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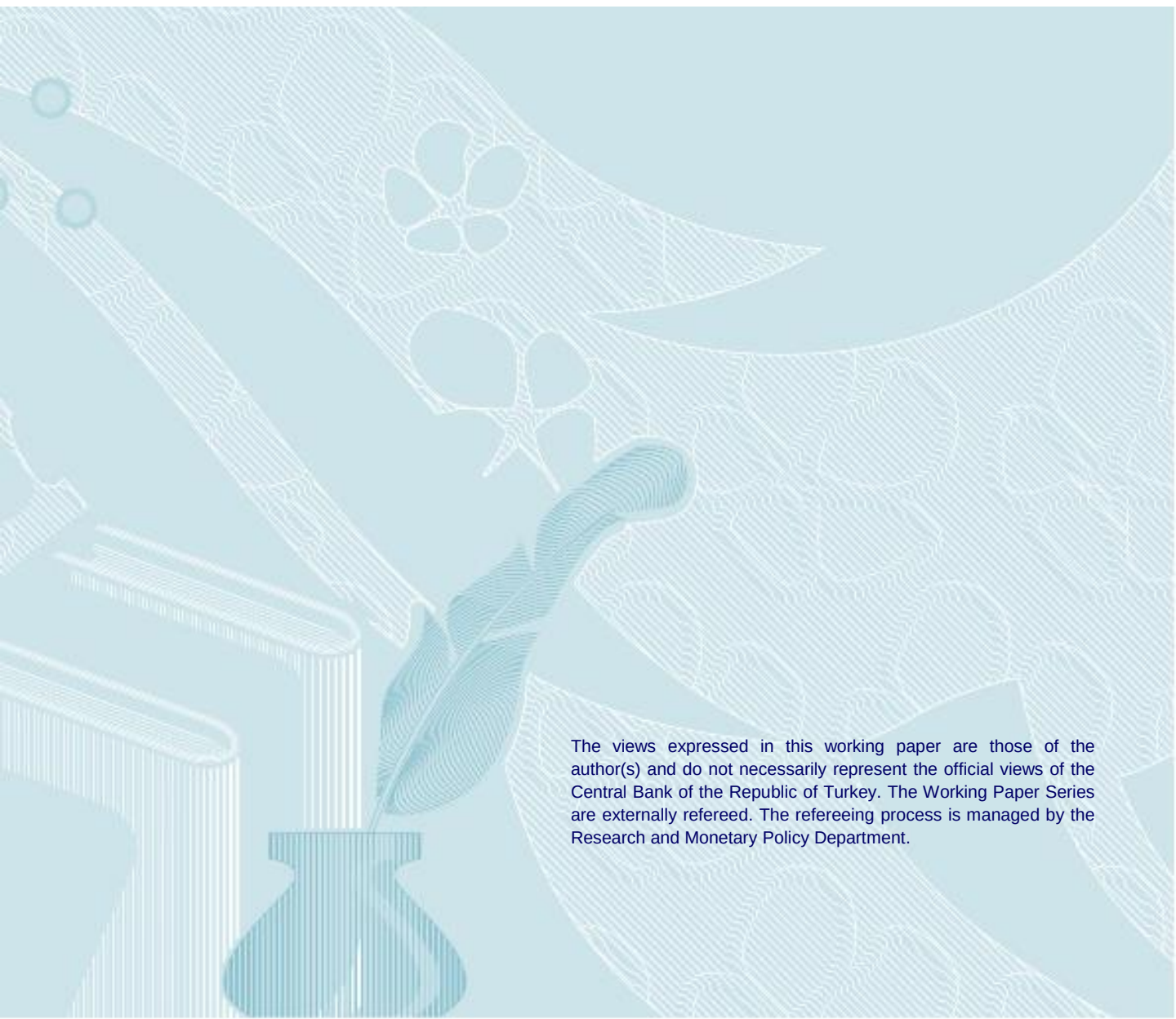

Government Spending Multiplier in Turkey*

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Abstract

This study aims to measure the size of the government spending multiplier in Turkey for post-2001 financial crisis period within a structural VAR framework. The analysis demonstrates that a positive shock to government spending tends to increase output, tax, real interest rate on impact and the size of the fiscal multiplier is relatively large at first few quarters. The fiscal multiplier reaches a peak value of 1.5 at second quarter and then starts to diminish. Furthermore, investigating the effects of the components of government spending reveals the fact that government investment expenditures, rather than consumption expenditures, have a profound impact on output at first few quarters. However, there is no evidence that multiplier effect of government investment higher than government consumption at the end of the first year.

JEL Classification: E62, H30
Keywords: Government Spending Multiplier, SVAR

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1 Introduction

Measuring the size of the fiscal multiplier has again received great deal of attention in the empirical literature since the onset of the global financial crisis in 2007-2008. Many countries have introduced a fiscal stimulus package in order to raise the output and create jobs for unemployed people. However, there is no theoretical and empirical consensus concerning the magnitude of the fiscal multiplier. As stated in Blanchard and Leigh (2013), fiscal multipliers can be higher or lower across time and across countries. This is because the value of fiscal multiplier depends on a variety of factors such as, among others, presence of economic slack in the economy and whether or not monetary policy is under a zero lower bound[1]. On the theoretical side, while Keynesian view supports the idea that fiscal policy is an effective tool to stabilize the economic activity and boost aggregate demand, neoclassical models predict that the effectiveness of fiscal policy remains limited[2]. The difference between two theoretical models particularly depends on the response of private consumption to a fiscal policy shock. While the former predicts that an increase in government spending leads to a surge in private consumption, which is indicative of a crowding-in effect, the latter states that private consumption decreases following a positive government spending shock because of a negative wealth effect, which implies existence of crowding-out.

