The power of fiscal multipliers in Croatia

ANA GRDOVIĆ GNIP, B.Sc.*

Article**
JEL: C32, E62, H30
doi: 10.3326/fintp.38.2.3

* The author is grateful to Davor Kunovac and Marina Botica for the valuable discussion, and would like to thank three anonymous referees for their useful comments and suggestions.
** Received: June 1, 2013
Accepted: December 24, 2013
The article was submitted for the 2013 annual award of the Prof. Dr. Marijan Hanžeković Prize.

Ana GRDOVIĆ GNIP
Juraj Dobrila University of Pula, Dr. Mijo Mirković Faculty of Economics and Tourism, Preradovićeva 1/1, 52100 Pula, Croatia
e-mail: agrdovic@unipu.hr

FINANCIAL THEORY AND PRACTICE
38 (2) 173-219 (2014)

Abstract

This paper investigates fiscal multipliers in Croatia in the period 1996Q1-2011Q4. For this purpose, a Blanchard Perotti three variable baseline SVAR is employed as a no regime-switch model, along with a four variable baseline STVAR as a regime-switch model. Results show that during recessions fiscal multipliers in Croatia tend to be much larger and move in line with Keynesian assumptions, i.e. a positive government spending shock increases output, private consumption and private investment, while oppositely a positive tax shock worsens the same macroeconomic variables. Moreover, during recession times government spending for purchases of goods and services seems to be the most effective fiscal instrument for boosting economic activity.

Keywords: fiscal multiplier, spending shock, tax shock, SVAR, STVAR, Croatia

"Our area of ignorance even on basic signs of fiscal policy multipliers is too great."

Perotti (2000:24)

1 INTRODUCTION

The recent global financial crisis refocused the attention of policy makers and economists onto fiscal policy as a potentially strong tool in stimulating economic growth. Although for decades there has been a global tendency for fiscal stabilization to be performed mainly by the work of automatic stabilizers rather than discretionary fiscal policy, governments as well as institutions traditionally seen as symbols of fiscal austerity (such as the International Monetary Fund or European Commission) opted for large fiscal stimuli during the latest economic downturn.

Still, the eventual effects of a stimulus package are uncertain and empirical research shows no absolute consensus on the effects of fiscal policy on macroeconomics. Most studies prove a positive multiplier for an exogenous government spending shock and a negative multiplier for an exogenous government tax shock. Nevertheless, the size (and sign) of a fiscal multiplier is country-, time-, estimation method- and regime-dependent. A revealing example of how differences in size of a fiscal multiplier affect potential fiscal stimuli effectiveness was recently provided by Barro (2009). In an article for the Wall Street Journal Barro discusses the recovery program proposed by Cristina Romer, Chair of President Obama's Council of Economic Advisers. Namely, when estimating the overall job gains for the proposed 787 billion USD stimulus package, Cristina Romer used 1.5 as the size of the government spending multiplier. Barro's opinion was that the size of this multiplier was essentially zero and therefore, as pointed by Ilzetzki, Mendoza and Vegh (2010:2) "the difference between Romer's and Barro's views of the world amounts to a staggering 3.7 million jobs by the end of 2010".

Diverging predictions of the effectiveness of fiscal stimuli can be found in theoretical literature as well. Real Business Cycle (RBC) models assume that an increase in government consumption will be completely neutralized by the reduction of private consumption (Baxter and King, 1993 or Fatás and Mihov, 2001). Keynesian models argue that a government consumption increase leads to an increase in private consumption and output (Blanchard, 2003)[1]. However, Pappa (2003:2) indicates that differences in predicting fiscal policy effects arise because fiscal shocks are difficult to identify in practice due to "endogeneity of fiscal variables, interactions between fiscal and monetary policy variables, delays between planning, approval and implementation of fiscal policies and scarceness of reasonable zero-identifying restrictions".

This paper studies fiscal multipliers in Croatia using two different frameworks for estimation. On one hand a linear structural vector autoregression (SVAR) model as proposed by Blanchard and Perotti (2002) is used to estimate the overall sign and size of a government spending and tax shock on output, private consumption and private investment. The novelty of the SVAR model in this paper with respect to other works published in the field of fiscal policy on the Croatian case (i.e. Ravnik and Žilić, 2011; Šimović and Deskar-Škrbić, 2013) are the following: (1) the data set is based on a longer time span (1996Q1-2011Q4), (2) estimated multipliers involve not only the effect of total government spending and taxes but government spending components as well, (3) fiscal policy effects are investigated not only with respect to output, but also with respect to private consumption and private investment, and (4) multipliers are converted into monetary values (in kuna), which is much more *friendly* for readers and gives a real *feeling* of the effect.

On the other hand a smooth transition vector autoregression (STVAR) model is used to investigate whether the size of a fiscal multiplier is different in *good* and *bad* times. This analysis as well embraces the effects (multipliers) of different government spending components on output, private consumption and investment.

The main results are in line with Keynesian theory. A spending shock positively affects output, private consumption and private investment and the response is significant within a year. Moreover, when investigating the effect of government consumption versus government investment, the positive effect of the first with respect to output and private consumption is persistent and significant throughout the whole time horizon. A tax shock leads to a drop in output, private consumption and private investment. If the regime-switching models are considered, the results are conclusive in the fact that fiscal multipliers tend to be larger in times of economic downturn in Croatia than in times of expansion when they are mostly insigni-

[1] The disagreement about fiscal policy effects on private consumption is part of a broader topic whether consumers are set as Ricardian or non-Ricardian. In the standard neoclassical model an increase in government spending tends to crowd out private consumption due to the negative wealth effect on consumer induced by expectations of higher tax payments in future.

FINANCIAL THEORY AND PRACTICE
38 (2) 173-219 (2014)

ficant. Such results are in line with similar research conducted in the case of other (developed and developing) countries.

This paper is structured as follow: section two gives some insight into the theoretical and empirical background about fiscal multipliers. The third section is devoted to a brief explanation of the methodologies and data used in the analysis. Section four presents the results, while the last, fifth, section is reserved for concluding remarks.

2 THEORETICAL AND EMPIRICAL BACKGROUND

In general, a fiscal multiplier refers to a change in output ΔY occurring after an exogenous one-unit change in a fiscal policy instrument ΔFI (the fiscal instrument FI can be represented by total government spending G, total taxes T or their subcomponent – transfers G^{tr} or direct taxes T^{d} for instance). For example, in the case in which a one-kuna increase in government spending in Croatia causes a 50 lipa increase in GDP, then the government spending multiplier is said to be 0.5. Such a multiplicative effect varies across the time horizon, so it is important to stress the following definitions:

The **impact multiplier** measures the ratio of a contemporaneous change in output to an exogenous change in fiscal policy instrument at time of impact (occurrence of shock), i.e. time t_0:

$$\frac{\Delta Y_{t_0}}{\Delta FI_{t_0}} \tag{1}$$

The **multiplier in a** future **period *n*** is the ratio of change in output in time t_0+n to an exogenous change in the fiscal policy instrument at time of impact t_0:

$$\frac{\Delta Y_{t_0+n}}{\Delta FI_{t_0}} \tag{2}$$

The **cumulative multiplier** is defined as the cumulative change in output over the cumulative change in fiscal policy instrument at some time horizon n:

$$\frac{\sum_{i=1}^{n} \Delta Y_{t_0+i}}{\sum_{i=1}^{n} \Delta FI_{t_0+i}} \text{ where i=1,2,…,}n \tag{3}$$

The **peak multiplier** represents the largest change in output after a change in fiscal policy instrument over any time horizon n:

$$\max_{n} \frac{\Delta Y_{t_0+n}}{\Delta FI_{t_0}} \tag{4}$$

Empirical and theoretical studies show that fiscal multipliers vary in sign and size, being also country-, time-, methodology- and economic conditions-specific. In fact, there is no absolute consensus on the effects of fiscal policy on macroeconomics,

and empirical results agree on one fact only, i.e. *that a positive government spending shock has a positive (and significant) effect on output*[2].

Additionally, Spilimbergo, Symansky and Schindler (2009:2) point out that the size of the multiplier is larger if (1) "leakages" are few (i.e. only a small part of the stimulus is saved or spent on imports), (2) monetary conditions are accommodative (i.e. the interest rate does not increase as a consequence of fiscal expansion), and (3) a country's fiscal position after the stimulus is sustainable. Moreover, these authors signal that the degree of financial market development and intermediation, as well as institutional features and the general macroeconomic and financial conditions in the domestic economy and externally, also have influence on the size and sign of a fiscal multiplier[3].

Although there was a predominant view that fiscal policy should mainly operate through the work of automatic stabilizers, the latest economic crisis showed that a growing number of governments opted for *discretionarism* to boost economic activity[4]. Therefore, fiscal policy is at the focus of academic and policy makers' debates concerning the question: *what is the transmission of fiscal policy shocks?* Especially in the case of an economic downturn, policymakers should be able to predict how a discretionary change in a fiscal instrument (or a set of instruments) will affect economic activity, in order to be as efficient and effective as possible in smoothing business cycles.

As already mentioned, among others, the answer is conditioned by the methodology used in identifying fiscal shocks and by the employed identification restrictions. Still, much of the empirical research in this area is based on two methodologies: (1) linear structural vector autoregression (SVAR) models and (2) linearized dynamic stochastic general equilibrium (DSGE) models[5,6]. Although frequently applied, both methodologies have two main shortcomings pinpointed by Parker (2011:6): first, the government spending multiplier is time-invariant and inde-

[2] It is important to point out that the agreement about the government spending effect on output is mainly due to the fact that much of the literature and research investigates fiscal policy on the basis of US data. Fiscal policy transmission mechanism is known to be country-specific (since there are no two identical tax and/or fiscal systems on the world) and therefore there are works based on the same country case that do not find such unambiguous results as in case of the US. For example, investigation into the case of Germany is not as conclusive as in the US case with respect to the size and statistical significance of the effect of government spending on output (Höppner, 2001; Perotti, 2005; Marcellino, 2002 and Heppke-Falk et al., 2006).

[3] For a detailed explanation of the mentioned determinants see Spilimbergo et al. (2009).

[4] Spilimbergo, Symansky and Schindler (2009) point out that countries turned to fiscal policy as their primary stabilization tool either because of changes in their monetary regime (such as currency board or participation in a monetary union) or because financial conditions deteriorated to the point at which monetary policy became ineffective.

[5] Moreover, the study of fiscal policy effects on economic activity proposes three additional schemes for identifying fiscal policy shocks: (1) the recursive approach introduced by Sims (1980), (2) the sign-restrictions approach developed by Mountford and Uhlig (2005), and (3) the event-study (narrative or Dummy approach) proposed by Ramey and Saphiro (1998) for studying the isolated effects of unexpected increases in government spending for defense purposes.

[6] Broad surveys of the literature estimating fiscal multipliers are provided in Parker (2011) and Ramey (2011).

pendent of the state of the economy, and second, a linear model forces a multiplier to be independent of the size of the stimulus.

The SVAR approach to investigating fiscal multipliers was introduced by Blanchard and Perotti (2002) in research on quarterly data about government spending, taxes and output in the US. Subsequently, much of the empirical research, including this, when investigating fiscal multipliers has relied on the Blanchard and Perotti (2002) SVAR method[7]. Table 1 summarizes selected main findings about spending and tax multipliers in developed and developing countries using such a methodological framework.

Table 1

SVAR based government spending and net taxes multipliers in selected studies

Study	Sample	Spending multiplier		Tax multiplier	
		Short-term	Medium-term	Short-term	Medium-term
Developed countries					
Blanchard and Perotti (2002)	US 1947Q1–1997Q4	0.5	0.5	(-0.7,-1.3)	(-0.4,-1.3)
Biau and Girard (2007)	France 1978Q1–2003Q4	1.9	1.5	-0.5	-0.8
IMF (2005)	Portugal 1995Q3–2004Q4	1.32	1.07	–	–
Perotti (2004)	US 1960Q1–1979Q4	1.29	1.4	-1.41	-23.87
	US 1980Q1–2001Q4	0.36	0.28	0.7	1.55
	Germany 1960Q1–1974Q4	0.36	0.28	0.29	-0.05
	UK 1963Q1–1979Q4	0.48	0.27	-0.23	-0.21
	UK 1980Q1–2001Q2	-0.27	-0.6	0.43	0.7
Heppke-Falk et al. (2006)	Germany 1974Q1–2004Q4	0.62	1.27	no effect	no effect
Giordano et al. (2007)	Italy 1982Q1–2004Q4	1.2	1.7	0.16	–
De Castro and de Cos (2008)	Spain 1980Q1–2004Q4	1.3	1	positive	negative
Burriel et al. (2010)	Euro area 1981Q1–2007Q4	0.87	0.85	-0.63	-0.49
Baum and Koester (2011)	Germany 1976Q1–2009Q4	0.62	1.27	-0.66	-0.53
De Castro and Fernandez (2011)	Spain 1981Q1–2008Q4	0.94	0.55		
Developing countries					
Lonzano and Rodriguez (2009)	Colombia 1980Q1–2007Q4	1.12	1.20	positive	–
Mirdala (2009)	Czech R. 2000Q1–2008Q4	positive	–	no effect	–
	Slovak R. 2000Q1–2008Q4	positive	–	positive	–
	Hungary 2000Q1–2008Q4	positive	–	negative	–
	Bulgaria 2000Q1–2008Q4	positive	–	positive	–
	Romania 2000Q1–2008Q4	positive	–	positive	–
	Poland 2000Q1–2008Q4	positive	–	no effect	–

[7] Hebous for instance shows that in investigations of government spending effects, in a total of 42 country cases, 22 of them employ the Blanchard and Perotti SVAR, 9 the sign restriction approach, 5 the recursive framework while the narrative and expectation augmented setups are presented in 4 and 2 cases respectively (2009:13-15).

