	0.0174
C(7)	0.011962	0.022966	0.520862	0.6025
C(8)	0.062289	0.033225	1.874771	0.0608
C(9)	-0.004990	0.080620	-0.061890	0.9507
C(10)	-0.533826	0.208113	-2.565082	0.0103
C(11)	-0.186961	0.477157	-0.391822	0.6952
C(12)	-1.062045	0.319914	-3.319784	0.0009
C(13)	0.258596	0.022508	11.48912	0.0000
C(14)	0.015103	0.014244	1.060356	0.2890
C(15)	0.017502	0.021834	0.801596	0.4228
C(16)	0.115223	0.010029	11.48912	0.0000
C(17)	0.056563	0.021217	2.665937	0.0077
C(18)	0.167661	0.014593	11.48912	0.0000
C(19)	0.030311	0.003079	9.843197	0.0000
C(20)	0.044226	0.004428	9.988440	0.0000
C(21)	0.106651	0.009283	11.48912	0.0000
Log likelihood	388.6840			

Appendix D_1: the estimated result of net tax revenue elasticity with output

Dependent Variable: LOG(REAL_DT)
Method: Least Squares
Date: 02/26/19 Time: 00:43
Sample: 2000/01Q1 2016/17Q4
Included observations: 68

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-18.30356	1.131321	-16.17893	0.0000
LOG(REALGDP)	**1.063418**	0.087939	12.09267	0.0000

R-squared	0.689021	Mean dependent var	-4.636494
Adjusted R-squared	0.684309	S.D. dependent var	0.740854
S.E. of regression	0.416260	Akaike info criterion	1.113955
Sum squared resid	11.43595	Schwarz criterion	1.179234
Log likelihood	-35.87447	Hannan-Quinn criter.	1.139821
F-statistic	146.2327	Durbin-Watson stat	0.625507
Prob(F-statistic)	0.000000		

Appendix D_2

Dependent Variable: LOG(REAL_IDIREC)
Method: Least Squares
Date: 02/26/19 Time: 01:10
Sample: 2000Q1 2016Q4
Included observations: 68

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-13.42292	0.927060	-14.47901	0.0000
LOG(PCQ)	0.753513	0.072893	10.33722	0.0000

R-squared	0.618184	Mean dependent var	-3.851032
Adjusted R-squared	0.612399	S.D. dependent var	0.597172
S.E. of regression	0.371785	Akaike info criterion	0.887970
Sum squared resid	9.122807	Schwarz criterion	0.953250
Log likelihood	-28.19099	Hannan-Quinn criter.	0.913836
F-statistic	106.8581	Durbin-Watson stat	0.128609
Prob(F-statistic)	0.000000		

AppendixD_3

Dependent Variable: LOG(PCQ)
Method: Least Squares
Date: 02/26/19 Time: 01:11
Sample: 2000Q1 2016Q4
Included observations: 68

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.886272	0.328424	-2.698561	0.0088
LOG(REALGDP)	1.057365	0.025529	41.41851	0.0000

R-squared	0.962952	Mean dependent var	12.70301
Adjusted R-squared	0.962391	S.D. dependent var	0.623114
S.E. of regression	0.120841	Akaike info criterion	-1.359718
Sum squared resid	0.963762	Schwarz criterion	-1.294438
Log likelihood	48.23041	Hannan-Quinn criter.	-1.333852
F-statistic	1715.493	Durbin-Watson stat	0.239975
Prob(F-statistic)	0.000000		

AppendixD_4The estimated results of net tax revenue elasticity with respect to price

Dependent Variable: LOG(REAL_DT)
Method: Least Squares
Date: 02/26/19 Time: 01:15
Sample: 2000Q1 2016Q4
Included observations: 68

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.738818	0.212521	-41.11979	0.0000
LOG(CPI)	1.036117	0.052955	19.56590	0.0000