On the empirical side, there are various techniques to calculate the size of the fiscal multiplier. These are mainly based on reduced form equations and model-based estimations[3]. While New Keynesian DSGE models are widely used in the framework of model-based estimations, it is quite common to use a system based VAR model in the context of reduced form equations to gauge the impacts of fiscal policy shocks on the output. In the fiscal VAR literature, there exist four approaches which use various identifying assumptions to extract structural shocks and investigate their impact on variable of interest[4]. One of them is developed by Blanchard and Perotti (2002), which identifies fiscal policy shocks by taking into account decision lags in fiscal policy and institutional information about the tax and government spending elasticities. The second category, namely 'the narrative event study approach', represented by Ramey and Shapiro (1998), Edelberg et al. (1999) and Burnside et al. (2004), traces the effects of a dummy variable representing exogenous, unanticipated and sharp fiscal events, such as high military spending, on the economy. The third category is the 'sign restriction' of Mountford and Uhlig (2009), which imposes sign restrictions directly on the impulse responses rather than imposing linear restrictions on the contemporaneous relations between reduced form residuals and structural

[1] Auerbach and Gorodnichenko (2012a, 2012b) assess the sensitivity of fiscal multipliers to state of the business cycles. Christiano, Eichenbaum and Rebelo (2011) analyze the effectiveness of fiscal policy when monetary policy at zero lower bound.

[2] Woodford (2011) uses simple analytical frameworks in order to investigate the size of the fiscal multiplier under a neoclassical benchmark and a New Keynesian benchmark. He also shows that how the size of fiscal multiplier changes under alternative assumptions about the degrees of monetary accommodation.

[3] See Hemming, Kell and Mahfouz (2002) for information about the theoretical and empirical literature on the effects of fiscal policy on the economy.

[4] Comparison of these techniques can be found in Perotti (2005) and Caldara and Kamps (2008).

innovations. The last category, 'the recursive approach' represented by Fatas and Mihov (2001), and Favero (2003), achieves the identification of fiscal policy shocks by relying on Cholesky ordering.

All these studies mentioned above are based on a linear VAR model, which have been criticized recently for several aspects. Some studies, such as Auerbach and Gorodnichenko (2012a, 2012b) and Baum and Koester (2011), consider the possibility of a non-linear relationship between fiscal policy tools and output and, hence, they argue that the size of the fiscal multiplier varies with the state of the business cycle. They suggest to apply a non-linear VAR model (regime-switching VARs), such as threshold VAR (TVAR) or smooth transition VAR (STVAR), to take into account state-dependent effects of fiscal policy. They find that the size of fiscal multiplier is high at times of recession compared to the periods of expansion, which supports the view that an existence of economic slack amplifies the effectiveness of fiscal policy.

The magnitude of fiscal multiplier is not only determined by the state of the business cycle but also by other factors such as the nature of fiscal shock, the type of exchange rate regime, degree of trade openness, the size of automatic stabilizers, the existence of concerns on debt sustainability and the implementation of monetary policy[5]. Therefore, it is observed that panel VAR is commonly used to measure the size of the fiscal multiplier by incorporating the structural features of the economies. Ilzetzki et al (2011) explore the effects of fiscal policy on output by categorizing countries based on their development level, their debt level, degree of trade openness and the type of exchange rate regime. They find that the size of government consumption multiplier is lower in developing countries than that of high-income countries. Countries with a flexible exchange rate regime have smaller multipliers compared to countries with a fixed exchange rate regime. The magnitude of fiscal multipliers in relatively open economies is smaller than that of the relatively closed economies. Finally, they conclude that debt level is another essential factor to determine the size of the multiplier, with the finding of higher fiscal multiplier for the countries with a low-debt level.

This paper aims to empirically explore the dynamic effects of an exogenous government spending shock on output in Turkey within the post 2001 crisis period[6]. The motivations behind this paper can be summarized as follows: First of all, an upward trend in the government spending to GDP ratio and its contribution to the growth rate make interesting to research a transmission mechanism of fiscal policy. Secondly, this paper aims to study an expansionary effect of government spending on output and to reveal whether fiscal policy is an effective tool to stimulate the economic activity. A particular question that we need to answer is as follows: Does the size of the government spending multiplier exceeds one or does it remain below one? Finally, measuring the size of government consumption

[5] The determinants of fiscal multiplier are clearly explained in Batini et al. (2014), who classified these factors into two categories, namely structural characteristics (trade openness, labor market rigidity, the size of fiscal multipliers, the exchange rate regime, the debt level, public expenditure management and revenue administration) and temporary factors such as the state of the economy and the existence of monetary accommodation.

[6] The rationale behind this short sample period can be attributed to the more stable feature of the Turkish economy compared to the pre-crisis period.

and government investment multiplier enables to evaluate the role of different fiscal instruments in assessing the effects of fiscal stimulus.

There are some studies which tend to examine the effects of fiscal policy on the output in Turkey such as Berument & Doğan (2004), Erdoğan (2007), Çebi (2010), Dökmen & Vural (2011) and Yıldırım (2012). However, these studies do not calculate the size of the fiscal multiplier. Only exception is Çebi (2010) who employ a three-variable structural VAR model to estimate the size of the government spending and revenue multiplier for the period of 1987.I - 2005.IV. He finds that a positive shock to government spending increases output and the value of government spending multiplier is less than one. The contributions of this study can be explained as follows: First, different from Çebi (2010), this study calculates the size of the government spending multiplier using a four-variable VAR model for more recent period (2002.I - 2014.IV) by explicitly controlling for the monetary policy. Introducing interest rate into the model may affect the size of fiscal multiplier. What is more, it allows for an evaluation of the interaction between monetary and fiscal policies. Second, while Çebi (2010) uses the consolidated budget primary spending data (total expenditures excluding interest payments), this paper estimates the impact of fiscal policy shocks on output by using the sum of government consumption and government investment expenditures. Therefore, the definition of government spending does not cover transfer expenditures in this study. Finally, this paper not only examines the expansionary effects of government spending itself but also explores the expansionary effects of components of government spending such as public investment and public consumption.