Study	Sample	Spending multiplier		Tax multiplier	
		Short-term	Medium-term	Short-term	Medium-term
Developing countries					
Crespo Cuaresma et al. (2011)	Czech R. 1995Q1–2009Q4	no effect	-0.04	no effect	0.03
	Hungary 1995Q1–2009Q4	0.01	0.01	no effect	-0.01
	Poland 1995Q1–2009Q4	no effect	-0.02	no effect	0.02
	Slovak R. 1996Q1–2009Q4	-0.01	0.00	-0.02	-0.1
	Slovenia 1996Q1–2009Q4	-0.01	-0.01	0.01	0.02
Jemec, Strojan Kastelec and Delakorda (2011)	Slovenia 1995Q1–2010Q4	1.61	no effect	-0.38	no effect
Mancellari (2011)	Albania 1998Q1–2009Q4	0.36	–	1.4	–
Ravnik and Žilić (2011)	Croatia 2001M1–2009M12	negative	–	positive	–
Šimović and Deskar-Škrbić (2013)*	Croatia 2004Q1–2012Q4	2.18	1.91	-1.32	-0.81

Notes: Short-term multiplier ranges from time of impact to one year span; medium-term multiplier refers to the time span going from one to two years, except in case of Crespo Cuaresma et al. (2011) and Mancellari (2011) when it goes to two years, i.e. maximum reported. Tax multipliers in Blanchard and Perotti (2002) are shown as range/interval.
**In the case of Šimović and Deskar-Škrbić (2013) the results shown refer to multipliers at the consolidated general government level.*

Source: Author's systematization.

It is possible to observe from table 1 that fiscal multipliers are highly debatable. In developed countries spending multipliers are positive in all cases no matter of the time horizon under investigation, except in Perotti (2004) in the case of the United Kingdom. Same multipliers in developing countries are mostly positive in the short run and above unity in Slovenia (Jemec, Strojan Kastelec and Delakorda, 2011) and Croatia (Šimović and Deskar-Škrbić, 2013). On the other hand tax multipliers do not exercise a certain effect on output. It is noticeable that not in all cases does an increase in taxes lead to a decrease in output, and moreover the magnitude of the effect is quite different in the studied cases.

Recent theoretical and empirical studies emphasize that one of the reasons why there is no conclusive evidence of fiscal policy effects may be found in the fact that government spending (and tax) multipliers may change over the business cycle, i.e. be larger in recessions than in expansions (Christiano, Eichenbaum and Rebelo, 2009; Woodford, 2010; Auerbach and Gorodnichenko, 2010a, 2010b, among others)[8]. These findings appear to be in line with Keynesian arguments in favor of using discretionary government spending in downturn periods to stimulate aggregate demand. Table 2 summarizes the spending and tax multipliers during recessions and expansions in selected studies. Among all it is worth noting

[8] It is important to point out that works in the field of fiscal policy when investigating state-dependent multipliers employ non-linear approaches, mainly STVAR and TVAR (threshold vector autoregressive) models. The main difference is that in a TVAR setup the economy discretely changes from one state to the other, i.e. it jumps from regime to regime, while a STVAR model allows such a switch to occur smoothly. Moreover, within a STVAR approach all observations are used for the estimation of parameters under both regimes.

that the highest negative short-term effect on output after a positive tax shock was recorded in France, being 1.6 in *bad* times and 0.7 in *good* times (Baum, Poplawski-Ribeiro and Weber, 2012), while a positive government spending shock in *bad* times mostly increases output in the short term in the euro area and the US (Batini, Callegari and Melina, 2012) with a multiplier of 2.6 and 2.2, respectively.

TABLE 2

Government spending and net taxes multipliers in non-linear approaches in selected studies

Study	Sample	Spending multiplier		Tax multiplier	
		Short-term	Medium-term	Short-term	Medium-term
Developed countries					
Baum, Poplawski-Ribeiro and Weber (2012)	Canada 1966Q1–2011Q2	R: -2.7 E: -0.8	R: -3.3 E: -1.1	R: -0.2 E: 0.2	R: -0.2 E: 0.2
	France 1970Q4–2010Q4	R: -0.7 E: 1.7	R: -1.1 E: 2.1	R: -1.6 E: -0.7	R: -2.2 E: -0.9
	Germany 1975Q3–2009Q4	R: 1.0 E: 0.4	R: 1.3 E: 0.4	R: -0.5 E: -0.6	R: -0.6 E: -0.8
	Japan 1970Q1–2011Q2	R: 1.6 E: 0.9	R: 1.8 E: 1.3	R: 0.2 E: 0.6	R: -0.2 E: 0.4
	UK 1970Q1–2011Q2	R: -0.1 E: 0.1	R: -0.1 E: 0.1	R: 0.1 E: 0.0	R: 0.1 E: -0.1
	US 1965Q2–2011Q2	R: 1.9 E: 1.6	R: 2.4 E: 2.4	R: -0.2 E: -0.4	R: -0.3 E: -0.5
Batini, Callegari and Melina (2012)	US 1975Q1–2010Q2	R: 2.2 E: 0.3	R: 2.2 E: -0.5	R: 0.2 E: 0.2	R: 0.7 E: 0.7
	Japan 1981Q1–2009Q4	R: 2.0 E: 1.4	R: 2.0 E: 1.1	R: -0.2 E: -0.3	R: 0.2 E: -0.1
	France 1970Q1–2010Q4	R: 2.1 E: 1.6	R: 1.8 E: 1.9	R: 0.0 E: -0.1	R: -0.3 E: -0.2
	Italy 1981Q1–2007Q4	R: 1.6 E: 0.4	R: 1.8 E: 0.5	R: 0.2 E: 0.1	R: 0.2 E: 0.1
	Euro area 1985Q1–2009Q4	R: 2.6 E: 0.4	R: 2.5 E: 0.1	R: 0.4 E: -0.2	R: 0.4 E: -0.1
Auerbach and Gorodnichenko (2010a)	US 1947Q1–2008Q4	R: 1.4 E: 0.0	R: 1.8 E: -0.1	–	–
Auerbach and Gorodnichenko (2010b)	OECD 1985–2010*	R: 0.5 E: -0.3	R: 0.4 E: -0.3	–	–

*Notes: Short-term multiplier ranges from time of impact to one-year span; medium-term multiplier refers to a time span of from one to two years. R stands for recession, while E for expansion. *In case of Auerbach and Gorodnichenko (2010b) the dataset is based on semiannual data with a time span from 1985 to 2010 for "old" OECD members and from 1990 to 2010 for the "newer" OECD members.*

Source: Author's systematization.

Moreover, Romer and Berstein (2009) estimate that a spending multiplier during the latest global financial crisis in US is at least 3. Similarly, Christiano, Eichenbaum and Rebelo (2009), Auerbach and Gorodnichenko (2010a, 2010b) and Bachmann and Sims (2012) find that spending multipliers on output and private consumption in US tend to rise during periods of economic downturns (up to the size of 3) while they are around zero during expansions. Empirical studies show that output multipliers of government consumption are larger in recessions, but they are even larger when monetary policy is highly accommodative, as in the case of the recent financial crisis when the monetary policy rate of most central banks was at its lower bound level. Christiano, Eichenbaum and Rebelo (2009) and Woodford (2010) show that when interest rates are at their effective low level, fiscal shocks tend to have amplified effects because government spending does not crowd out private spending, with multipliers as large as 10.

Most papers that investigate fiscal multipliers in *special* times focus on the case of developed countries (mainly the US), while there is almost no evidence that the same conclusion holds in the case of developing/emerging countries. In the latter fiscal policy often tends to be overwhelmingly procyclical, partly because of political incentives for governments to spend more generously and thus run large deficits in *good* times (for example, Kaminsky, Reinhart and Vegh, 2004; and Alesina, Campante and Tabellini, 2008). If this is the case then fiscal actions should be less effective irrespective of whether the economic times are *good* or *bad*.

3 DATA AND METHODOLOGY

The empirical analysis of fiscal multipliers in this paper is based on two methodologies. On one hand the Blanchard and Perotti (2002) SVAR setup is chosen from the set of linear approaches, while on the other hand, in order to investigate whether fiscal multipliers differ in Croatia in *good* and *bad* times, the smooth transition vector autoregression (STVAR) is applied, as in Auerbach and Gorodnichenko (2010b).

3.1 THE SVAR SPECIFICATION

The baseline specification includes three variables: the log of real government spending g_t, the log of real output y_t and the log of real government revenue r_t ("net taxes" or "taxes" for short). Denoting the vector of endogenous variables by X_t and the vector of reduced form innovations by U_t, the reduced form VAR model can be written as:

$$X_t = C(L)X_{t-1} + U_t\,, \tag{5}$$

where $X_t = \left[g_t \quad y_t \quad r_t\right]^T$, $C(L)$ is a $n \times n$ autoregressive lag polynomial matrix and $U_t = \left[u_t^g \quad u_t^y \quad u_t^r\right]^T$ [9].

[9] Reduced form residuals U_t represent a linear combination of different structural innovations and therefore have no economic interpretation.

FINANCIAL THEORY AND PRACTICE
38 (2) 173-219 (2014)

The reduced form residuals u_t^g and u_t^r can be thought of as a linear combination of three components (Perotti, 2004:3): (1) the *automatic response* of taxes and government spending to innovations in output, (2) the *systematic discretionary response* of policymakers to output, and (3) the *random discretionary* shocks to fiscal policy. The latter encompasses the structural fiscal shocks, which unlike the reduced form residuals are uncorrelated among each other.

Defining the vector of spending, output and tax structural shocks as $V_t = \left[v_t^g \quad v_t^y \quad v_t^r\right]^T$, U_t can be written as a linear combination of structural shocks V_t in the following way

$$AU_t = BV_t\,, \tag{6}$$

where A and B are n x n matrices describing immediate relations between the reduced form residuals and the structural shocks[10]. Therefore, the structural VAR can be obtained by multiplying (5) by matrix A and using (6), which leads to the following:

$$AX_t = AC(L)X_{t-1} + BV_t \tag{7}$$

The matrix representation of the latter is:

$$\begin{bmatrix} 1 & -\alpha_y^g & -\alpha_r^g \\ -\alpha_g^y & 1 & -\alpha_r^y \\ -\alpha_g^r & -\alpha_y^r & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^y \\ u_t^r \end{bmatrix} = \begin{bmatrix} \beta_g^g & 0 & \beta_r^g \\ 0 & \beta_y^y & 0 \\ \beta_g^r & 0 & \beta_r^r \end{bmatrix} \begin{bmatrix} v_t^g \\ v_t^y \\ v_t^r \end{bmatrix} \tag{8}$$

Blanchard and Perotti (2002) argue that governments cannot react within the same quarter to changes of the macroeconomic setting mainly because fiscal policy decisions involve many agents (parliament, government and society) and therefore need a long period of time for implementation. Hence the *systematic discretionary response* is absent in quarterly data. Therefore the reduced-form fiscal shocks capture only the *automatic response* of fiscal variables to economic activity (meaning that $\alpha_r^g = \alpha_g^r = 0$).

Without loss of generality, one can write:

$$u_t^g = \alpha_y^g u_t^y + \beta_r^g v_t^r + \beta_g^g v_t^g\,, \tag{9}$$

$$u_t^y = \alpha_g^y u_t^g + \alpha_r^y u_t^r + \beta_y^y v_t^y\,, \text{ and} \tag{10}$$

$$u_t^r = \alpha_y^r u_t^y + \beta_g^r v_t^g + \beta_r^r v_t^r\,, \tag{11}$$

[10] In such a set up A and B are n x n parameter matrices that require identifying restrictions to be imposed on A and B to obtain an unique relation, because reduced form residuals have no economic interpretation and different structural forms can give the same reduced form VAR model (see for instance Gottshalk, 2001).

where the α_i^js capture the other two components and v_t^g and v_t^r are the *structural fiscal shocks*.

When this is the case, Blanchard and Perotti (2002) use available exogenous information on the elasticity of spending and taxes with respect to GDP to compute the appropriate value of the coefficients α_i^j. These elasticities allow fiscal shocks to be constructed in cyclically adjusted terms as follows:

$$u_t^{g,CA} = u_t^g - \alpha_y^g u_t^y, \text{ and} \tag{12}$$

$$u_t^{r,CA} = u_t^r - \alpha_y^r u_t^y. \tag{13}$$

As mentioned earlier, this study assumes that expenditure does not respond to output within a quarter because it is predetermined in a budgetary plan and therefore not elastic in the short run. Thus, α_y^g is set to zero according to the assumption that government spending is solely under the control of the fiscal authority. However, worth noting is that some recent studies challenge this assumption. Among others, Rodden and Wibbles (2010) find evidence of spending elasticity of 0.17 with respect to output at the state and local level in the US. However, this work (like others in this field) is based on annual data, so it is reasonable to assume that such a procyclicality vanishes in quarterly frequencies.

