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Impacts of Fiscal Policy Shocks in Finland

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Abstract: This paper focuses on the responses of main macroeconomic indicators to the tax and spending shocks in Finland using a structural VAR approach. The results suggest that GDP increases in response to an increase in government spending whereas it falls in response to an increase in total net taxes. The response of investment to both government spending and total net tax shock is consistent with the Keynesian theory. The results also indicate that the relative impact of government spending on output is lower than that of total net taxes.

Keywords*:* Fiscal Policy; Government Spending; VAR

JEL Classification Number*:* E62; H30

1. Introduction

The impacts of fiscal policy on macroeconomic aggregates is still of great importance and discussed by both academics and policy-makers despite the evidence from theoretical point of view and empirical studies differ. These disagreements aside, fiscal policy has been gaining special relevance and importance particularly in the context of Economic and Monetary Union (EMU) of the European Union. As is widely known, by establishing a single monetary policy, EMU prevents individual member states to act independently. Such prevention leaves the fiscal policy as the single tool on the demand side of the economies of EMU against any shock to their economies.

In the last years, there has been a growing body of literature investigating the impacts of fiscal policy on macroeconomic indicators even though there is still no consensus amongst researchers regarding the size and the duration of the effects. Using the Vector Autoregression (VAR) approach, the most recent and standard strand of the literature started with Blanchard and Perotti (2002) which indicated positive short-run multipliers resulting from tax cuts and increased in government expenditures. Similarly, using a panel of OECD countries Alesina et al. (2002) investigate the impacts of a change in fiscal variables on private investment. The authors find a negative reaction of output in response to an increase in taxes, which is in line with the findings of Blanchard and Perotti (2002).

Investigating the effects of fiscal policy in Australia, Canada, Germany and the UK, Perotti (2004) on the other hand points out that the impact of any change in tax policy on GDP and its components evaporates over time. Envisaging the following three scenarios: a

deficit-financed spending increase, a balanced budget spending increase, and a deficit-financed tax cut, Mountford and Uhlig (2008) try to distinguish the impacts of fiscal policy shocks between 1955 and 2000. Their main finding is that among the three scenarios the deficit financed tax-cut is the most efficient method in helping raise the GDP. This paper seeks to contribute to the analysis of the impacts of fiscal policy by applying a Vector Autoregression method to Finland data. To this end, a 5-variable VAR model, which involves total government spending, total net taxes, GDP, a measure of inflation and interest rate is used as a benchmark. In a further step, the responses of the GDP components, private investment and consumption, to a shock to fiscal variables are examined.

The results suggest that output increases in response to an increase in government spending whereas output falls in response to an increase in total net taxes. The response of investment to both government spending and total net tax shock, is consistent with the Keynesian theory, which predicts that an increase in spending may yield either an increase or a decrease in investment depending on the relative strength of the effects of the increase in output and the increase in the interest rate; yet, in either case, increases in spending and taxes have opposite effects on investment. On the other hand, following an increase in government spending, consumption is crowded in, whereas in response to an increase in total net taxes, consumption is crowded out. While the former result is consistent with the Keynesian model, the latter is difficult to reconcile with the neoclassical model. Finally, our results also indicate that the relative impact of government spending on output is lower than that of total net taxes.

The rest of the paper is organized as follows: Section 2 describes the data. Section 3 addresses the methodological issues related to the specification and identification of the VAR; Section 4 focuses on the results concerning the effects of government spending and total net taxes; and, finally, Section 5 concludes.

2. Data

The availability of the quarterly fiscal variables, particularly for the net tax components, is a binding constraint for the analysis of fiscal policy with VAR models. The sample, therefore, covers the period 1970:1-2007:4. The baseline VAR includes quarterly data on government spending (g_t), net taxes (T_t) and GDP (y_t) all in real terms; the GDP deflator (p_t), and the Treasury bill rate (r_t). T_t is defined as public revenues net of transfers, whereas g_t includes both public consumption and public investment.

All the variables are seasonally adjusted by the original sources and log-transformed except the interest rate that enters in levels. Following the leading studies in the literature, in all cases, the GDP deflator is employed in order to obtain the corresponding real values.

The GDP deflator and the Treasury bill rate data are taken from the IMF International Financial Statistics database, whereas the rest of the data are obtained from the OECD World Economic Outlook database.