The main findings of the study can be explained in the following manner: First, while the size of impact multiplier is at one or near to one, the value of peak multiplier, which occurs in the second quarter, substantially exceeds one and is statistically significant. These results are consistent with the argument that government spending is an effective instrument to stimulate the economy. Second, assessing the role of two main components of government spending reveals the fact that government investment shocks are more effective than government consumption shocks in boosting output in the very short run.

This paper is structured as follows. Section 2 provides an overview of fiscal policy in Turkey. Section 3 describes the data; Section 4 considers unit root tests; Section 5 shows cointegration test results; Section 6 outlines the structural VAR model; Section 7 presents the impulse response analysis and measures the size of government spending multipliers; Section 8 devoted to robustness analysis; Section 9 concludes the study.

2 Fiscal Policy in Turkey

A comprehensive stabilization programme, "Strengthening the Turkish Economy", was put into effect in Turkey following the deep financial crisis that occurred at the beginning of 2001. It was conducted under a flexible exchange rate and an informal (implicit) inflation targeting regime, underpinned by

the coordination between fiscal and monetary policies. Initial success of the stabilization programme can be observed in remarkable improvements in fiscal indicators. For instance, General Government budget deficit to GDP ratio gradually decreased from 11.8 percent in 2001 to 0.1 percent in 2005[7]. Similarly, EU-defined General Government debt stock to GDP ratio showed downward trend and reached 52.7 percent in 2005 from approximately 78 percent in 2001 (Table 1).

Notable improvements in fiscal stance (high primary budget surpluses and low debt ratios) mitigated concerns on debt sustainability and lowered the risk premium on interest rates. Furthermore, sound fiscal policies created an environment conducive to countercyclical fiscal policy. For example, when the 2008-2009 global financial crisis hit the economy, Turkey took some fiscal and monetary measures to eliminate the negative effects on the domestic economy. In the framework of coordination between monetary and fiscal policies expansionary monetary and fiscal policies (monetary-fiscal policy mix) were implemented in order to lessen business cycle volatility and unemployment. On the monetary side, the Central Bank of Turkey (CBRT) implemented an expansionary monetary policy by reducing policy interest rates and took some measures to meet the liquidity needs of the banking system. On the fiscal side, in parallel with some countries, Turkey gave more importance to economic stabilization and implemented a countercyclical fiscal policy at the time of the recession by decreasing taxes and increasing government spending[8]. As a result, budget deficit to GDP ratio increased to 5.5 percent from 1.6 percent in 2008 and debt to GDP ratio reached 46 percent in 2009 by showing a six percentage point increase compared to the previous year[9]. Although, budget balance and debt stock deteriorated markedly in 2009, we observed an improvement in fiscal indicators following the crisis thanks to removal of some temporary measures regarding to tax reduction and high growth rates occurred in 2010 and 2011.

Table 1 gives detailed information about the composition of General Government budget balance and Figure 1 displays the pattern of tax to GDP ratio and government spending to GDP ratio during the period of 2000-2013. Government spending consists of current and investment expenditures, which are the focus of this study. Figure 1 gives important messages regarding the transformation of budget expenditures and the way government spending is financed. We have observed a persistent upward trend in the government spending to GDP ratio since 2005[10]. Similarly, tax to GDP ratio has shown an

[7] General government covers central government, local governments, social security institutions, extrabudgetary funds, revolving funds, the unemployment insurance fund and the general health-care insurance.

[8] The fiscal stimulus package was of a temporary nature and comprised many measures regarding revenues and expenditures. Revenue measures covered private taxes, taxes on companies, consumption taxes on goods and services and other revenue measures. On the expenditure side, Turkey took several measures including public consumption and investment, transfers to households and companies, contributions to employment and social security premiums, transfers to the rest of the public sector and other expenditures.

[9] A deterioration in the budget balance and debt stock in 2009 mainly stems from two channels: Firstly, automatic stabilizer effects due to the economic contraction, secondly, a countercyclical discretionary fiscal policy via a fiscal stimulus package.

[10] We also observe a similar upward trend for aggregated budget data, namely primary spending to GDP ratio and total revenue to GDP ratio (Table 1).

upward trend, especially after 2009. It appears that a sharp decline in the interest payments to GDP ratio and a rise in the tax to GDP ratio created a fiscal space for increasing the public consumption and public investment to GDP ratio without jeopardizing debt sustainability. Hence, government spending to GDP ratio displayed a sizable increase in the last decade (during the period of 2004 -2013) and reached 22.2 percent in 2013 from 16 percent in 2004. Examining the composition of the government spending reveals the fact that a major part of government spending, current expenditures to GDP ratio, increased to 18 percent in 2013 by showing an increase of five percentage points compared to 2001 (Table 1). On the other hand, a smaller part of government spending, public investment to GDP ratio, displayed a similar upward trend and reached 4.2 percent in 2013 by increasing 0.7 percentage points compared to 2001 (Table 1). Therefore, the upward trend in government spending raises a question related to the contribution of government spending to GDP growth.