In line with Blanchard and Perotti (2002) the coefficient α_y^r is estimated as the weighted average of different revenue components' output elasticity. The output elasticity of net taxes is 0.92 in the Croatian case (see appendix B for a detailed view about the estimations of exogenous elasticities), meaning that a 1% increase in output (GDP) generates a 0.92% increase in taxes. This estimation is in line with results obtained by studies covering other countries. It matches the tax elasticity with respect to output in the German case shown in Perotti (2002) but is lower than that in the US or Canada for example. If it is compared to the tax elasticity obtained in the Croatian case by Ravnik and Žilić (2011) it is 0.03 percentage point lower and not significantly different.

The recovered cyclically adjusted reduced form fiscal shocks represent a linear combination of the two structural fiscal policy shocks, i.e.

$$u_t^{g,CA} = \beta_r^g v_t^r + \beta_g^g v_t^g, \text{ and} \tag{14}$$

$$u_t^{r,CA} = \beta_g^r v_t^g + \beta_r^r v_t^r. \tag{15}$$

Assuming that a government tends to decide on expenditure first means that $\beta_r^g = 0$, and therefore:

$$u_t^{g,CA} = \beta_g^g v_t^g, \text{ while} \tag{16}$$

$$u_t^{r,CA} = \beta_g^r v_t^g + \beta_r^r v_t^r , \tag{17}$$

where β_g^r is estimated by OLS to retrieve the structural shocks to the fiscal variables.

The two estimated structural shocks are orthogonal to the structural shock of output and therefore can be used as instruments when estimating equation (10) using the instrumental variables approach.

So the just-identified three variable baseline SVAR model is the following[11]:

$$\begin{bmatrix} 1 & 0 & 0 \\ -\alpha_g^y & 1 & -\alpha_r^y \\ 0 & -0.92 & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^y \\ u_t^r \end{bmatrix} = \begin{bmatrix} \beta_g^g & 0 & 0 \\ 0 & \beta_y^y & 0 \\ \beta_g^r & 0 & \beta_r^r \end{bmatrix} \begin{bmatrix} v_t^g \\ v_t^y \\ v_t^r \end{bmatrix} \tag{18}$$

where OLS is adopted in estimating β_g^r and IV in estimating α_g^y and α_r^y. The estimates are presented in the following table.

TABLE 3

Estimated contemporaneous coefficients in the baseline SVAR model

	β_g^r	α_g^y	α_r^y
	OLS	**IV**	**IV**
Coefficient	-0.079	0.018	-0.3537
(Standard errors)	(-1.277)	(0.048)	(0.125)
[P-value]	[0.207]	[0.698]	[0.005]

Source: Author's estimation.

The signs of the contemporaneous effects of spending and taxes on output are, as expected, positive and negative respectively. Moreover, the correlation between cyclically adjusted fiscal shocks results to be very low (-0.14) yielding very low estimates of β_g^r[12].

Important to notice is that in alternative specifications the baseline model is extended for a GDP component (private consumption or private investment) to a four variable SVAR, where private consumption or investment in turn is ordered third[13]. Moreover, when investigating the effects of particular government spen-

[11] The system needs $2n^2 - \left(\frac{n^2-n}{2} + n\right)$ restrictions, where n is the number of endogenous variables.

[12] The correlation between cyclically adjusted fiscal shocks is very low also in the case when taxes are ordered first. Therefore, small values of β_g^r and β_r^g imply that the choice between ordering spending or taxes first does not influence impulse responses and proves the robustness of the results.

[13] This order follows the suggestion by Caldara and Kamps (2008), as in the case of the baseline model. For a detailed discussion on the assumptions behind such ordering, refer to their work. To recall, placing private consumption or private investment in the third place means it does not react contemporaneously to taxes, but is contemporaneously affected by government spending and output shocks.

ding component variable g_t is replaced by the component in question in the extended four variable VAR[14,15].

3.2. THE STVAR SPECIFICATION

Auerbach and Gorodnichenko (2010a) extend the Blanchard and Perotti (2002) setup by allowing for responses differentiated across recessions and expansions in a regime switching vector autoregression framework, where transitions across states occur smoothly. The main advantage of the STVAR over the SVAR is that it effectively utilizes more information by exploiting variations in the degree to which the economy is in a particular regime (i.e. recession or expansion) so that estimation and inference for each regime is based on a larger set of observations (Auerbach and Gorodnichenko, 2010a:4). Estimating a SVAR for each regime separately may seriously limit the amount of observations in a regime, which makes estimates unstable and imprecise.

According to Auerbach and Gorodnichenko (2010a) the baseline smooth transition vector autoregression (STVAR) specification is:

$$X_t = (1 - F(z_{t-1}))\Pi_E(L)X_{t-1} + F(z_{t-1})\Pi_R(L)X_{t-1} + u_t\,, \tag{19}$$

where $u_t \sim N(0,\Omega)$ (20)

$$\Omega_t = \Omega_E(1 - F(z_{t-1})) + \Omega_R F(z_{t-1}) \tag{21}$$

$$F(z_t) = \frac{\exp(-\lambda z_t)}{1 + \exp(-\lambda z_t)} \text{ with } \lambda > 0, \tag{22}$$

$$\text{var}(z_t) = 1\,,\ E(z_t) = 0 \tag{23}$$

where X_t is the vector of endogenous variables, ordered again by taking into account the assumed contemporaneous effects amid variables, u_t a normal error term, and z_t is the indicator of the state of an economy, i.e. an index of the business cycle, normalized to have unit variance so that λ remains scalar invariant. A positive z indicates an expansionary phase, while oppositely a negative z indicates a contractionary phase of the business cycle. The matrices Π_i and Ω_i (where $i=R$ in recession and $i=E$ in expansion) represent the coefficients and variance-covariance matrix of disturbances in two regimes that are the system in a sufficiently deep recession (when $F(z_t) \approx 1$) and in a sufficiently strong expansion (when $1 - F(z_t) \approx 1$). The weights assigned to each regime (expansion and recession) for a given weighting function *F(.)* vary between 0 and 1 according to the contemporaneous state of the economy zt[16].

[14] Specific budget component elasticities to output and/or GDP components are reported in appendix B.
[15] Additional details about alternative models are given in appendix C.
[16] Auerbach and Gorodnichenko set z equal to a four- (2010a) and seven- (2010b) quarter moving average of the real output growth rate.

Following Auerbach and Gorodnichenko (2010a), this study employs the four quarter moving average of output growth rates as indicator of the state of the economy, and lambda is calibrated on the level of 1.5, making the economy spend 20 percent of the time in recessionary regimes[17].

Such a model allows two ways for differences to occur in the propagation of structural shocks (Auerbach and Gorodnichenko, 2010a:5): (1) contemporaneous via differences in covariance matrices for disturbances Ω_E and Ω_R, and (2) dynamic via differences in lag polynomials $\Pi_E(L)$ and $\Pi_R(L)$.

In their original work (2010a), Auerbach and Gorodnichenko implement a STVAR approach on a US dataset available in high frequencies, and thus are able to carry out highly nonlinear estimation for a large number of parameters[18]. Thus, in their following work (2010b, p. 3) such an approach for OECD countries would be very challenging due to the short time series with lower frequencies[19].

Given the importance of expectations in identifying fiscal shocks, Auerbach and Gorodnichenko (2010b) extend the model and control for expectations by using real time forecasts and thus augmenting the equations for the unanticipated component of government spending and/or revenue (FE_t^{FI}, with *FI* being the fiscal instrument under examination). This unanticipated component was not accounted for in the SVAR approach; it is newly introduced and measured by the ratio between actual spending (or actual revenue) and its forecasted value in one period earlier (spending *t* in time *t-1*, or revenue *t* in time *t-1*)[20]. Therefore, the first step is to estimate the SVAR for $X_t = \left[FE_t^g \quad g_t \quad y_t \quad r_t\right]^T$[21].

Since this is the case, Auerbach and Gorodnichenko (2010b) modify the aforesaid original approach and follow an approach previously advocated by Jorda (2005) and Stock and Watson (2007), among others, i.e. rather than estimating the entire system of equations in the STVAR and using these to estimate the impulse response functions, they estimate the impulse responses directly by projecting a variable of interest on its own lags and lags of other variables entering the VAR. As pinpointed by Auerbach and Gorodnichenko (2010b:4), this **direct projection**

[17] See appendix D for a plot of the transition function between regimes of expansions and recessions in the Croatian case. Moreover, it is important to stress that the growth rate data span used in estimating the weighting function is longer than the observation period in the models, i.e. it ranges from 1995Q1 to 2013Q1. In that way there is no loss of the first observations due to the four-quarter moving average representation.

[18] To inspect in detail the nonlinear estimation approach, see the appendix in Auerbach and Gorodnichenko (2010a).

[19] Although the time span of observations in the Croatian case used in this analysis goes back in history as much as possible, it can be considered relatively short, not only with respect to the available statistics in the case of the US, but also with respect to (older and newer) OECD member states.

[20] To obtain values of the unanticipated component Auerbach and Gorodnichenko (2010b:3) rely on several sources, such as surveys prepared by professional forecasters, projections prepared by governmental or international agencies, or other credible sources. In the Croatian case the sources and calculation of unanticipated components is presented in appendix A.

[21] For simplicity of notation the unanticipated component of government spending in the equations is denoted by FE_t^g, which corresponds to the variable defined in appendix A as *FEgspend*.

approach provides a flexible estimation method, which does not impose dynamic restrictions implicitly embedded in VARs and which can conveniently accommodate nonlinearities in the response function.

For example, if the interest is in determining the response of output y_t at horizon h after a government spending shock, bearing in mind the vector $X_t = \left[FE_t^g \quad g_t \quad y_t \quad r_t\right]^T$, then the estimation equation is:

$$\begin{aligned} y_{t+h} = {} & (1-F(z_t))\Theta_{E,h}FE_t^g + F(z_t)\Theta_{R,h}FE_t^g \\ & + (1-F(z_t))\Phi_{E,h}(L)g_{t-1} + F(z_t)\Phi_{R,h}(L)g_{t-1} \\ & + (1-F(z_t))\Psi_{E,h}(L)y_{t-1} + F(z_t)\Psi_{R,h}(L)y_{t-1} \\ & + (1-F(z_t))\Gamma_{E,h}(L)r_{t-1} + F(z_t)\Gamma_{R,h}(L)r_{t-1} + u_t \end{aligned} \tag{24}$$

with $F(z_t)$ as defined in equation (22) and $h=0,1,\ldots,H$. The unanticipated component of government spending (FE_t^g) represents the forecast error, i.e. the difference between forecasted and actual government spending in time *t-1* for period *t*. Thus FE_t^g can be interpreted as the "surprise government spending shock" (Auerbach and Gorodnichenko, 2010b:4).

The lag polynomials $(\Phi_{E,h}(L),\Phi_{R,h}(L),\Psi_{E,h}(L),\Psi_{R,h}(L),\Gamma_{E,h}(L),\Gamma_{R,h}(L))$ in equation (24) are used to control for the history of shocks rather than to compute the dynamics, while the coefficients in $\Theta_{E,h}$ and $\Theta_{R,h}$ can be interpreted as multipliers that show the response of output to a structural shock in government spending in expansions and recessions respectively.

A linear equivalent o equation (24) is the following:

$$y_{t+h} = \Theta_{lin,h}FE_t^g + \Phi_{lin,h}(L)g_{t-1} + \Psi_{lin,h}(L)y_{t-1} + \Gamma_{lin,h}(L)r_{t-1} + u_t\,, \tag{25}$$

where the response of *Y* is constrained to be the same for all z_t's[22].

The estimation method as set in equation (20) has the following main advantages (Auerbach and Gorodnichenko, 2010b:6): (1) it involves only linear estimation if the parameter λ is fixed, (2) it allows just the equation related to the variable of interest (output, for example) to be estimated, and (3) it does not constrain the shape of the impulse response functions, rather than imposing the pattern generated by the SVAR.

3.3 THE DATA

As already mentioned, the baseline dataset includes a quarterly dataset from 1996Q1 to 2011Q4 for output (Y_t), government spending (G_t) and government revenue (R_t – also referred to as taxes or net taxes in the rest of the paper). Impor-

[22] Such a constraint implies that $\Theta_{lin,h} = \Theta_{E,h} = \Theta_{R,h}$, $\Phi_{lin,h}(L) = \Phi_{E,h}(L) = \Phi_{R,h}(L)$, $\Psi_{lin,h}(L) = \Psi_{E,h}(L) = \Psi_{R,h}(L)$ and $\Gamma_{lin,h}(L) = \Gamma_{E,h}(L) = \Gamma_{R,h}$ for all *L* and *h*.

tant to stress is that fiscal variables are defined as in Blanchard and Perotti (2002), i.e. both net of transfers, and at the consolidated central government level[23]. All variables are in logarithms, real terms (CPI deflated 2000=100) and seasonally adjusted using the ARIMA X12 algorithm.

According to the Augmented Dickey Fuller (ADF) test results, all variables present unit roots in levels and are stationary in first differences (table 4).