R-squared	0.852949	Mean dependent var	-4.636494
Adjusted R-squared	0.850721	S.D. dependent var	0.740854
S.E. of regression	0.286241	Akaike info criterion	0.365006
Sum squared resid	5.407641	Schwarz criterion	0.430285
Log likelihood	-10.41020	Hannan-Quinn criter.	0.390872
F-statistic	382.8246	Durbin-Watson stat	1.349990
Prob(F-statistic)	0.000000		

AppendixD_5

Dependent Variable: LOG(REAL_IDIREC)
Method: Least Squares
Date: 02/26/19 Time: 01:16
Sample: 2000Q1 2016Q4
Included observations: 68

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6.991241	0.214605	-32.57718	0.0000
LOG(CPI)	0.793117	0.053475	14.83165	0.0000

R-squared	0.769213	Mean dependent var	-3.851032
Adjusted R-squared	0.765716	S.D. dependent var	0.597172
S.E. of regression	0.289049	Akaike info criterion	0.384527
Sum squared resid	5.514242	Schwarz criterion	0.449807
Log likelihood	-11.07392	Hannan-Quinn criter.	0.410393
F-statistic	219.9778	Durbin-Watson stat	0.158392
Prob(F-statistic)	0.000000		

Appendix FOR VECM Model

Appendix E_1 cointegration test result for baseline model

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.592473	102.8710	69.81889	0.0000
At most 1	0.311024	44.52382	47.85613	0.0994
At most 2	0.222446	20.30817	29.79707	0.4022
At most 3	0.051406	3.954032	15.49471	0.9072
At most 4	0.008025	0.523711	3.841466	0.4693

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.592473	58.34716	33.87687	0.0000
At most 1	0.311024	24.21565	27.58434	0.1274
At most 2	0.222446	16.35414	21.13162	0.2048
At most 3	0.051406	3.430321	14.26460	0.9140
At most 4	0.008025	0.523711	3.841466	0.4693

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

AppendixE_2 VECM analysis result for baseline model

	long run relation of variables with respect RGDP					
Variables	RGDP	Ltex	LCPI	LTR	interest rate	constant
β	1	-4.2045	-1.453713	3.887461	0.107249	-2.532113
		[-8.32679]	[-1.05491]	[5.59046]	[0.64445]	
	short run relations of variables					
	RGDP	Ltex	LCPI	LTR	interest rate	ECMt-1
α	0.693856	-0.01316	-0.026989	0.012154	0.013937	-0.02986
	[7.44466]	[-1.11051]	[-0.34569]	[0.41679]	[0.69451]	[-6.9929]

AppendixE_3 VEC autocorrelation test

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	40.69958	25	0.0247	1.702122	(25, 187.2)	0.0251
2	33.30618	25	0.1236	1.366460	(25, 187.2)	0.1248

AppendixE_4 VEC heteroskadesticty test

Chi-sq	df	Prob.
260.5788	180	0.5630

AppendixE_5 Cointegration test for disaggregated components of government spending

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.626706	144.7188	95.75366	0.0000
At most 1 *	0.367169	80.66860	69.81889	0.0053
At most 2 *	0.284249	50.92777	47.85613	0.0250
At most 3	0.258644	29.19031	29.79707	0.0586
At most 4	0.110644	9.737486	15.49471	0.3015
At most 5	0.032026	2.115762	3.841466	0.1458

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.626706	64.05020	40.07757	0.0000
At most 1	0.367169	29.74083	33.87687	0.1441
At most 2	0.284249	21.73746	27.58434	0.2341
At most 3	0.258644	19.45282	21.13162	0.0845
At most 4	0.110644	7.621724	14.26460	0.4185
At most 5	0.032026	2.115762	3.841466	0.1458

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Appendix E_6VECM result for disaggregated components of government spending