As a share of GDP (%)	**2001**	**2003**	**2005**	**2007**	**2009**	**2011**	**2013**
Taxes	19.0	18.7	18.6	18.6	18.5	20.1	21.4
Total Revenues*	30.9	31.6	32.9	33.6	34.6	36.4	40.0
Current Expenditures	13.1	13.8	13.4	15.0	17.7	16.6	18.0
Investment Expenditures	3.5	2.9	2.9	3.2	3.3	3.3	4.2
Interest Payments	17.6	13.3	7.2	5.9	5.7	3.4	3.3
Primary Expenditures	25.1	26.2	25.8	28.0	34.4	33.4	37.4
Total Expenditures	42.7	39.5	33.0	33.8	40.1	36.8	40.7
Budget Balance	-11.8	-7.9	-0.1	-0.2	-5.5	-0.4	-0.7
Primary Budget Balance	5.8	5.4	7.1	5.7	0.3	3.0	2.6
EU-defined General Gov. Debt Stock	77.9	67.7	52.7	39.9	46.0	39.1	36.2

Source: Ministry of Development of Turkey, the Turkish Treasury.

* Total revenues include taxes, non-tax revenues, factor incomes and social funds.

Table 1: General Government Budget

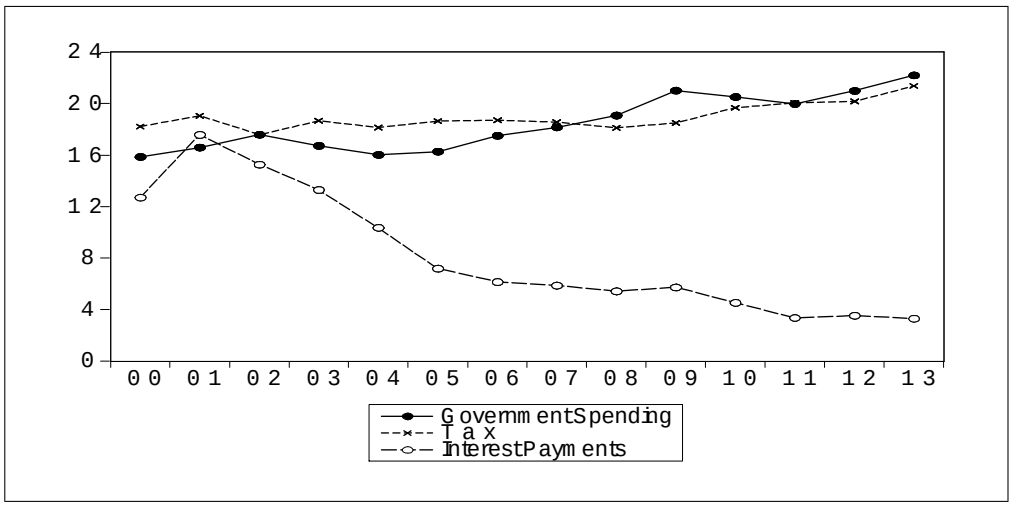

Figure 1: General Government Spending and Taxes (as a share of GDP, %)

3 Data

The baseline VAR includes four variables, namely *government spending* (g_t), *tax revenues* (t_t), *output* (y_t) and *real interest rate* (r_t). Including tax and interest rate in the model as control variables can be justified as follows: Taxes and expenditures are two sides of the same coin and both of them affect the size of the fiscal multiplier. In other words, not only the behavior of government spending but also response of tax is very important for the magnitude of fiscal multiplier[11]. On the other hand, the interaction between monetary and fiscal policies are very essential to determine size of fiscal multiplier[12]. The GDP and government spending data are collected from National Accounts published by Turkish Statistical Institute and tax revenues are obtained from the Ministry of Finance of Turkey. Government spending covers government final consumption expenditures (gc_t, compensation of employees and purchases of goods and services) and investment expenditures (gi_t, gross fixed capital formation). Ex ante real interest rates are calculated using Treasury securities nominal interest rates and expected inflation rates. The nominal interest rates are received from the Turkish Treasury and expected inflation rates are obtained from CBRT Survey of Expectations[13]. The data are in real, seasonally unadjusted and natural logarithmic forms except real interest rates. To transform tax revenues into real terms, GDP deflator is used. The analysis cover the period from 2002.I to 2014.IV.

4 Unit Root Tests

Due to the fact that all variables are seasonally unadjusted, HEGY test, which is proposed by Hylleberg et. al. (1990), is used in order to determine the order of the integration of the variables. HEGY test allows to investigate the presence of seasonal and non-seasonal unit roots at the same time in the quarterly data. Reasonable lag lengths are chosen by taking into account model selection criteria and the existence of autocorrelation problem is checked by using Portmanteau test statistics. Portmanteau test results show that there is no evidence for autocorrelation problem at the chosen lag lengths. According to HEGY tests, government spending and its components, tax, GDP and real interest rate are difference stationary (integrated at order one) and they do not have seasonal unit roots[14]. Therefore, it would be suitable to take first difference of the variables and include deterministic seasonal dummies in the model to capture seasonal patterns.

[11] One may expect that a deficit-financed increase in government purchases has a more profound impact on output than a tax-financed increase in government spending.

[12] Suppose that government implements an expansionary fiscal policy by increasing public expenditures and this leads to higher inflation. How should the Central Bank react to an increase in inflation? If the Central Bank chose to keep inflation under control via an increase in interest rates, this may offset some of government spending's expansionary effects.

[13] Ex ante real interest rates are defined as $r_t = (1 + i_t)/(1 + \pi^e_{t+4}) - 1$, where r_t and i_t represents real and nominal interest rates respectively, π^e_{t+4} denotes 12-month ahead CPI expectation. Nominal interest rates are average annual compounded interest rate at the Treasury's TL-denominated zero-coupon security auctions.