Table 4

Augmented Dickey Fuller test values

H0: The variable has a unit root.

Variable	Deterministic component	test statistics	Variable	Deterministic component	test statistics
LY	c,t	-1.8110	ΔLY	c,t	-9.4757***
	c	-1.8825		c	-9.2081***
LG	c,t	-0.3815	ΔLG	c,t	-8.7127***
	c	-1.3053		c	-8.4404***
LR	c,t	-1.1244	ΔLR	c,t	-7.9141***
	c	-1.8792		c	-7.7397***

Note: Variables' definition and symbols explained in appendix A; L is used to denote logarithms, while Δ refers to first differences; variables are seasonally adjusted; constant included; maximum number of lags used is 12.
** Null hypothesis rejected on 10% level of significance; test statistics' critical values according Davidson and MacKinnon (1993); ** null hypothesis rejected on 5% level of significance; *** null hypothesis rejected on 1% level of significance.*

Source: Author's calculation.

Moreover, results show the presence of co-integrating relations and hence a possible specification of a vector error correction model. But as noted by Heppke-Falk, Tenhofen and Wolff (2006:12), when estimating models that have many disaggregated time series it is difficult to find economically interpretable cointegration vectors. Moreover, Blanchard and Perotti (2002) find no significant differen-

[23] See appendix A for details about all variables used throughout the analysis. Moreover, it is important to point out that generally it is common empirical practice to analyze fiscal policy effects using consolidated general government data. Still, this paper (as well as others that investigate fiscal policy in Croatia – Benazić, 2006; Rukelj, 2009; Ravnik and Žilić, 2011, among others) bases the empirical part on consolidated central government data. It is important to stress that quarterly fiscal data for Croatia at the consolidated general government level are not available for the periods prior to the year 2004. Nevertheless, such a limitation should not pose significant differences, principally for two reasons: (1) discretionary decisions are carried by the central government, and (2) the share of local governments' budgets in the consolidated general budget is on average less than 10% and only 53 Croatian local units (out of a total of 576 – regions, cities and counties) are concerned. Moreover, Šimović and Deskar-Škrbić (2013) show that fiscal multipliers in Croatia differ across different government levels, but this is mainly true for the short-run, while the cumulative multiplier of government spending across 8 quarters turns out to be 1.80 and 1.91 at the consolidated central and general government respectively. The same authors also report that the peak government spending multiplier has the size of 1.20 and 1.39 at the consolidated central and the general government, respectively, while the lowest spending multiplier is 0.19 irrespective of the consolidation level.

ces between results obtained with and without taking the cointegrating relation into account[24].

Although the system is stationary in first differences, the analysis is done using variables in levels, because the focus of the analysis is on the dynamics (i.e. impulse responses), not the coefficient estimation25. To choose the appropriate lag length the judgment is based on information criteria results, the length of the sample and economic sense. To be as parsimonious as possible the VAR lag selection tests included a maximum of four lags. The Akaike criterion (AIC) and final prediction suggest two lags, while the Schwarz Bayesian (SC) and Hannan-Quinn (HQC) criteria indicate one lag as optimal. This analysis will allow for dynamic interaction up to one lags as suggested by the Schwarz and Hannan-Quinn criteria. Such a choice is based on two assumptions: on one hand a lower lag reduces the probability of over fitting the model (because every additional parameter added substantially decreases the power of estimation), and on the other hand Lütkepohl (2005:326) shows that the Akaike criterion asymptotically overestimates the true order with some positive probability.

4 RESULTS

According to the level specification, structural shocks represent as one percentage point increase in the policy variables, while impulse responses represent the percent change of the responding variable. Still, all fiscal multipliers shown are expressed in kuna[26]. To do so, the estimated multiplier value is multiplied by the ratio of the mean of the response variable (in kuna) to the mean of the respective impulse variable (in kuna)[27]. Reported fiscal multipliers for the SVAR approach include the impact multiplier, two cumulative multipliers (at the horizon of 12 quarters and one at 20 quarters) and the peak multiplier, which additionally in

[24] Krusec (2003) employs a SVEC (structural vector error correction) model to account for the cointegrating relation(s) and to differentiate between permanent and transitory shocks, when investigating the effects of fiscal policy on output in case of four EMU (Austria, Finland, Germany and Italy) and four non-EMU (US, Great Britain, Australia and Canada) countries. Still, results show that a government spending shock positively affects output, while a tax shock leads to a decrease in output, and the size (magnitude) of the effect is very similar to those obtained by other works using a SVAR setup.

[25] This is common empirical practice. Studies that estimate a SVAR in levels no matter of the stationarity in first differences are for instance Perotti (2002), Heppke-Falk, Tenhofen and Wolff (2006), de Castro and de Cos (2006), Jemec, Strojan-Kastelec and Delakorda (2011), Ravnik and Žilić (2011). In addition, as demonstrated by Sims, Stock and Watson (1990) even if the system includes non-stationary variables, the OLS estimators are still consistent when the model is estimated in levels.

[26] As mentioned, this Section reports multipliers monetarized in kuna, while the impulse response functions are presented in appendix E.

[27] For example: say that the estimated impact multiplier of government spending on output is 0.15 and the ratio of the mean of GDP to the mean of government spending is 2.5, then at impact a one kuna increase in government spending leads to an increase in output of 38 lipa (=0.15*2.5). It is important to point that Ramey and Zubairy (2013) discuss on the US case how such a procedure in converting percentage changes into dollar changes is not precise and leads to higher values of fiscal multipliers. The authors stress that the ratio of the mean of output to the mean of government spending on the US case depends upon the time span of the sample, varying from 2 to 24 in the 1889-2009 sample or from 4-7 in the post WWII sample. Therefore, Ramey and Zubairy (2013:9-10) suggest an *ex ante* conversion of output and government spending to the same units using the value of G/Y in each point of time and not averaging. However, such a conversion can be omitted in the Croatian case, since the already limited time-span in case of shortening does not lead to significantly different ratios of the mean of GDP to the mean of government spending.

parenthesis shows the quarter in which the peak occurs. For the STVAR, i.e. regime switching and no-regime switching model, average multipliers are reported over three horizons (eight, twelve and twenty quarters)[28,29]. Important to notice is that, not only due to different methodological approaches, presented fiscal multipliers may not be directly comparable, but this reporting strategy better highlights the differences between obtained regime- and no-regime switching models, which is the main point of this paper. The main point of the STVAR is estimating multipliers in the expansionary and recessionary phases of the business cycle. Moreover, in all STVAR specifications a linear representation of the corresponding model has been estimated as in equation (25), but these results are not reported since there is no case where they significantly differ from those obtained using the SVAR.

4.1 BASELINE MODEL RESULTS

Table 5 shows the multiplier effect of government spending and net taxes on outtput in Croatia using the Blanchard and Perotti estimation approach.

No matter the methodological framework, a positive spending shock positively affects output, while a positive tax shock negatively affects output in Croatia. These findings are in line with those shown in Grdović Gnip (2013) when a five variable SVAR Blanchard and Perotti approach is used[30]. Next, it is possible to observe that macroeconomics reacts according to the Keynesian assumption of higher multiplier effect in downturn times, the average multiplier being above 2 and significant, meaning that a one kuna increase in government spending would lead to an increase in output of more than 2 kuna in the medium and long term.

In the SVAR approach output reacts negatively to a tax shock only at impact, while in the STVAR setting the reaction follows the same pattern in recession times, while in expansion times it results to be negative irrespective of the time horizon but also insignificant. Moreover, all multipliers in expansion times are insignificant.

[28] The average multiplier in recession and expansion is calculated as $\frac{1}{1+H}\sum_{h=0}^{H}\Theta_{R,h}$ and $\frac{1}{1+H}\sum_{h=0}^{H}\Theta_{E,h}$ respectively.

[29] Important to point out is that Ramey and Zubairy (2013) as well as Owyang, Ramey and Zubairy (2013) provide a detailed discussion about pitfalls in reporting fiscal multipliers in normal and recessionary times. In doing so, they focus on the Auerbach and Gorodnichenko (2010b) direct projection method as the most widely implemented during the last years. Owyang, Ramey and Zubairy (2013) point out that Auerbach and Gorodnichenko' s multipliers are overestimated due to their fundamental assumption how a positive shock to government spending during a low-growth state does not help the economy escape that state. Moreover, they add that the Auerbach and Gorodnichenko assumption about the recession lasting 20 quarters is unrealistic since the data provide information about shorter recessionary periods in the US. Above that, the authors conclude that spending multipliers calculated as in Auerbach and Gorodnichenko (2010a, 2010b) show the response of output after a government spending shock without being rescaled for the effects the same shock exercises on the development in government spending. In line with Auerbach and Gorodnichenko this work also reports the average multiplier across 8, 12 and 20 periods (quarters), being these the average response of output in time $t+h$ (where h equals to 8, 12 or 20) after the initial shock in government spending.

[30] The five-variable SVAR includes prices and interest rates in addition to government spending, output and taxes.

TABLE 5
Fiscal multipliers in the baseline SVAR and STVAR models

	Government spending multiplier (G)	Tax multiplier (R)
SVAR Blanchard and Perotti		
Impact multiplier	0.33	-0.03
Cumulative multiplier (h=12)	1.84	0.34
Cumulative multiplier (h=20)	2.66	0.65
Peak multiplier (q)	0.33 (0)	0.04 (8)
STVAR – regime switch: recession		
Average multiplier (h=8)	2.12	-0.02
Average multiplier (h=12)	2.18	0.02
Average multiplier (h=20)	2.21	0.40
STVAR – regime switch: expansion		
Average multiplier (h=8)	*0.40*	*-0.02*
Average multiplier (h=12)	*1.00*	*-0.02*
Average multiplier (h=20)	*0.58*	*-0.03*

Note: Numbers in italic mean that the estimate is not significant at the 95% confidence level.

Source: Author's estimation.

Robustness of the baseline models was checked by means of several alternatives. In the case of the SVAR approach the estimation was redone by (i) assuming that taxes come first and (ii) using different output elasticity of taxes, i.e. those obtained by Ravnik and Žilić (2011). In the case of the STVAR approach the robustness was checked by (i) replacing the transition variable output growth rates with output gap[31] and (ii) trying a different calibration of lambda, i.e. 0.8, as calibrated by Auerbach and Gorodnichenko (2010a) for the US, plus 3 and 5 to make the transition between regimes even smoother or more abrupt.

4.2 ALTERNATIVE MODELS

As mentioned earlier alternative models are extended by one variable, i.e. private consumption and private investment in turn, ordered after output and before the government revenue (tax) variable. When the effects of different spending components are analyzed, then the component under investigation replaces the government spending variable in the extended model. Similarly, when direct and indirect tax effects are studied, the net taxes variable is replaced[32].

4.2.1 Effects on private consumption and private investment

Government spending, as well as a tax shock, exercises a Keynesian effect on private consumption. As shown in table 6 a positive government spending shock

[31] HP filtered output gap with λ=1600 and λ=480 (the first is standard for quarterly data, while for the latter refer to Bouthevillain et al., 2001).

[32] It is important to point out that in the case of an extended SVAR model the equation regarding net taxes needs to be adjusted for additional exogenous elasticities, presented in appendix B.

increases private consumption, while a positive tax shock decreases the same macroeconomic variable.

Table 6

Private consumption multipliers to fiscal shocks in the alternative SVAR and STVAR models

	Government spending multiplier (G)	Tax multiplier (R)
SVAR Blanchard and Perotti		
Impact multiplier	0.04	-0.02
Cumulative multiplier (h=12)	0.73	-0.29
Cumulative multiplier (h=20)	1.22	-0.46
Peak multiplier (q)	0.06 (8)	-0.02 (0)
STVAR – recession		
Average multiplier (h=8)	1.07	-0.08
Average multiplier (h=12)	1.09	*0.05*
Average multiplier (h=20)	1.02	*0.13*
STVAR – expansion		
Average multiplier (h=8)	0.77	*0.04*
Average multiplier (h=12)	0.58	*0.07*
Average multiplier (h=20)	*0.35*	*0.03*

Note: Numbers in italic mean that the estimate is not significant at the 95% confidence level.

Source: Author's estimation.

Moreover, it is possible to observe that the multiplier is much higher (and significant) in recession, while fiscal multipliers in expansion times seem to be mostly insignificant. According to the SVAR approach a one kuna government spending increase will on impact raise private consumption by four lipa, but in the long term the effect will reach 1.22 kuna. In contrast, a one kuna increase in taxes will on impact decrease private consumption by just two lipa, but in the long term the decrement is about 46 lipa.

If the regime-switch model is considered then in downturn times the effect of the multiplier is much stronger and has a stronger effect on boosting the economy. That is, if during recessions an increase in government spending of one kuna occurs, private consumption will rise by 1.07 kuna on average per quarter during the first two years. On the other hand the effect on private investment is meager and insignificant (table 7).

It is possible to notice that effects of fiscal policy on private investment are mostly significant at impact when a positive spending shock raises private investment and a positive tax shock leads to a negative effect on private investment. The multiplier effect is thus stronger in recessions than in expansions, the average tax multiplier not being significant in the medium- and long-term.