Error Correction:	D(RGDP)	D(LCPI)	D(INTEREST)	D(LCE)	D(LKE)	D(LTR)
CointEq1	-0.19941	0.013478	-0.166520	0.251317	0.112418	-0.070552
	(0.01355)	(0.02098)	(0.05820)	(0.08571)	(0.11712)	(0.04644)
	[-14.71660]	[0.64244]	[-2.86127]	[2.93210]	[0.95988]	[-1.51921]
CointEq2	0.007613	-0.179818	-0.318418	-0.578232	-0.497268	-0.008992
	(0.03132)	(0.04850)	(0.13454)	(0.19814)	(0.27074)	(0.10735)
	[0.24310]	[-3.70763]	[-2.36679]	[-2.91829]	[-1.83670]	[-0.08376]
CointEq3	-0.005517	0.007943	-0.049600	0.038343	-0.082825	0.005423
	(0.00459)	(0.00711)	(0.01971)	(0.02903)	(0.03966)	(0.01573)
	[-1.20238]	[1.11792]	[-2.51657]	[1.32094]	[-2.08823]	[0.34480]
D(RGDP(-1))	0.683620	0.033596	0.098609	0.822197	0.817307	-0.311656
	(0.09223)	(0.14283)	(0.39620)	(0.58351)	(0.79731)	(0.31615)
	[7.41219]	[0.23522]	[0.24889]	[1.40905]	[1.02508]	[-0.98578]
D(LCPI(-1))	-0.035269	0.116449	-0.299342	0.383770	0.980177	0.180306
	(0.08707)	(0.13484)	(0.37406)	(0.55090)	(0.75275)	(0.29848)
	[-0.40504]	[0.86358]	[-0.80026]	[0.69662]	[1.30213]	[0.60408]
D(INTEREST(-1))	0.018282	-0.045071	0.662037	-0.153745	0.075769	-0.070664
	(0.02437)	(0.03773)	(0.10467)	(0.15416)	(0.21064)	(0.08352)
	[0.75030]	[-1.19444]	[6.32491]	[-0.99732]	[0.35970]	[-0.84604]
D(LCE(-1))	0.007395	0.062671	-0.139517	-0.390378	0.220649	-0.094604
	(0.01779)	(0.02754)	(0.07641)	(0.11253)	(0.15376)	(0.06097)
	[0.41576]	[2.27530]	[-1.82599]	[-3.46911]	[1.43501]	[-1.55166]
D(LKE(-1))	-0.024061	-0.015068	0.058864	0.096485	-0.010638	-0.167961
	(0.01442)	(0.02233)	(0.06193)	(0.09121)	(0.12464)	(0.04942)
	[-1.66889]	[-0.67489]	[0.95044]	[1.05779]	[-0.08552]	[-3.39859]
D(LTR(-1))	-0.010195	-0.110987	-0.132219	-1.134996	-1.611685	-0.329577
	(0.03259)	(0.05048)	(0.14002)	(0.20621)	(0.28177)	(0.11173)
	[-0.31278]	[-2.19885]	[-0.94431]	[-5.50402]	[-5.71988]	[-2.94983]
C	0.012809	0.025610	0.010438	0.080951	0.078708	0.085212
	(0.00564)	(0.00873)	(0.02422)	(0.03566)	(0.04873)	(0.01932)
	[2.27223]	[2.93372]	[0.43106]	[2.26984]	[1.61514]	[4.40989]

AppendixE_7 VEC autocorrelation test for disaggregated components of government spending

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	39.52311	36	0.3155	1.109845	(36, 200.4)	0.3191
2	44.96133	36	0.1454	1.278966	(36, 200.4)	0.1480

AppendixE_8 VEC heteroskadesticity test for disaggregated components of government spending

Chi-sq	df	Prob.
469.1702	378	0.0751

Appendix E_9 Co integration test for disaggregate components of tax revenue

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.608307	151.0622	95.75366	0.0000
At most 1 *	0.522289	90.13931	69.81889	0.0005
At most 2	0.298627	42.12057	47.85613	0.1554
At most 3	0.186173	19.06403	29.79707	0.4883
At most 4	0.054700	5.673527	15.49471	0.7337
At most 5	0.030555	2.017081	3.841466	0.1555