[14] HEGY Test results are available from the author upon request.

5 Cointegration

Since all variables are integrated at order one, it requires to examine a long-run relationship among level of the variables. In this section, existence of cointegration is investigated by using Johansen trace test and maximum eigenvalue test. Appendix A (Table 5) reports the cointegration test results for three models. The evidence is clearly in favor of only one cointegration relation for each model at 5% significance level. Subsequently, Vector Error Correction Model (VECM) is estimated to find a cointegration vector for each specification. Cointegration equations are also displayed in Appendix A (Table 6)[15].

As a result, based on statistical properties of the data, we also estimate a VAR in first difference model by taking into account a long-run relationship among the levels of the variables and we present estimation results of this specification in section 8 as a part of robustness check.

6 Methodology: SVAR

In this study, a structural VAR technique is used to gauge the magnitude of fiscal multiplier. In particular, an extended version of Blanchard and Perotti (2002) is employed following Perotti (2005) and Perotti (2004), among others, which control for monetary policy by including interest rate in the model. The reduced-form VAR can be written as follows:

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

where $X_t \equiv (g_t, t_t, y_t, r_t)$ is the vector of endogenous variables, $A(L)$ is an autoregressive lag-polynomial, $U_t \equiv (u_t^g, u_t^t, u_t^y, u_t^r)$ corresponds to the vector of reduced form residuals, which are generally correlated with each other. The relationship between the reduced form residuals and structural shocks can be shown as follows in matrix notation[16]:

$$\begin{aligned}
u_t^g &= \alpha_{gy}u_t^y + \alpha_{gr}u_t^r + \beta_{gt}\varepsilon_t^t + \varepsilon_t^g \\
u_t^t &= \alpha_{ty}u_t^y + \alpha_{tr}u_t^r + \beta_{tg}\varepsilon_t^g + \varepsilon_t^t \\
u_t^y &= \alpha_{yg}u_t^g + \alpha_{yt}u_t^t + \alpha_{yr}u_t^r + \varepsilon_t^y \\
u_t^r &= \alpha_{rg}u_t^g + \alpha_{rt}u_t^t + \alpha_{ry}u_t^y + \varepsilon_t^r
\end{aligned}$$

[15] Cointegration equations (in the form of tax relation) show that the coefficients for government spending and output have positive sign and they are statistically significant. As it is expected, when output increases tax also increases due to automatic stabilizer effect. Moreover, an increase government spending leads to higher tax revenues. This might reflect the fact that an increase in government spending motivates the output and so tax revenues, which are positively associated with output.

[16] This kind of VAR system is commonly used and called AB model in the literature (See Amisano and Giannini (1997)). It is also quite common to use in the fiscal VAR studies following the seminal paper of Blanchard and Perotti (2002).

$$\begin{bmatrix} u_t^g \\ u_t^t \\ u_t^y \\ u_t^r \end{bmatrix} = \begin{bmatrix} 1 & 0 & -\alpha_{gy} & -\alpha_{gr} \\ 0 & 1 & -\alpha_{ty} & -\alpha_{tr} \\ -\alpha_{yg} & -\alpha_{yt} & 1 & 0 \\ -\alpha_{rg} & -\alpha_{rt} & -\alpha_{ry} & 1 \end{bmatrix}^{-1} \begin{bmatrix} 1 & \beta_{gt} & 0 & 0 \\ \beta_{tg} & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_t^g \\ \varepsilon_t^t \\ \varepsilon_t^y \\ \varepsilon_t^r \end{bmatrix}$$

where $\varepsilon_t = \left(\varepsilon_t^g, \varepsilon_t^t, \varepsilon_t^y, \varepsilon_t^r\right)$ represents the orthogonal structural innovations. As explained in Blanchard and Perotti (2002), the coefficients on output in government spending and tax equations $(\alpha_{gy}, \alpha_{ty})$ theoretically contain both automatic response of fiscal variables to output innovations and systematic discretionary responses of fiscal variables to output innovations. The fiscal policy shocks are identified by exploiting decision lags in fiscal policy, which means that the coefficients on output in government spending and tax equations only reflect the automatic stabilizers' effect. Therefore, using quarterly data, which reflects a relatively high frequency, helps eliminate the effect of systematic part of discretionary fiscal policy[17].

As mentioned in the previous section, a parsimonious structural VAR model contains four variables: log of real government spending, log of real tax revenues, log of real GDP and real interest rate[18]. Based on the findings of unit root tests reviewed in previous section, all series have a unit root and, hence, first difference of the variables (growth rates) were used in the model. The VAR in first difference specification includes a constant and three seasonal dummies in order to account for seasonality in the data. The appropriate lag length has been chosen as *three*, which is suggested by some model selection criteria such as Akaike information criterion (AIC), LR test statistic and Final prediction error (FPE). VAR(3) specification does not contain an autocorrelation problem.

To estimate the VAR model, some restrictions need to be imposed on the parameters of the model. First, it is assumed that government spending elasticity with respect to output is zero $(\alpha_{gy} = 0)$, which implies that there is no automatic feedback from economic activity to the government spending within the same quarter (Blanchard and Perotti (2002)). Because notably government consumption and government investment do not respond to economic activity automatically. Second, the automatic response of government spending to the real interest rate is also set to zero $(\alpha_{gr} = 0)$[19]. Third, tax

[17] Discretionary fiscal policy contains both decision lags and implementation lags, which implies that policymakers do not make a decision in order to minimize fluctuations in the business cycle in a very short time period. It takes some time for policymakers to understand what happens to economy, take fiscal measures that are needed and implement these decisions. Therefore, the frequency of the data is very important for identification of the fiscal policy shocks. Using quarterly data instead of annual data can help to eliminate the second channel (discretionary fiscal policy). This is because a period of three months is a very short time period for policymakers to take fiscal measures due to decision and implementation lags in fiscal policy. This is the identification strategy that takes into account decision lags in fiscal policy.