Table 7
Private investment multipliers to fiscal shocks in the alternative SVAR and STVAR models

	Government spending multiplier (G)	Tax multiplier (R)
SVAR Blanchard and Perotti		
Impact multiplier	0.05	-0.03
Cumulative multiplier (h=12)	0.35	-0.11
Cumulative multiplier (h=20)	*0.47*	*-0.15*
Peak multiplier (q)	0.05 (0)	*0.0 (10)*
STVAR – recession		
Average multiplier (h=8)	0.56	-0.19
Average multiplier (h=12)	0.39	*-0.14*
Average multiplier (h=20)	0.30	*-0.03*
STVAR – expansion		
Average multiplier (h=8)	0.39	*0.15*
Average multiplier (h=12)	0.30	*0.13*
Average multiplier (h=20)	*0.20*	*0.12*

Note: Numbers in italic mean that the estimate is not significant at the 95% confidence level.

Source: Author's estimation.

4.2.2 Effect of different spending components

As mentioned in the introductory section a number of countries implemented fiscal stimuli packages during the latest financial crisis. In order to investigate what spending category would be at most effective in the Croatian case this section presents fiscal multipliers with respect to output, private consumption and private investment for three main government spending categories, i.e. spending for purchases of goods and services, spending for wages and capital spending.

Table 8 presents multipliers of spending for purchases of goods and services and it is noticeable that in the case of a regime-switching model the multipliers are higher than in the case of the linear approach. If considering the latter a one kuna increase in spending for purchases of goods and services at impact decreases output and private consumption by three and one lipa respectively, the effect being much larger in three years, i.e. there is increase of 33 and 24 lipa respectively.

On the other hand during recessions the average multiplier is higher in the first eight quarters, meaning that a one kuna increase in this spending component will raise output, private consumption and private investment by 3.89, 2.16 and 0.61 kuna respectively. In all these cases the effect is significant. It is interesting that the impact of a spending shock in expansionary times is shown to be high but statistically insignificant.

Table 8

Government expenditure for purchases of goods and services multipliers in the alternative SVAR and STVAR models

	Output	Private consumption	Private investment
SVAR Blanchard and Perotti			
Impact multiplier	-0.03	-0.01	0.01
Cumulative multiplier (h=12)	0.33	0.24	*0.06*
Cumulative multiplier (h=20)	*0.67*	*0.44*	*0.09*
Peak multiplier (q)	0.04 (10)	0.02 (11)	0.01 (4)
STVAR – recession			
Average multiplier (h=8)	3.89	2.16	0.61
Average multiplier (h=12)	3.04	1.73	0.35
Average multiplier (h=20)	2.21	1.27	*0.24*
STVAR – expansion			
Average multiplier (h=8)	4.42	2.65	*1.07*
Average multiplier (h=12)	*3.31*	*1.89*	*0.77*
Average multiplier (h=20)	*2.26*	*1.16*	*0.45*

Note: Numbers in italic mean that the estimate is not significant at the 95% confidence level.

Source: Author's estimation.

Spending for wages does not exercise as large an effect on macroeconomic variables as spending for purchases of goods and services. Table 9 presents the results and it is shown that the effect is not significant in most of the cases, for both output cumulative multipliers are insignificant, as are one or two average multipliers in recession times and all multipliers in expansionary times. Nevertheless, in a linear setting, on impact a one kuna increase in spending for wages raises output, private consumption and private investment on impact by four, two and nine lipa respectively. In recessionary times the same impact is 4.04, 2.22 and 0.58 kuna respectively on average for the first eight quarters.

A one-kuna increase in capital spending will increase output and private consumption on impact by 47 and 12 lipa respectively. In the medium term the effect on output will be more prominent because according to the SVAR approach output will increase 1.20 kuna in three years (table 10).

As in the case of other spending components, the effect of a capital spending shock is much higher during economic downturns than in expansions when in addition it is seen to be insignificant. Although it is expected that a government investment will increase private investment, the SVAR approach is not conclusive regard this fact, while the multiplier in the case of a recession in the regime-switch model is lower than one.

TABLE 9

Government expenditure for wages multipliers in the alternative SVAR and STVAR models

	Output	Private consumption	Private investment
SVAR Blanchard and Perotti			
Impact multiplier	0.04	0.02	0.09
Cumulative multiplier (h=12)	*0.01*	*0.01*	*0.31*
Cumulative multiplier (h=20)	*-0.06*	*-0.05*	*0.31*
Peak multiplier (q)	0.04 (0)	0.02 (0)	0.09 (0)
STVAR – recession			
Average multiplier (h=8)	4.04	2.22	0.58
Average multiplier (h=12)	3.29	*1.71*	0.37
Average multiplier (h=20)	*2.26*	*1.20*	*0.17*
STVAR – expansion			
Average multiplier (h=8)	*1.68*	*0.94*	*0.47*
Average multiplier (h=12)	*1.26*	*0.70*	*0.35*
Average multiplier (h=20)	*0.78*	*0.40*	*0.20*

Note: Numbers in italic mean that the estimate is not significant at the 95% confidence level.

Source: Author's estimation.

TABLE 10

Government capital expenditure multipliers in the alternative SVAR and STVAR model

	Output	Private consumption	Private investment
SVAR Blanchard and Perotti			
Impact multiplier	0.47	0.12	*-0.01*
Cumulative multiplier (h=12)	*1.20*	*0.04*	*-0.02*
Cumulative multiplier (h=20)	*0.95*	*0.41*	*-0.03*
Peak multiplier (q)	0.47 (0)	0.12 (0)	*0.00 (3)*
STVAR – recession			
Average multiplier (h=8)	2.50	1.40	0.61
Average multiplier (h=12)	2.23	1.26	0.42
Average multiplier (h=20)	1.83	1.03	0.20
STVAR – expansion			
Average multiplier (h=8)	*0.58*	*0.33*	*0.19*
Average multiplier (h=12)	*0.35*	*0.22*	*0.17*
Average multiplier (h=20)	*0.20*	*0.06*	*0.10*

Note: Numbers in italic mean that the estimate is not significant at the 95% confidence level.

Source: Author's estimation.

The results are similar and in line with the significance time horizon to those of Grdović Gnip (2013), where spending components were disaggregated into current and capital in a five-variable Blanchard and Perotti SVAR approach.

5 CONCLUDING REMARKS

During the latest financial crisis a large number of countries and respective economic authorities opted for fiscal policy measures to boost economic activity. This paper investigates the effectiveness of fiscal multipliers on the Croatian case and shows that an expansionary fiscal policy during recessions could be a powerful stabilization tool. It is shown that in a regime-switch model the multipliers are much larger than in a no-regime switch approach.

A one-kuna increase in government spending would lead to an increase in output of more than 2 kuna in the medium and long term in economic downturns. According to the SVAR approach a government spending of one kuna will on impact raise private consumption by four lipa, but in the long term the effect will be 1.22 kuna. In contrast, an increase in taxes of one kuna will on impact decrease private consumption by just two lipa, but in the long term the decrement is about 46 lipa. If during recessions an increase in government spending of one kuna occurs, private consumption will rise by 1.07 kuna on average per quarter during the first two years.

When investigating the possible trilemma concerning spending for purchases of goods and services, wages or capital goods, there are actually no doubts in times of recessions. That is, the effect of the shock in the purchase of goods and services is significant throughout the whole time horizon and a one kuna increase in this component will raise output, private consumption and private investment by 3.89, 2.16 and 0.61 kuna respectively.

Nevertheless, these results can be considered as indicative since there is a need to extend the research in two main directions. On the one hand the effects of different taxes (direct and indirect) in a regime-switching model should be investigated. The Croatian government made a number of discretionary changes (mainly with respect to taxes and not spending) during the latest recession (starting with the crisis tax, the VAT rate increment and so on), which according to the literature could not be considered as counter-cyclical. Since this research has shown that the effects of taxes (as well as spending) are larger and more significant in recessionary times such government decisions may have deepened the recession (keeping in mind that nothing particularly "strong" has been done on the expenditure side of the budget to offset the effects of the tax measures). This may be one of the key issues why Croatia has experienced one of the longest recession periods amid EU countries.

On the other hand, no research in the field of fiscal multipliers based on the Croatian case has so far provided information about the possible driving forces of fiscal multipliers such as indebtedness or openness to trade, either in linear or in non-linear models. This extension would show the effect of particular economic factors on fiscal multipliers and would exhibit whether the magnitude of the multipliers would change and in which direction.

On top of that, it is important to point out that this paper uses consolidated central government data because consolidated general government data for Croatia are available only from 2004 onward. Using the latter data set would imply a short time-span, which could affect the power of test, and not only in the SVAR setup, but especially in the STVAR setup where the baseline already includes additional variables. Furthermore, encompassing just the period 2004-2012 would mean having two additional limitations: (1) the data would embrace only one recession period and this could also affect the results, since it is better to have as many "jumps" between different states of the economy as possible, plus (2) the "only recession period" would be represented by the latest crisis, which comes at the end of the observation period meaning that there is (still) no registered switch (and or data set) to a following subsequent recovering/expansionary phase.

Therefore, when the potential period under investigation involves a longer time series (and therefore a higher number of observations) not necessitating particular assumptions that restrict the tests by possibly doing harm to the degrees of freedom, a non-linear approach at the general government level should be considered. This could make the results of fiscal policy effects more precise. Moreover, an extended observation sample would permit an "extended" baseline STVAR (or another regime switching) model by incorporating more endogenous or exogenous variables, resulting in even more accurate estimations.

APPENDIX A: DATA VARIABLES' DEFINITION AND SOURCES

Symbol	Name and description	
Y	**Output**	
	Definition:	Gross domestic product in real terms. The series spans from 1995Q1–2011Q4.
	Units:	HRK, 2,000 reference prices
	Source:	For the period 1994-1997 Mikulić and Lovrinčević (2000); for the period 1998-2011 Croatian Bureau of Statistics' Press Releases available at the Croatian Bureau of Statistics Official Web Page.
C	**Private consumption**	
	Definition:	Private consumption in real terms. The series spans from 1995Q1–2011Q4.
	Units:	HRK, 2,000 reference prices
	Source:	For the period 1994-1997 Mikulić and Lovrinčević (2000); for the period 1998-2011 Croatian Bureau of Statistics' Press Releases available at the Croatian Bureau of Statistics Official Web Page.
I	**Investment**	
	Definition:	Investment in real terms. The series spans from 1995Q1–2011Q4.
	Units:	HRK, 2,000 reference prices
	Source:	For the period 1994-1997 Mikulić and Lovrinčević (2000); for the period 1998-2011 Croatian Bureau of Statistics' Press Releases available at the Croatian Bureau of Statistics Official Web Page.
G	**Net government expenditure**	
	Definition:	Government expenditure as in Blanchard and Perotti (2002), i.e. total purchases of goods and services plus capital spending at the central government level in real terms. As in the referred work, this variable expresses expenditure net of transfers. *Note: GFS 1986 was the official Croatian government finance statistics methodology until 2004, when the new IMF methodology, i.e. the GFS 2001, was adopted. Since that would pose a structural break in the data, aggregated fiscal data for the period 2004-2011 were reclassified according to the GFS 1986 methodology (for details see Grdović Gnip, 2011:48, 67 and its references).* The series spans from 1996Q1–2011Q4.
	Units:	HRK, 2000 reference prices.
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page. Author's estimation.
R	**Net taxes**	
	Definition:	Net taxes in the sense of Blanchard and Perotti (2002), i.e. personal income tax plus corporate income tax plus indirect taxes plus social security contributions minus transfers to persons and minus interest payments, in real terms. Still, transfers to persons are proxied by the unemployment related expenditure only due to the unavailability of the data for the period prior to year 2004. *Note: GFS 1986 was the official Croatian government finance statistics methodology until 2004, when the new IMF's methodology, i.e. the GFS 2001 was adopted. Since that would pose a structural break in the data, aggregated fiscal data for the period 2004-2011 were reclassified according to the GFS 1986 methodology (for details see Grdović Gnip, 2011:48, 67 and its references).* The series spans from 1996Q1–2011Q4.

Symbol	Name and description	
	Units:	HRK, 2,000 reference prices
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page, and Ministry of Finance. Author's estimation.
Ecur_r	**Current expenditure**	
	Definition:	Central government budget current expenditure in real terms. The series spans the period from 1996Q1–2011Q4.
	Units:	HRK, 2,000 reference prices
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page.
Ecap_r	**Capital expenditure**	
	Definition:	Central government budget capital expenditure in real terms. It is used as a proxy for public investment as well. *Note: Data for all expenditure subcategories, therefore capital expenditure as well, for the period from June 2003 to October 2003 are not available in the Statistical Reports of the Ministry of Finance on a monthly basis. Still, data of the sum between capital and current expenditures are available, so capital expenditure is obtained by subtracting current from total expenditure.* The series spans the period from 1996Q1–2011Q4.
	Units:	HRK, 2,000 reference prices
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page.
Ewages_r	**Expenditure for wages**	
	Definition:	Current expenditure for gross wages and social contributions from the central government budget in real terms. It is used as proxy for public employment. *Note: Data for all expenditure subcategories, therefore expenditure for employees as well, for the period from June 2003 to October 2003 are not available in the Statistical Reports of the Ministry of Finance on a monthly basis. Still, data of the cumulative sum of this expenditure for the period January-November 2003 are available. Available data from January to June were subtracted from the available cumulative sum, and then the missing data are obtained by interpolating the residue sum between the missing months using as a pattern the monthly growth rates of current expenditure.* The series spans the period from 1997Q4–2011Q4.
	Units:	HRK, 2,000 reference prices
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page.
Epur_r	**Expenditure for purchases of goods and services**	
	Definition:	Current expenditure for purchases of goods and services from the central government budget in real terms. It is used as proxy for public consumption. *Note: Data for all expenditure subcategories, therefore expenditure for purchases of goods and services as well, for the period from June 2003 to October 2003 are not available in the Statistical Reports of the Ministry of Finance on a monthly basis. Still, data of the cumulative sum of this expenditure for the period January-November 2003 are available. Available data from January to June were subtracted from the available cumulative sum, and then the missing data are obtained by interpolating the residue sum between the missing months using as a pattern the monthly growth rates of current expenditure.* The series spans the period from 1997Q4–2011Q4.