3. The Identification Strategy

The reduced-form VAR specification can be written as:

$$Y_t = A(L,q)Y_{t-1} + U_t \quad (1)$$

where Y_t is a N x 1 vector of endogenous variables, $A(L,q)$ is a N x N matrix lag polynomial, and U_t is a N x 1 vector of reduced-form innovations which are assumed to be independently and identically distributed with covariance matrix equal to the $\sum_U = E(U_t U_t')$. Following the leading studies in the literature, the following relationship between the reduced-form residuals U_t and V_t is assumed:

$$AU_t = BV_t \quad (2)$$

in which the shocks are assumed to be independently and identically distributed with covariance matrix equal to the identity one. Or, to put it differently, the structural shocks are assumed to be orthogonal to study the impact of an isolated shock. By multiplying the first equation with A, the following structural form of the VAR can be obtained:

$$AY_t = AC(L)Y_{t-1} + AU_t = AC(L)Y_{t-1} + BV_t \quad (3)$$

Once this equation is solved for Y_t, it will yield the following structural moving-average representation:

$$Y_t = [I - C(L)L]^{-1}A^{-1}B\,V_t \quad (4)$$

The method adopted here is the structural identification method proposed by Blanchard and Perotti (2002). According to this method, some elements of the matrix A in equation (2) can be obtained by using information on elasticities of government spending and taxes with respect to output. The elasticities can either be computed or taken exogenously. There are two main assumptions for this method. First, the relative ordering of the fiscal variables needs to be identified. In other words, it is required to identify whether the government spending decisions or tax decisions are deemed to come first. Second, it is assumed that government spending does not react with a certain period to shocks to the economy. That is simply why the quarterly data is preferred in this method as it is not possible to learn about a GDP shock, pass the measures through legislature and implement them within a quarter. In this paper, the identification will be built upon this method and it is assumed that government spending decisions come first. Thus, the system takes the following form:

$$\begin{bmatrix} 1 & 0 & -\alpha_y^g & -\alpha_p^g & -\alpha_r^g \\ 0 & 1 & -\alpha_y^T & -\alpha_p^T & -\alpha_r^T \\ -\gamma_g^y & -\gamma_T^y & 1 & 0 & 0 \\ -\gamma_g^p & -\gamma_T^p & -\gamma_y^p & 1 & 0 \\ -\gamma_g^r & -\gamma_T^r & -\gamma_y^r & -\gamma_p^r & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^T \\ u_t^y \\ u_t^p \\ u_t^r \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ \beta_g^T & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} v_t^g \\ v_t^T \\ v_t^y \\ v_t^p \\ v_t^r \end{bmatrix}$$

where v_i^j's represents the structural shocks, u_i^j's stands for the reduced form residuals. The coefficients α_i^j measures the automatic response of fiscal variable i to the macroeconomic variable j. Similarly, the coefficients β_i^j capture the random discretionary fiscal policy shocks to fiscal policies.

Table 1 provides an overview of the quarterly elasticities used in this study. The elasticity of tax to GDP is constructed from the data provided by OECD, following the leading studies in the literature i.e. Perotti (2007) and Monacelli and Perotti (2010). In this context, it is assumed that the contemporaneous elasticity of government spending with respect to GDP is zero. Such an assumption is also standard in the literature for most of the studies including but not limited to Blanchard and Perotti (2002), De Castro and De Cos (2008), Burriel et al. (2010). Furthermore, no fiscal variables are assumed to be sensitive to the nominal interest rate. The elasticity of fiscal variables with respect to real private consumption and investment are equal to the elasticities with respect to GDP component in the sum of both. Finally, following Heppke-Falk et al. (2006), the GDP deflator elasticity is the real GDP elasticity of the nominal fiscal variable less 1.

Table 1: Exogenous Elasticities

	Real GDP	**Treasury Bill Rate**	**GDP deflator**	**Private Investment**	**Consumption**
Total Net Taxes	0.7	0	-0,3	0.49	0.21
Government Spending	0	0	-1	0	0