[18] While Perotti (2005) and Perotti (2004) include nominal interest rate in their models, Batini et al (2012) uses real interest rate.

[19] Note that the definition of government spending used in this study does not cover interest payments and other transfer expenditures.

elasticity with respect to output is set to 1.1 ($\alpha_{ty} = 1.1$)[20]. Additionally, the automatic response of tax to the real interest rate is also set to zero ($\alpha_{tr} = 0$). Finally, a restriction can be imposed on β_{gt} or β_{tg}. Assuming $\beta_{gt} = 0$ $\left(\beta_{tg} = 0\right)$ allows government spending shocks (tax shocks) affect tax (government spending) via β_{tg} $\left(\beta_{gt}\right)$. We assume that government spending decision comes first $\left(\beta_{gt} = 0\right)$ in the baseline specification. However, as part of the robustness analysis, the baseline VAR specification was also re-estimated under the assumption of tax decision comes first $\left(\beta_{tg} = 0\right)$ and results are presented in Section 8.

7 Fiscal Multiplier

The government spending multiplier is defined as a ratio of a change in output to an exogenous change in government spending (Spilimbergo et al (2009)). In this study, in particular, we report results related to three different definitions of fiscal multiplier, namely the impact multiplier $\left(\frac{\Delta Y_t}{\Delta G_t}\right)$, the peak (maximum) multiplier over any horizon H $\left(\max \frac{\Delta Y_{t+H}}{\Delta G_t}\right)$ and the cumulative multiplier for different horizon H $\left(\frac{\sum_{j=0}^{H} \Delta Y_{t+j}}{\sum_{j=0}^{H} \Delta G_{t+j}}\right)$. Therefore, one-year cumulative multiplier defined as a ratio of cumulative change in output over one year to cumulative change in government spending over one year[21].

Results presented in this section are based on impulse response analysis which allows to examine the strength, timing and persistence of output responses[22]. As shown in Figure 1, impulse response analysis demonstrates that a positive government spending innovation leads to an increase in real interest rate, which may offset some of government spending's expansionary effects[23]. Furthermore, the way government spending is financed plays a vital role to determine the size of the fiscal multiplier. Our analysis show that taxes mimic output and respond positively to a government spending shock at first few quarters, which reflects the fact that an expansionary fiscal policy via government spending is accompanied by higher tax revenues[24].

[20] Consumption based tax revenues are the primary components of total tax revenues in Turkey, and, on average, indirect taxes constitutes two-thirds of total central government tax revenues (67 percent) in the period of 2006-2013. Some studies estimate tax elasticity in Turkey, such as Çebi and Özlale (2012) and Çulha (2012), who find the weighted average of tax elasticity as 1.07 and 1.2, respectively.

[21] A detailed survey on fiscal multipliers can be found in Spilimbergo et al (2009) and Batini et al (2014).

[22] Impulse response functions are presented with one-standard deviation confidence intervals which are calculated by Monte Carlo simulations. Additionally, since we work with growth rates of the variables, impulse responses are accumulated to find the responses of level of each variable to a shock in level of government spending.

[23] An increase in interest rate may result from two effects: Firstly, following an increase in government spending Central Bank may increase interest rate in order to respond an inflationary effect. Secondly, an increase in government spending may increase risk premium, which result in an increase in interest rate. Since concerns on debt sustainability have been reduced during the estimation period, we think that the first channel plays an important role in increasing interest rates.

[24] Higher tax revenues may stem from two channels: First, cyclical changes may affect tax revenues automatically. An increase in government spending may increase the output, which in turn raises private spending and so does the tax revenues. Second, the government may raise taxes in a discretionary way in order to finance the budget deficit resulting from increasing government spending.