Symbol	Name and description	
	Units:	HRK, 2,000 reference prices
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page.
FEgspend	**Unanticipated component in net government spending (Ebr)**	
	Definition:	Ratio between the outturn (realization) of net government spending and the one-quarter-ahead forecast (plan). *Note: Planned values of net government spending are usually presented in the Croatian Official Gazette in December of year* t *for year* t+1 *(or exceptionally in January of year* t+1 *for year* t+1*) for the central budget level. Since forecast values of government spending are available on an annual basis only, interpolation is used to get a quarterly series and the procedure is based on quarterly growth rates of government spending outturn.* The series spans the period from 1995Q2–2011Q4.
	Units:	Ratio
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page, and Ministry of Finance. Official gazette's following numbers: NN 98/1994, 9/1996, 111/1996, 141/1997, 167/1998, 33/2000, 130/2000, 116/2001, 154/2002, 31/2004, 171/2004, 148/2005, 137/2006, 28/2008, 149/2008, 151/2010 and 140/2011. Author's estimation.
FEtaxes	**Unanticipated component in net taxes (Rbr)**	
	Definition:	Ratio between the outturn (realization) of net taxes and the one-quarter-ahead forecast (plan). *Note: Planned values of taxes are usually presented in the Croatian Official gazette in December of year* t *for year* t+1 *(or exceptionally in January of year* t+1 *for year* t+1*) for the central budget level. Since forecast values of taxes are available on an annual basis only, interpolation is used to get a quarterly series and the procedure is based on quarterly growth rates of total taxes outturn.* The series spans the period from 1995Q2–2011Q4.
	Units:	Ratio
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page, and Ministry of Finance. Official Gazette, the following numbers: NN 98/1994, 9/1996, 111/1996, 141/1997, 167/1998, 33/2000, 130/2000, 116/2001, 154/2002, 31/2004, 171/2004, 148/2005, 137/2006, 28/2008, 149/2008, 151/2010 and 140/2011. Author's estimation.
FEcurE	**Unanticipated component in current government spending (Ecur)**	
	Definition:	Ratio between the outturn (realization) of current government spending and the one-quarter-ahead forecast (plan). *Note: Planned values of current government spending are usually presented in the Croatian Official gazette in December of year* t *for year* t+1 *(or exceptionally in January of year* t+1 *for year* t+1*) for the central budget level. Since forecast values of current government spending are available on an annual basis only, interpolation is used to get a quarterly series and the procedure is based on quarterly growth rates of current government spending outturn.* The series spans the period from 1995Q2–2011Q4.
	Units:	Ratio

Symbol	Name and description	
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page, and Ministry of Finance. Official Gazette, the following numbers: NN 98/1994, 9/1996, 111/1996, 141/1997, 167/1998, 33/2000, 130/2000, 116/2001, 154/2002, 31/2004, 171/2004, 148/2005, 137/2006, 28/2008, 149/2008, 151/2010 and 140/2011. Author's estimation.
FEpurE	**Unanticipated component in government spending for purchases of goods and services (Epur)**	
	Definition:	Ratio between the outturn (realization) of expenditure for purchases of goods and services and the one-quarter-ahead forecast (plan). *Note: Planned values of government spending for purchases of goods and services are usually presented in the Croatian Official gazette in December of year* t *for year* t+1 *(or exceptionally in January of year* t+1 *for year* t+1*) for the central budget level. Since forecast values are available on an annual basis only, interpolation is used to get a quarterly series and the procedure is based on quarterly growth rates of government spending for purchases of goods and services outturn.* The series spans the period from 1997Q4–2011Q4.
	Units:	Ratio
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page, and Ministry of Finance. Official Gazette, the following numbers: NN 98/1994, 9/1996, 111/1996, 141/1997, 167/1998, 33/2000, 130/2000, 116/2001, 154/2002, 31/2004, 171/2004, 148/2005, 137/2006, 28/2008, 149/2008, 151/2010 and 140/2011. Author's estimation.
FEwagesE	**Unanticipated component in government spending for wages (Ewages)**	
	Definition:	Ratio between the outturn (realization) of expenditure for wages and the one-quarter-ahead forecast (plan). *Note: Planned values of government spending for wages are usually presented in the Croatian Official gazette in December of year* t *for year* t+1 *(or exceptionally in January of year* t+1 *for year* t+1*) for the central budget level. Since forecast values are available on an annual basis only, interpolation is used to get a quarterly series and the procedure is based on quarterly growth rates of government spending for wages outturn.* The series spans the period from 1997Q4–2011Q4.
	Units:	Ratio
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page, and Ministry of Finance. Official Gazette, the following numbers: NN 98/1994, 9/1996, 111/1996, 141/1997, 167/1998, 33/2000, 130/2000, 116/2001, 154/2002, 31/2004, 171/2004, 148/2005, 137/2006, 28/2008, 149/2008, 151/2010 and 140/2011. Author's estimation.
FEcapE	**Unanticipated component in capital government spending (Ecap)**	
	Definition:	Ratio between the outturn (realization) of capital expenditure and the one-quarter-ahead forecast (plan). *Note: Planned values of capital government spending are usually presented in the Croatian Official gazette in December of year* t *for year* t+1 *(or exceptionally in January of year* t+1 *for year* t+1*) for the central budget level. Since forecast values are available on an annual basis only, interpolation is used to get a quarterly series and the procedure is based on quarterly growth rates of capital government spending outturn.* The series spans the period from 1995Q2–2011Q4.
	Units:	Ratio

Symbol	Name and description	
	Source:	Statistical Reports of the Ministry of Finance, Republic of Croatia available at the Ministry of Finance Official Web Page, and Ministry of Finance. Official gazette's following numbers: NN 98/1994, 9/1996, 111/1996, 141/1997, 167/1998, 33/2000, 130/2000, 116/2001, 154/2002, 31/2004, 171/2004, 148/2005, 137/2006, 28/2008, 149/2008, 151/2010 and 140/2011. Author's estimation.

APPENDIX B: EXOGENOUS ELASTICITIES

The exogenous elasticities of a budgetary item with respect to output are obtained as product of the elasticity of the budgetary item to its macroeconomic base and the elasticity of this base with respect to output. If the elasticity of a budgetary item is constructed as an average value of two or more sub-components' elasticities, then their respective shares in the budgetary item's volume are used as weights. To sum up, the tax elasticity to output is:

$$\alpha_y^r = \sum_{i=1}^{n} \alpha_{B_i}^{\tau_i} \cdot \alpha_y^{B_i} \cdot \frac{T_i}{T}. \qquad \text{(B1)}$$

Table B1 shows the elasticities of different tax components to their respective macrobase as well as the elasticity of the latter to output, plus the shares of tax components in total tax revenues. Similarly, table B2 reports the sub-elasticities used to estimate the overall elasticity of taxes with respect to private consumption and private investment.

TABLE B1

Exogenous sub-elasticities with respect to real GDP and share of tax item in total taxes (baseline model)

Budgetary item	Elasticity of budgetary item to "macrobase"	Elasticity of "macrobase" to real GDP	Elasticity of budgetary item w.r.t. real GDP	Share in total taxes
	$\alpha_{B_i}^{\tau_i}$	$\alpha_y^{B_i}$	$\alpha_{B_i}^{\tau_i} \cdot \alpha_y^{B_i}$	T_i / T
Personal income tax	1.77	0.49	0.87	0.126
Corporate income tax	3.62	0.33	1.19	0.048
Social security contributions	0.68	0.49	0.33	0.357
Indirect taxes	1.53	0.89	1.36	0.468

Note: For details on the respective "macrobase" (macroeconomic base) see for instance Bouthevillain et al. (2001).

Source: Author's calculation.

TABLE B2

Exogenous sub-elasticities with respect to private consumption and investment

Budgetary item	Elasticity of "macrobase" to private consumption	Elasticity of "macrobase" to investment	Elasticity of budgetary item w.r.t. private consumption	Elasticity of budgetary item w.r.t. investment
	$a_C^{B_i}$	$a_I^{B_i}$	$\alpha_{B_i}^{\tau_i} \cdot a_C^{B_i}$	$\alpha_{B_i}^{\tau_i} \cdot a_I^{B_i}$
Personal income tax	0.21	0.27	0.37	0.48
Corporate income tax	0.14	0.19	0.51	0.69
Social security contributions	0.21	0.27	0.14	0.18
Indirect taxes	–	0.46	1.53	0.70

Note: For details on respective "macrobase" (macroeconomic base) see for instance Bouthevillain et al. (2001). All coefficients are significant at least at the 5% level.

Source: Author's calculation.

The overall elasticities are presented in table B3. It is important to note that the overall total tax elasticity is 0.93, but since the fiscal variable regarding government revenues used in the analysis is constructed following the assumptions of Blanchard and Perotti (2002), i.e. net of transfers, it is corrected by the elasticity of unemployment related expenditures to output weighted by the share of this expenditure in total government expenditure[33].

TABLE B3

Exogenous elasticities with respect to output

Budgetary item	w.r.t. real output	w.r.t. private consumption	w.r.t. private investment
	α_y^r	α_c^r	α_I^r
Net taxes	0.92	0.84	0.49
Direct taxes	0.53	0.23	0.29
Indirect taxes	1.36	1.53	0.70
Government spending	0	0	0
Government spending for purchases	0	0	0
Government spending for wages	0	0	0
Government capital spending	0	0	0

Source: Author's calculation regarding taxes and its components, and Perotti (2002) regarding spending and its components.

[33] Following Grdović Gnip (2011) the output elasticity of unemployment-related expenditures is -0.58, and these expenditures amount to 0.85% of total central government expenditures, which allows for a -0.01 correction of the total tax elasticity, to obtain the output elasticity of net taxes.

FINANCIAL THEORY AND PRACTICE
38 (2) 173-219 (2014)

SVAR APPROACH

Alternative SVAR models represent a four-variable VAR model extended for an output component y_t^i, i.e. private investment or private consumption, placed third in the system[34]. Having four endogenous variables in the system means 22 restrictions in order to have the just-identified SVAR model:

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ -\alpha_g^y & 1 & 0 & -\alpha_r^y \\ -\alpha_g^{y^i} & -\alpha_y^{y^i} & 1 & -\alpha_r^{y^i} \\ 0 & -0.92 & -\alpha_{y^i}^r & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^y \\ u_t^{y^i} \\ u_t^r \end{bmatrix} = \begin{bmatrix} \beta_g^g & 0 & 0 & \beta_r^g \\ 0 & \beta_y^y & 0 & 0 \\ 0 & 0 & \beta_{y^i}^{y^i} & 0 \\ \beta_g^r & 0 & 0 & \beta_r^r \end{bmatrix} \begin{bmatrix} v_t^g \\ v_t^y \\ v_t^{y^i} \\ v_t^r \end{bmatrix}. \quad \text{(C1)}$$

Equation (C1) shows the matrix representation of an alternative SVAR model with 20 restrictions out of the total needed 22. One more restriction comes out from the tax shock equation, since, in order to be able to formulate cyclically adjusted taxes, there is need for another exogenous elasticity, i.e. the elasticity of taxes with respect to the GDP component in question ($\alpha_{y^i}^r$). These elasticities are shown in table B3, α_c^r being the elasticity with respect to private consumption and α_I^r the elasticity with respect to private investment.

The last restriction again comes out of the assumption whether government decides first on taxes or spending. Since the results proved to be robust in the baseline model under the assumption that spending comes first in the Croatian case, all alternative models are in line with that choice and therefore again $\beta_r^g = 0$.

For example, the just-identified SVAR model extended for private consumption would be the following:

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ -\alpha_g^y & 1 & 0 & -\alpha_r^y \\ -\alpha_g^{y^i} & -\alpha_y^{y^i} & 1 & -\alpha_r^{y^i} \\ 0 & -0.92 & -0.84 & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^y \\ u_t^{y^i} \\ u_t^r \end{bmatrix} = \begin{bmatrix} \beta_g^g & 0 & 0 & 0 \\ 0 & \beta_y^y & 0 & 0 \\ 0 & 0 & \beta_{y^i}^{y^i} & 0 \\ \beta_g^r & 0 & 0 & \beta_r^r \end{bmatrix} \begin{bmatrix} v_t^g \\ v_t^y \\ v_t^{y^i} \\ v_t^r \end{bmatrix}. \quad \text{(C2)}$$

In the case when the effects of a particular sending component, like government expenditure for wages for instance, are under investigation, then the latter replaces the (total) government spending in the model ordered first.