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.608307	60.92292	40.07757	0.0001
At most 1 *	0.522289	48.01874	33.87687	0.0006
At most 2	0.298627	23.05654	27.58434	0.1711
At most 3	0.186173	13.39050	21.13162	0.4170
At most 4	0.054700	3.656446	14.26460	0.8937
At most 5	0.030555	2.017081	3.841466	0.1555

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Appendix E_{10} VECM analysis result for disaggregated components of tax revenue

Error Correction:	D(RGDP)	D(LCPI)	D(INTEREST)	D(LINDIRECT_T)	D(LDIRECT_T)	D(LTEX)
CointEq1	-0.013244	0.022529	-0.115065	-0.080771	0.638436	0.368596
	(0.002080)	(0.03400)	(0.09868)	(0.07527)	(0.11556)	(0.18165)
	[-6.36730]	[0.66272]	[-1.16608]	[-1.07310]	[5.52466]	[2.02911]
CointEq2	0.001511	-0.012522	0.001281	-0.013115	0.192446	-0.192074
	(0.00367)	(0.00601)	(0.01743)	(0.01330)	(0.02042)	(0.03209)
	[0.41129]	[-2.08495]	[0.07351]	[-0.98624]	[9.42626]	[-5.98498]
D(RGDP(-1))	0.683646	0.015548	-0.040805	-0.109392	-1.033621	0.993235
	(0.09607)	(0.15705)	(0.45585)	(0.34771)	(0.53385)	(0.83918)
	[7.11581]	[0.09900]	[-0.08951]	[-0.31460]	[-1.93615]	[1.18357]
D(LCPI(-1))	0.008180	0.067276	-0.106675	0.233783	0.684377	-0.600134
	(0.08936)	(0.14607)	(0.42400)	(0.32342)	(0.49655)	(0.78054)
	[0.09154]	[0.46057]	[-0.25159]	[0.72285]	[1.37827]	[-0.76887]
D(INTEREST(-1))	0.013531	0.034693	0.797236	-0.090923	-0.015471	0.000968
	(0.02016)	(0.03296)	(0.09567)	(0.07297)	(0.11204)	(0.17612)
	[0.67107]	[1.05261]	[8.33340]	[-1.24598]	[-0.13809]	[0.00550]
D(LINDIRECT_T(-1))	-0.010411	-0.063618	-0.083885	-0.338878	-0.733009	-0.098505
	(0.03786)	(0.06189)	(0.17965)	(0.13703)	(0.21038)	(0.33071)
	[-0.27497]	[-1.02791]	[-0.46695]	[-2.47302]	[-3.48414]	[-0.29786]
D(LDIRECT_T(-1))	0.001014	-0.028915	-0.044886	-0.090993	0.325226	-0.667874
	(0.01871)	(0.03058)	(0.08875)	(0.06770)	(0.10394)	(0.16339)
	[0.05422]	[-0.94566]	[-0.50574]	[-1.34409]	[3.12900]	[-4.08771]
D(LTEX(-1))	-0.015922	0.064129	-0.054357	0.025258	-0.250763	-0.017681
	(0.01325)	(0.02166)	(0.06288)	(0.04796)	(0.07364)	(0.11575)
	[-1.20152]	[2.96045]	[-0.86449]	[0.52662]	[-3.40544]	[-0.15275]
C	0.011408	0.026598	0.010454	0.064798	0.094994	0.075436
	(0.00571)	(0.00933)	(0.02709)	(0.02066)	(0.03173)	(0.04987)
	[1.99810]	[2.84993]	[0.38590]	[3.13586]	[2.99427]	[1.51265]

Appendix E_{11} VEC autocorrelation test for disaggregated components of tax revenue

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	46.92375	36	0.1051	1.340324	(36, 204.8)	0.1072
2	85.56452	36	0.1311	1.217973	(36, 204.8)	0.1408

Appendix E_{12} VEC Heteroskadesticity test for disaggregated components of tax revenue

Chi-sq	df	Prob.
392.1447	336	0.1870