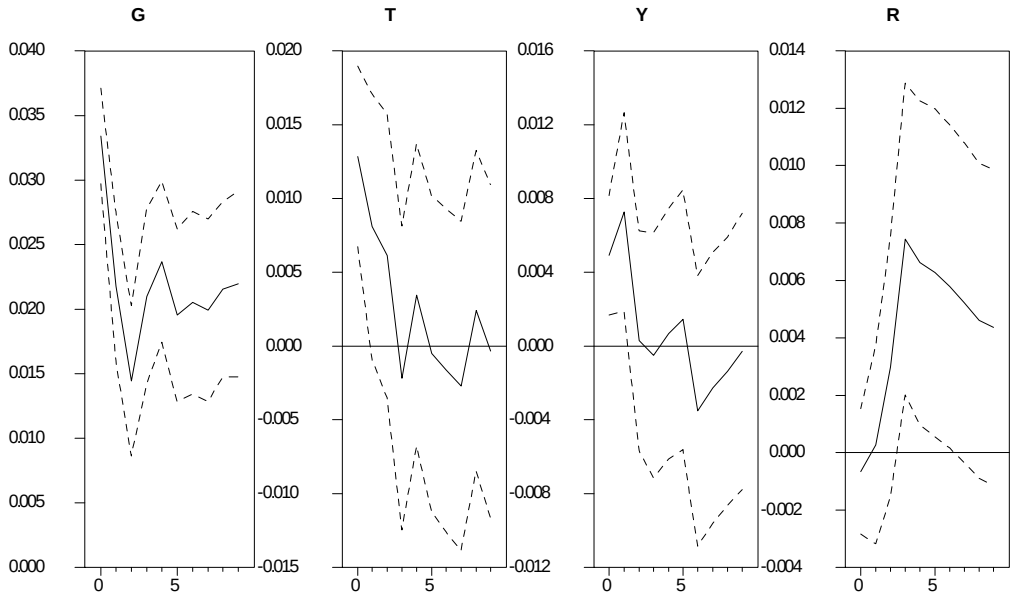

Figure 2: Responses to a Shock in Government Spending

Table 2 reports the size of the government spending multipliers which have been calculated for Turkey for the period of 2002.I - 2014.IV[25]. Each number in Table 1 denotes an effect of a unit (1 TL) in 1998 prices increase in government spending on real GDP level. The findings of the VAR in first difference model can be summarized as follows: The responses of output to a government spending shock have positive signs at first few quarters. While the impact multiplier takes the value of 1.0, the peak multiplier exceeds one and they are statistically significant, which demonstrates that fiscal policy can be effective in the short-term. Fiscal multiplier shows its largest effect at the second quarter yielding a value of 1.5. Following the peak effect, the size of the government spending multipliers started to reduce and wide confidence intervals around them imply that these are not statistically significantly different from zero[26]. One-year cumulative multiplier is calculated as 0.9.

Variable	impact	peak	one-year (cumulative)
Government Spending	1.0	1.5 (2)	0.9
Government Consumption	1.4	1.9 (2)	1.7
Government Investment	2.1	3.6 (2)	1.7

Table 2: Size of Government Spending Multipliers

Additionally, dynamic effects of component of government spending are also investigated by re-

[25] The size of the tax multiplier is beyond the scope of this paper.

[26] Consistent with the most of the literature, such as Blanchard and Perotti (2002) for US and de Castro and Hernández de Cos (2008) for Spain, government spending reacts persistently to its own shock in Turkey. However, in contrast to these studies, we do not observe a persistent response for output. One possible explanation for this result can be attributed to a positive and persistent behavior of real interest rate following a government spending shock.

placing total government spending with its components in the VAR context. We split the aggregated government spending data in two primary sub-components, namely government consumption and government investment expenditures. Using the disaggregated data gives important messages in terms of impact of fiscal policy on the economy. The most striking result is that an increase in investment expenditure has a profound influence on the output compared to an increase in government consumption expenditure in the short-run. While the values of impact and peak multiplier are 1.4 and 1.9, respectively for government consumption expenditure[27], they take value of 2.1 and 3.6 for government investment expenditure (Table 2). Although the sizes of the government consumption and investment multiplier differ each other in the short-term, they follow a similar pattern. Having reached their peak values at the second quarter, the magnitudes of the fiscal multiplier start to decelerate and become statistically insignificant. The values of one-year cumulative multiplier of government consumption and government investment are close to each other and both of them substantially exceed one (a value of 1.7).

8 Robustness Analysis

In this section, we estimate alternative models to gauge size of the fiscal multiplier as a purpose of comparison. Since VAR models may give different results with small changes in the specification, the main criteria that we focus on are the sign of the expenditure multiplier and whether the point estimate exceeds one. In terms of former, all specifications points to positive sign. In terms of latter, most of the specifications produce estimates of fiscal multipliers greater than one. Table 3 documents the estimation results of three different models regarding detrending methods. These models are called a VAR in first difference model, a VAR in first difference model with cointegration and a level VAR specification. All specifications are estimated for government spending and its components. Furthermore, Table 4 gives estimation results of alternative models regarding the ordering of fiscal variables for each element of government spending. Hence, Table 4 reports two different models to answer a particular question: What is the effect of a unit spending shock on output if spending decision comes first or tax decision comes first?

Estimation results of government spending are shown in the first three rows of Table 3. It is observed that size of government spending multiplier is very close to each other for VAR in first difference model and the VAR model with cointegration. All specifications demonstrate that the impact multiplier takes the value of one (or close to one) and the peak multiplier exceeds one by ranging in size between 1.3 - 1.8. Moreover, first year cumulative multiplier is slightly less than one (0.9) for both the VAR in first difference model and the VAR model with cointegration. Estimation results of government consumption and government investment are shown in the middle and the bottom

[27] We also explore the effects of a positive shock to government purchases of goods and services on the output. Fiscal multiplier is found to be 1.3.

of Table 3, respectively. Government consumption impact multiplier takes the value of 1.4 and 1.2 for the VAR in first difference model and the VAR with cointegration model, respectively. Similarly, the peak multiplier occurs in the second quarter and takes the value of 1.9 in both specifications. Although, two different specifications give similar results for government consumption, this argument is not valid for government investment. While the impact multiplier takes the value of 1.3 and 1.5 for the level specification and the VAR with cointegration model, respectively, it reaches a value of 2.1 for VAR in first difference model. It appears that the similarity between the level specification and the VAR with cointegration model is also valid in terms of peak multiplier. Each specification finds that the maximum multiplier takes the values around 2.7. Moreover, while the magnitude of first year cumulative government investment multiplier slightly remains below one for VAR with cointegration model, it exceeds one for other specifications.