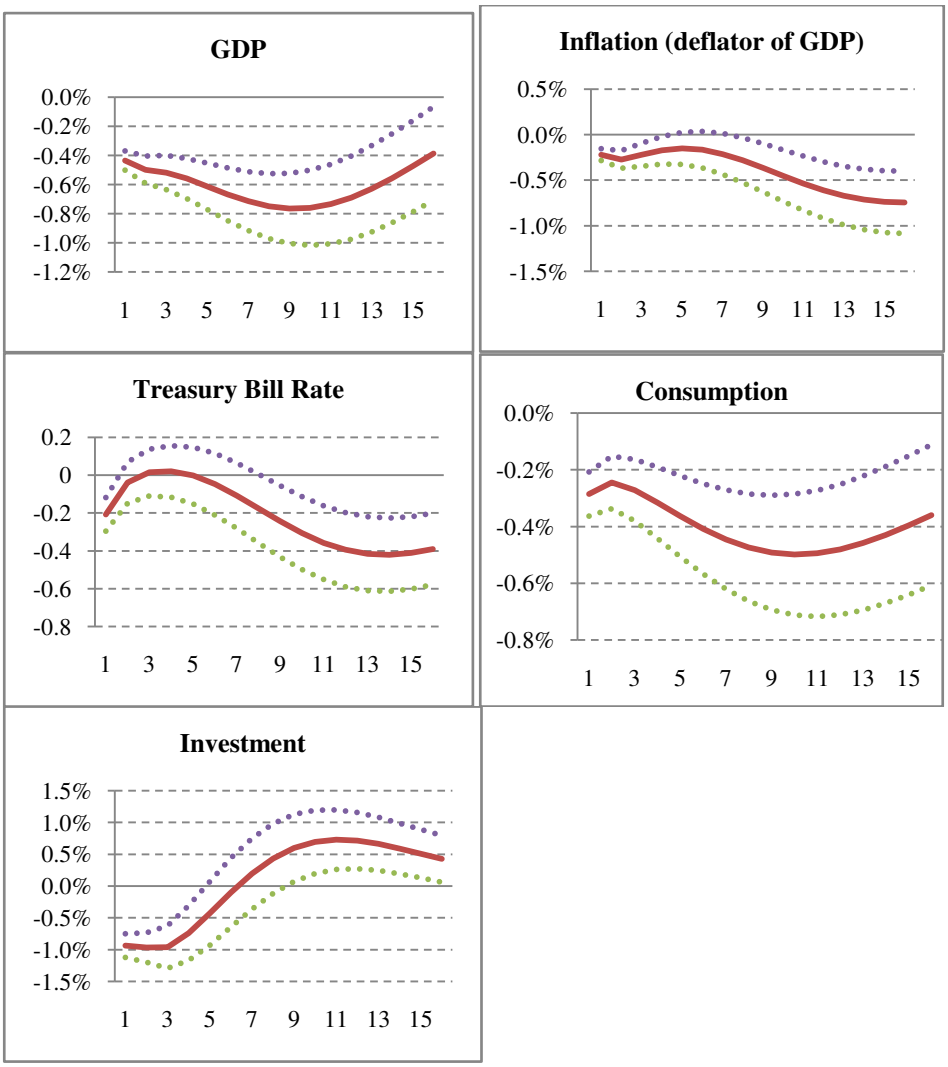
The Specification

Equation 1 is estimated by ordinary least squares (OLS) method and the choice of the number of lags is made considering the Akaike, Schwarz and Hannan-Quinn information criteria and the final prediction error. Here, 3 lags is chosen. The VAR specification described above is estimated so as to obtain the responses of macroeconomic aggregates to various fiscal policy instruments. The baseline VAR includes five variables: government expenditures (g_t), tax revenue (T_T), the GDP (y_t), the GDP deflator (p_t) and the Treasury bill rate (r_t). In a further step, a number of other specifications where GDP is substituted, in turn, by its private components (consumption and investment) are also estimated.

4. Empirical Results

Figure 1 presents the impulse responses of the various macroeconomic indicators following an increase in total net taxes. GDP falls on impact in response to total net taxes innovations in Finland. The significant decline in output appears to be significant and lasts almost the entire period under consideration.

Figure 1: Effects of Total Net Tax Innovations in Finland



Note: Dotted lines indicate the one-standard error confidence interval.

The response of GDP components in terms of consumption and investment are also examined so as to obtain a more detailed picture. As regards investment, there will instead be two effects: wealth effect and output effect. As mentioned above, when there is an increase in taxes, consumption decreases while national savings and labor supply increases lowering the interest rate, therefore, investment increases. This is called wealth effect. Second, when there is an increase in net taxes, the economy will slow down by a decrease in output. As the money demand hinges on income, the decline in output will lead to a decrease in interest rate that partially crowds in private investment. The degree of crowding in will depend on the sensitivity of private investment to interest rate and income. However, the final effect of the contraction will be a decline in consumption, investment and output. This is called output effect. So, the net effect on investment will depend on these two effects. It is clear from Figure 1 that the wealth effect is dominated by the output effect and thus the impact response of consumption, investment and output are all negative. Notably, the decline in investment lasts around five quarters, and, thereafter started to rise along with the decline in interest rate.