[34] Recall Caldara and Kamps (2008) for a detailed insight into assumptions behind such ordering.

STVAR APPROACH

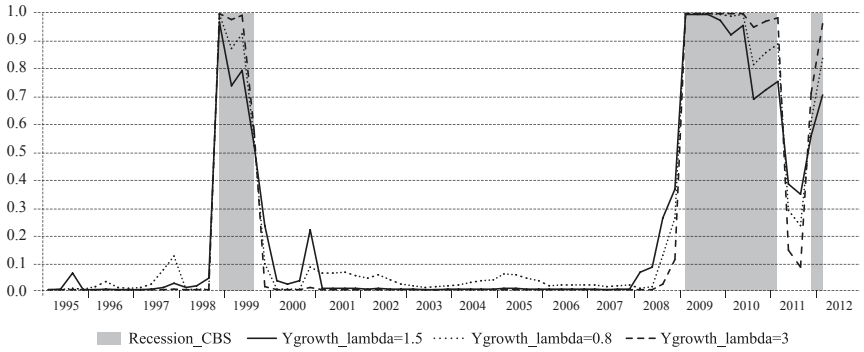
Alternative STVAR models represent a five-variable model (since in the baseline specification in comparison with SVAR models there is already an extra variable, i.e. the unanticipated component of the fiscal instrument) extended again for an output component y_t^i. If we again consider the example of the extended model for private consumption, then the response of the latter after a government spending shock would be an extension of equation (24) in the following way:

$$\begin{aligned} c_{t+h} = {} & (1-F(z_t))\Theta_{E,h}FE_t^g + F(z_t)\Theta_{R,h}FE_t^g \\ & + (1-F(z_t))\Phi_{E,h}(L)g_{t-1} + F(z_t)\Phi_{R,h}(L)g_{t-1} \\ & + (1-F(z_t))\Psi_{E,h}(L)y_{t-1} + F(z_t)\Psi_{R,h}(L)y_{t-1} \\ & + (1-F(z_t))\Sigma_{E,h}(L)c_{t-1} + F(z_t)\Sigma_{R,h}(L)c_{t-1} \\ & + (1-F(z_t))\Gamma_{E,h}(L)r_{t-1} + F(z_t)\Gamma_{R,h}(L)r_{t-1} + u_t \end{aligned} \tag{C3}$$

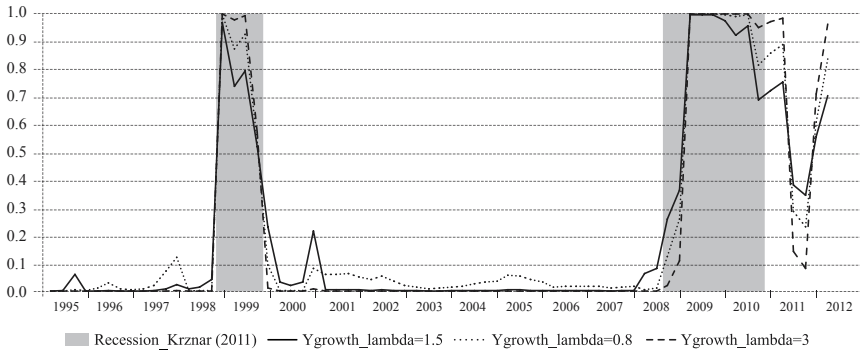
FIGURE D1

Smooth transition function F(zt) with different values for λ

(a) Recession periods according to CBS



(b) Recession periods according to Krznar (2011)



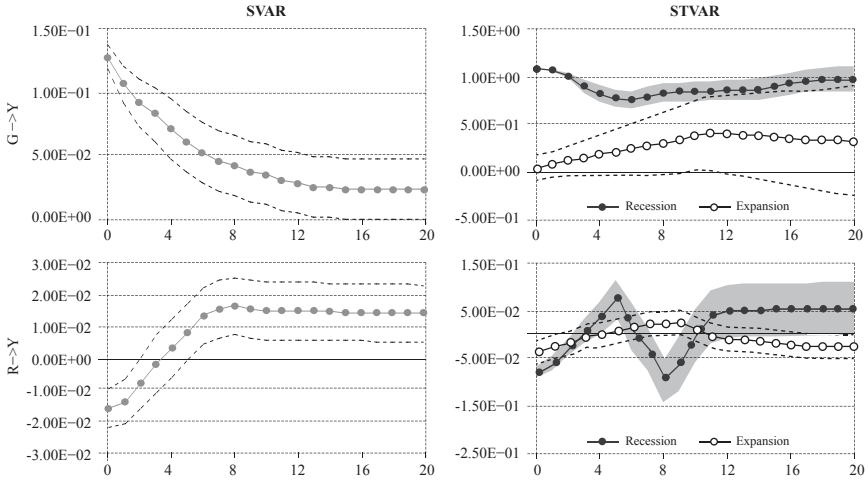
Notes: On both figures the grey surface corresponds to recession periods. However, in panel (a) these periods correspond to the occurrence of two or more consecutive periods (quarters) of negative real GDP, while panel (b) shows recession periods as identified in Krznar (2011). It is important to point out that in the latter case the last observation used in the estimation was 2010Q4.

Source: Author's estimation.

FINANCIAL THEORY AND PRACTICE
38 (2) 173-219 (2014)

FIGURE E1

Impulse responses of output after a spending and tax shock

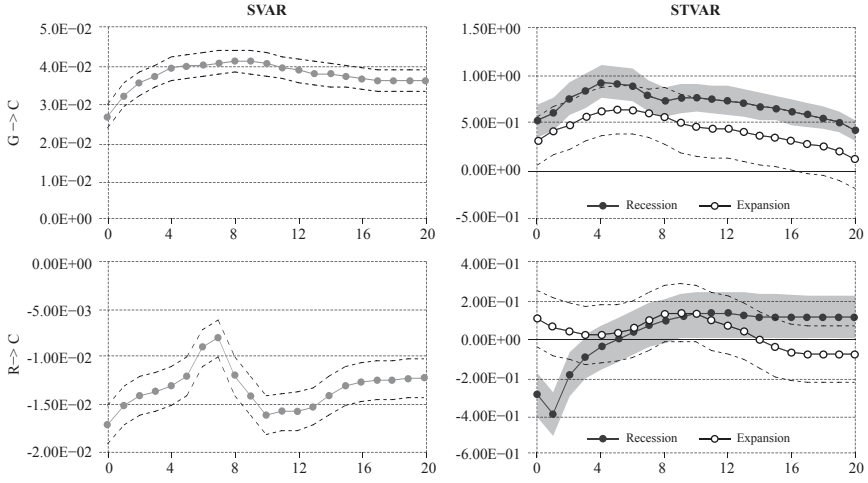


Note: SVAR panels – dashed lines show 95% confidence intervals. STVAR panels – grey shadow area shows 95% confidence intervals in case of recession IRF, while dashed lines the same in case of expansion IRF.

Source: Author's estimation.

FIGURE E2

Impulse responses of private consumption after a spending and tax shock

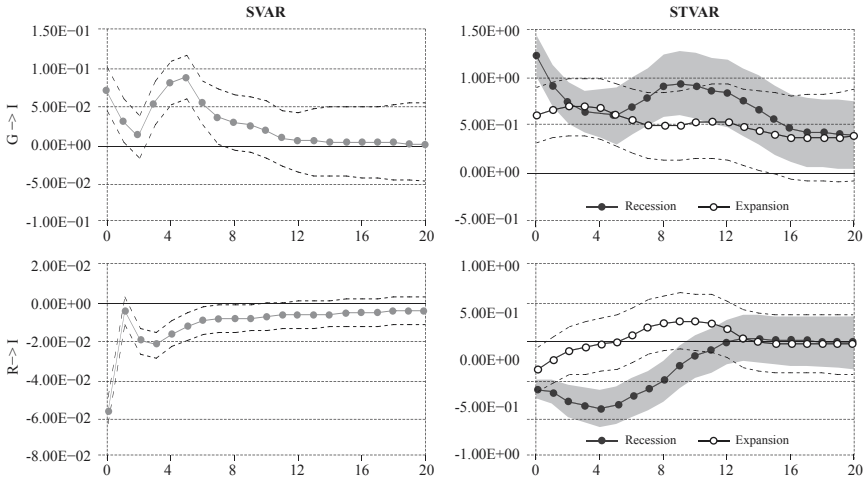


Note: SVAR panels – dashed lines show 95% confidence intervals. STVAR panels – grey shadow area shows 95% confidence intervals in case of recession IRF, while dashed lines the same in case of expansion IRF.

Source: Author's estimation.

FIGURE E3

Impulse responses of private investment after a spending and tax shock

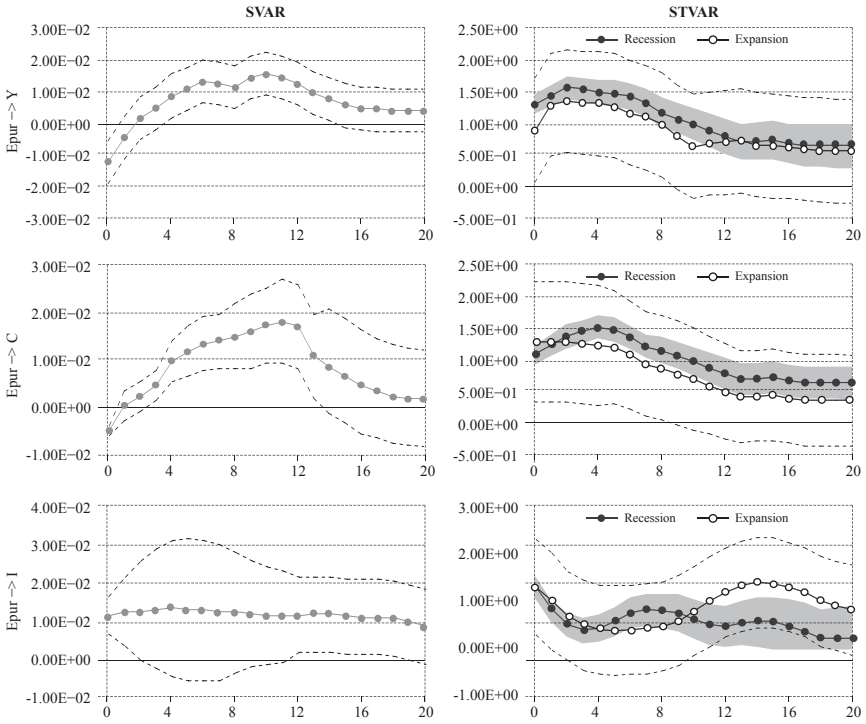


Note: SVAR panels – dashed lines show 95% confidence intervals. STVAR panels – grey shadow area shows 95% confidence intervals in case of recession IRF, while dashed lines the same in case of expansion IRF.

Source: Author's estimation.

FIGURE E4

Impulse responses of output, private consumption and private investment, after a shock in government spending for purchases of goods and services



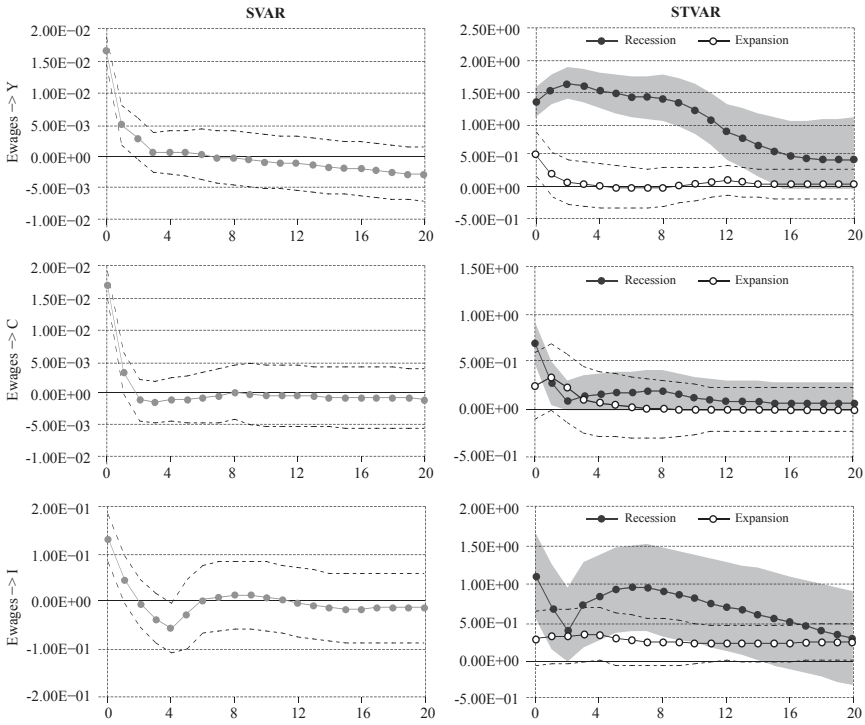
Note: SVAR panels – dashed lines show 95% confidence intervals. STVAR panels – grey shadow area shows 95% confidence intervals in case of recession IRF, while dashed lines the same in case of expansion IRF.

Source: Author's estimation.