Model	Variable	impact	peak	one-year (cumulative)
First difference	Spending	1.0	1.5 (2)	0.9
First difference with cointegration	Spending	0.8	1.3 (2)	0.9
Level	Spending	0.9	1.8 (2)	2.5
First difference	Consumption	1.4	1.9 (2)	1.7
First difference with cointegration	Consumption	1.2	1.9 (2)	1.8
Level	Consumption	2.2	3.3 (2)	6.6
First difference	Investment	2.1	3.6 (2)	1.7
First difference with cointegration	Investment	1.5	2.7 (2)	0.9
Level	Investment	1.3	2.7 (2)	1.7

Table 3: Government Spending Multipliers with Alternative Detrending Methods

Table 4 illustrates estimation results of two different specification regarding order of fiscal variables. In Section 7, we employ a VAR model under the assumption of spending decision comes first. In this section, we examine whether the output responses are changed when we estimate the same model under the assumption of tax decision comes first. As shown in Table 4, changing the order of fiscal variables does not matter in terms of size of impact multiplier. However, we have noticed some differences in terms of peak and one-year cumulative multipliers, especially for government spending and government investment. As a result, estimation results indicate that size of fiscal multiplier diminishes when the model is estimated under the ordering where tax decision comes first.

Variable	Ordering	impact	peak	one-year (cumulative)
Spending	Spending comes first	1.0	1.5 (2)	0.9
Spending	Tax comes first	1.0	1.1 (2)	0.3
Consumption	Spending comes first	1.4	1.9 (2)	1.7
Consumption	Tax comes first	1.4	1.8 (2)	1.6
Investment	Spending comes first	2.1	3.6 (2)	1.7
Investment	Tax comes first	2.2	2.3 (2)	0.4

Table 4: Government Spending Multipliers with Alternative Ordering of Fiscal Variables

9 Conclusion

This paper provides an analysis of the short run effects of fiscal stimulus via government spending on economic activity and focuses on measuring the size of the government spending multiplier in Turkey for the 2001 post-crisis period. A four-variable structural VAR model is estimated with quarterly data by using the first differences of logged data. The variables are log of real government spending, log of real tax, log of real output and real interest rate. The model includes the real interest rates as well as fiscal variables as a determinant of the size of the fiscal multiplier, which enables to consider the interaction between monetary and fiscal policies. The identification of fiscal policy shocks is achieved by taking into account decision lags in fiscal policy and imposing reasonable restrictions on government spending and tax elasticities.

The results of this study appear to be broadly in line with the findings of the existing literature. The impulse response analysis shows that a positive shock to government spending is associated with an increase in the output, tax and real interest rate. The size of the government spending multiplier exceeds one at first few quarters by showing its largest effect at the second quarter and they are found to be statistically significant. An expenditure multiplier greater than one supports the existence of crowding-in effect in Turkey after the post 2001 financial crisis period. However, one can observe that the magnitude of the government spending multiplier starts to decrease following the second quarter and becomes statistically insignificant. This result could partly be explained by an increase in interest rates following a positive government spending shock, which may limit the effects of expansionary fiscal policy on the output. More importantly, the value of one-year cumulative multipliers oscillates around one. Furthermore, the finding of the study points to the importance of the type of government spending. One of the most striking results of this study is that the multiplier effect of government investment expenditure substantially higher than that of government consumption expenditure at first few quarters. However, there is no evidence that one-year cumulative government investment multiplier exceeds that of government consumption multiplier.

The results received in this paper need to be interpreted with caution due to the fact that the magnitude of fiscal multiplier depends on plenty of factors, and hence varies across countries and over time. Therefore, it is important for policy-makers to understand economic conditions properly before they use fiscal policy in order to affect economic activity.

As a result, this study aims to gauge the size of government spending multiplier for Turkey using a linear-VAR model. It seems that using non-linear VAR models has received increasing attention in the recent fiscal literature in order to take into account state-dependent effects of fiscal policy. These studies highlight the fact that the magnitude of fiscal multipliers substantially changes depending on the position of the business cycles. Hence, it would be useful to measure the quantitative short run effects of fiscal policy on the output via non-linear models and this issue is left for future work.

Appendix A: Cointegration Tests

Number of Cointegrations	Trace Statistics	C.Value 5%	prob.**	Max-Eigen Statistics	C.Value 5%	prob.**
Government Spending (g_t, t_t, y_t, r_t)						
None*	67.0	47.8	0.00	40.3	27.5	0.00
At most 1	26.6	29.7	0.11	18.4	21.1	0.11
At most 2	8.2	15.4	0.43	5.2	14.2	0.71
At most 3	3.0	3.8	0.08	3.0	3.8	0.08
Government Consumption (gc_t, t_t, y_t, r_t)						
None*	51.9	47.8	0.01	28.6	27.5	0.03
At most 1	23.3	29.7	0.23	15.6	21.1	0.24
At most 2	7.7	15.4	0.49	5.5	14.2	0.66
At most 3	2.1	3.8	0.14	2.1	3.8	0.14
Government Investment (gi_t, t_t, y_t, r_t)						
None*	62.1	47.8	0.00	33.3	27.5	0.00
At most 1	28.7	29.7	0.06	18.8	21.1	0.10
At most 2	9.8	15.4	0.29	6.2	14.2	0.58
At most 3	3.6	3.8	0.05	3.6	3.8	0.05

* denotes rejection of the null hypothesis at the 5% level.

** Mackinnon, Haug and Michelis (1999) p-values.

Table 5: Johansen Cointegration Tests

$t_{t-1} = -4.41 + 1.74g_{t-1} - 0.16y_{t-1} + 2.89r_{t-1}$			
$(t\text{-}values)$	(4.48)	(-0.27)	(3.43)
$t_{t-1} = -6.39 + 0.78gc_{t-1} + 0.84y_{t-1} + 1.50r_{t-1}$			
$(t\text{-}values)$	(2.67)	(2.22)	(3.01)
$t_{t-1} = -2.60 + 0.57gi_{t-1} + 0.69y_{t-1} + 1.14r_{t-1}$			
$(t\text{-}values)$	(4.93)	(2.64)	(2.56)

Table 6: Cointegration Equations

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