Figure 2 displays the responses of the same indicators following an increase in government spending. The impact response of GDP is positive and significant on impact. The behavior of consumption largely mimics that of GDP; which basically rises on impact. Government spending shock has also positive impact on interest rate as a result of increasing money demand. It should here be noted that the response of investment is positive. Such an outcome is consistent with the Keynesian theory, which predicts that an increase in spending may yield either an increase or a decrease in investment depending on the relative strength of the effects of the increase in output and the increase in the interest rate; yet, in either case, increases in spending and taxes have opposite effects on investment.[1]

Finally, one might also interest in discovering which policy is more effective on output in the economy. Comparing the on impact values of output in response to government spending and total net taxes shocks, it is clear from the figures that the relative impact of government spending is lower than that of total net taxes. Or, to put it differently, decreasing the total net taxes will lead to better results on the overall economy than increasing the government spending same amount.[2]

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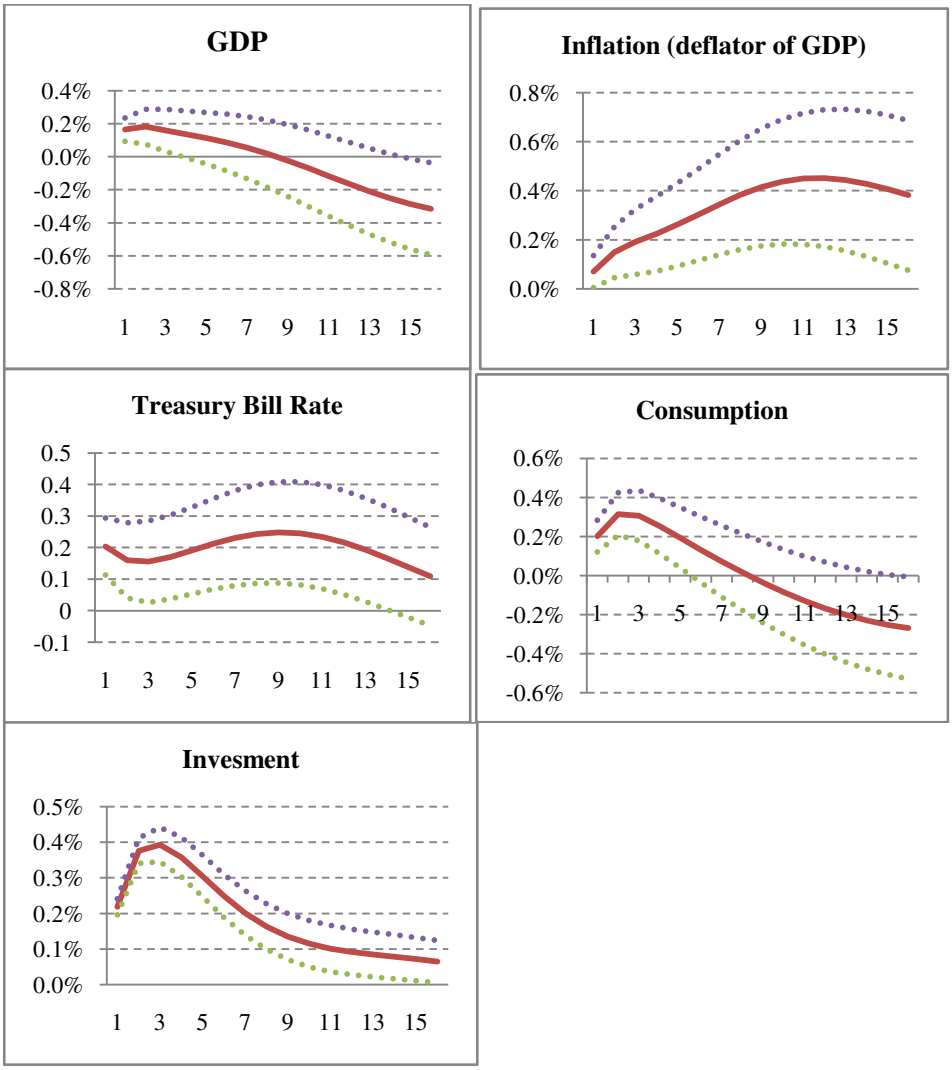
[1]For more information, please see Blanchard and Perotti (2002).

[2]The robustness of the results were analysed in several ways such as changing the ordering of fiscal variables, replacing the elasticities with their 15 per cent bandwith values,and working with other automatic stabilizer multipliers. The results obtained with alternative approaches are very close to those of the benchmark model. To save space, they are not reported here, and available upon request.

Figure 2: Effects of Government Spending Innovations in Finland



Note: Dotted lines indicate the one-standard error confidence interval.

5. Conclusion

The main goal in this paper was to characterize the responses of main macroeconomic indicators to the tax and spending shocks in Finland using a structural VAR approach under the Blachard and Perotti (2002) identification scheme. The results suggest that GDP

increases in response to an increase in government spending whereas it falls in response to an increase in total net taxes. The response of investment to both government spending and total net tax shock is consistent with the Keynesian theory. Following an increase in government spending, consumption is crowded in, whereas in response to an increase in total net taxes, consumption is crowded out. While the former result is consistent with the Keynesian model, the latter is difficult to reconcile with the neoclassical model. Our results also indicated that the relative impact of government spending on output is lower than that of total net taxes.

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