FINANCIAL THEORY AND PRACTICE
38 (2) 173-219 (2014)

FIGURE E5

Impulse responses of output, private consumption and private investment, after a shock in government spending for wages

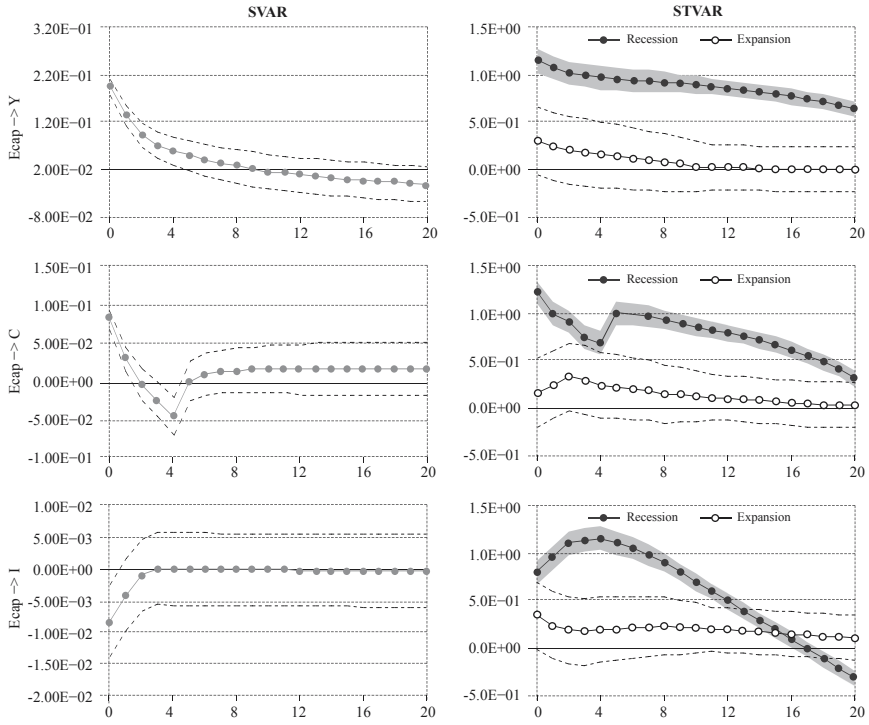


Note: SVAR panels – dashed lines show 95% confidence intervals. STVAR panels – grey shadow area shows 95% confidence intervals in case of recession IRF, while dashed lines the same in case of expansion IRF.

Source: Author's estimation.

FIGURE E6

Impulse responses of output, private consumption and private investment, after a shock in capital government spending



Note: SVAR panels – dashed lines show 95% confidence intervals. STVAR panels – grey shadow area shows 95% confidence intervals in case of recession IRF, while dashed lines the same in case of expansion IRF.

Source: Author's estimation.

REFERENCES

1. Alesina, A., Campante, F. and Tabellini, G., 2008. Why is fiscal policy often procyclical? *Journal of the European Economic Association*, 6 (5), pp. 1006-1036. doi: 10.1162/JEEA.2008.6.5.1006
2. Amisano, G. and Giannini, C., 1997. *Topics in structural VAR econometrics*. Berlin: Springer. doi: 10.1007/978-3-642-60623-6
3. Auerbach, A. and Gorodnichenko, Y., 2010a. Measuring the output responses to fiscal policy, *NBER Working Paper 17447*, NBER 16311 [online]. Available at: <http://www.nber.org/papers/w16311>.
4. Auerbach, A. and Gorodnichenko, Y., 2010b. Fiscal Multipliers in Recession and Expansion, *NBER Working Paper 17447*, NBER [online]. Available at: <http://www.nber.org/papers/w17447>.
5. Bachman, R. and Sims, E., 2012. Confidence and the Transmission of Government Spending Shocks. *Journal of Monetary Economics*, 59 (3), pp. 235-249. doi: 10.1016/j.jmoneco.2012.02.005
6. Barro, R. J., 2009. Government Spending is No Free Lunch. *Wall Street Journal*, [online]. Available at: <http://online.wsj.com/article/SB123258618204604599.html>.
7. Batini, N., Callegari, G. and Melina, G., 2012. Successful Austerity in the United States, Europe and Japan. *IMF Working Paper* WP/12/190 [online]. Available at: <http://www.imf.org/external/pubs/ft/wp/2012/wp12190.pdf>.
8. Baum, A. and Koester, G. B., 2011. The impact of fiscal policy on economic activity over the business cycle: evidence from a threshold VAR analysis. *Deutsche Bundesbank Discussion Paper Series 1: Economic Studies* No. 03/2011 [online]. Available at: <http://www.econstor.eu/bitstream/10419/44961/1/65618079X.pdf>.
9. Baum, A., Poplawski-Ribero, M. and Weber, A., 2012. Fiscal Multipliers and the State of the Economy. *IMF Working Paper* WP/12/286 [online]. Available at: <http://www.imf.org/external/pubs/ft/wp/2012/wp12286.pdf>.
10. Baxa, J., 2010. What the data say about the effects of fiscal policy in the Czech Republic? *Mathematical Methods in Economics*. České Budějovice: University of South Bohemia.
11. Baxter, M. and King, R., 1993. Fiscal Policy in General Equilibrium. *American Economic Review,* 83 (3), pp. 315-334.
12. Benazić, M., 2006. Fiskalna politika i gospodarska aktivnost u Republici Hrvatskoj: model kointegracije. *Ekonomski pregled*, 57 (12), pp. 882-918.
13. Bermperoglou, D., Pappa, E. and Vella, E., 2012. Government consumption, investment, or employment to boost the economy? There is no trilemma [online]. Avaiable at: <http://www.aueb.gr/conferences/Crete2012/papers/papers%20senior/Pappa.pdf>.

14. Biau, O. and Girard, E., 2007. Politique budgétaire et dynamique économique en France: l'approche VAR structurel. *Economie et Prevision,* 169-171, pp. 1-24.

15. Blanchard, O. and Perotti, R., 2002. An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output. *Quarterly Journal of Economics*, 117 (4), pp. 1329-1368. doi: 10.1162/003355302320935043

16. Blanchard, O., 2003. *Macroeconomics.* Pearson: Prentice Hall.

17. Bouthevillain, C. [et al.], 2001. Cyclically Adjusted Budget Balances: an Alternative Approach. *ECB Working Paper* no. 77. Frankfurt am Main: European Central Bank.

18. Burnside, C., Eichenbaum, M. and Fisher, J., 2004. Fiscal shocks and their consequences. *Journal of Economic Theory*, 115 (1), pp. 89-117. doi: 10.1016/S0022-0531(03)00252-7

19. Burriel, P. [et al.], 2010. Fiscal Policy Shocks in the Euro Area and the US: An Empirical Assessment. *Fiscal Studies*, 31 (2), pp. 251-285. doi: 10.1111/j.1475-5890.2010.00114.x

20. Caldara, D. and Kamps, C., 2006. What do We Know about the Effects of Fiscal Policy Shocks? A Comparative Analysis. *Computing in Economics and Finance Series*, No. 257/2006 [online]. Available at: <http://repec.org/sce2006/up.9905.1140994990.pdf>.

21. Caldara, D. and Kamps, C., 2008. What are the effects of fiscal policy shocks? a VAR-based comparative analysis. *ECB Working Papers series* No 877. Frankfurt am Main: European Central Bank.

22. Cogan, J. F. [et al.], 2010. New Keynesian versus Old Keynesian Government Spending Multipliers. *Journal of Economic Dynamics and Control*, 34 (3), pp. 281-295. doi: 10.1016/j.jedc.2010.01.010

23. Crespo Cuaresma, J., Eller, M. and Mehrotra, A., 2011. The Economic Transmission of Fiscal Policy Shocks from Western to Eastern Europe, Focus on European Economic Integration Q2/11. Wien: Oesterreichische Nationalbank [online]. Available at: <http://www.oenb.at/en/img/feei_2011_q2_studies_01_tcm16-232748.pdf>.

24. Croatian Bureau of Statistics (CBS), 2012. <http://www.dzs.hr>.

25. Croatian Ministry of Finance, 2013. <http://www.mfin.hr>.

26. Croatian National Bank (CNB), 2013. <http://www.hnb.hr>.

27. Christiano, L., Eichenbaum, M. and Rebelo, S., 2009. When is the Government Spending Multiplier Large? *NBER Working Paper* 15394, NBER [online]. Available at: <http://www.nber.org/papers/w15394.pdf>.

28. Davidson, R. and MacKinnon, J., 1993. *Estimation and Inference in Econometrics*. London: Oxford University Press.

29. de Castro, F. and de Cos, P. H., 2008. The economic effects of fiscal policy: The case of Spain. *Journal of Macroeconomics*, 30 (3), pp. 1005-1028. doi: 10.1016/j.jmacro.2007.08.009

30. de Castro, F. and Fernandez-Caballero, L., 2011. The effects of fiscal shocks on the exchange rate in Spain. *Banco de Espana, Documentos de Trabajo* No. 1121 [online]. Available at: <http://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSeriadas/DocumentosTrabajo/11/Fich/dt1121e.pdf>.

31. Deak, S. and Lenarčić, A., 2012. The Fiscal Multiplier and the State of Public Finances. *Bocconi Univerisity Working paper* [online]. Available at: <http://www.szabolcsdeak.com/files/Deak_JMP_dec28.pdf>.

32. Edelberg, W., Eichenbaum, M. and Fisher, J., 1999. Understanding the Effects of a Shock to Government Purchases. *Review of Economics Dynamics*, 2 (1), pp. 166-206. doi: 10.1006/redy.1998.0036

33. Fatás, A. and Mihov, I., 2001. The Effects of Fiscal Policy on Consumption and Employment: Theory and Evidence. *Center for Economic Policy Research*, *Discussion Paper,* No. 2760 [online]. Available at: <http://www.cepr.org/pubs/dps/DP2760>.

34. Fatás, A. and Mihov, I., 2003. The case for restricting fiscal policy discretion. *The Quarterly Journal of Economics,* 118 (4), pp. 1419-1447 doi. 10.1162/003355303322552838

35. Galí, J., López-Salido, J., and Vallés, J., 2004. Understanding the effects of government spending on consumption. *ECB Working Papers Series* No. 339 [online]. Available at: <http://www.ecb.int/pub/pdf/scpwps/ecbwp339.pdf>.

36. Giordano, R. [et al.], 2007. The effects of fiscal policy in Italy: Evidence from a VAR model. *European Journal of Political Economy*, 23 (3), pp. 707-733. doi: 10.1016/j.ejpoleco.2006.10.005

37. Gottshalk, J., 2001. An Introduction into the SVAR methodology: Identification, Interpretation and Limitations of SVAR models. *Kiel Working Paper* No. 1072 [online]. Available at: <http://www.ifw-members.ifw-kiel.de/publications/an-introduction-into-the-svar-methodology-identification-interpretation-and-limitations-of-svar-models/kap1072.pdf>.

38. Granger, C. W. J. and Terasvirta, T., 1993. *Modelling nonlinear economic relationships*. London: Oxford University Press.

39. Grdović Gnip, A., 2011. Discretionary measures and automatic stabilizers in the Croatian fiscal policy. *Ekonomska istraživanja*, 24 (3), pp. 45-74.

40. Grdović Gnip, A., 2013. Empirical assessment of stabilization effects of fiscal policy in Croatia, unpublished.

41. Hebous, S. 2009. The Effects of Discretionary Fiscal Policy on Macroeconomic Aggregates: A Reappraisal. *MPRA Paper* No. 23300 [online]. Available at: <http://mpra.ub.uni-muenchen.de/23300/1/MPRA_paper_23300.pdf>.

42. Hemming, R., Kell, M. and Mahfouz, S. 2002. The Effectiveness of Fiscal Policy in Stimulating Economic Activity – A Review of the Literature. *IMF Working Paper*, No. 02/208 [online]. Available at: <http://rbidocs.rbi.org.in/rdocs/content/pdfs/L-6a.pdf>.

43. Heppke-Falk, K. H., Tenhofen, J. and Wolf, G. B., 2006. The Macroeconomic Effects of Exogenous Fiscal Policy Shocks in Germany: a Disaggregated SVAR Analysis. *Deutsche Bundesbank Discussion Paper Series* 1: *Economic Studies*, No. 41/2006 [online]. Available at: <http://econstor.eu/bitstream/10419/19670/1/200641dkp.pdf>.

44. Höppner, F., 2001. *A VAR Analysis of the Effects of Fiscal Policy in Germany* [online]. Available at: <http://www.iiw.uni-bonn.de/content/forschung/publikationen/2001/fiscalvar.pdf>.

45. Ilzetzki, E., Mendoza, E. G. and Vegh, C. A., 2010. How Big (Small?) Are Fiscal Multipliers? *NBER Working Paper* 16479, NBER [online]. Available at: <http://www.nber.org/papers/w16479.pdf>.

46. IMF, 2005. Portugal: Selected Issues. *IMF Country Report* No. 05/376 [online]. Available at: <http://www.imf.org/external/pubs/ft/scr/2005/cr05376.pdf>.

47. International Monetary Fund (IMF), 2013. <http://www.imf.org>.

48. Jemec, N., Strojan Kastelec, A. and Delakorda, A., 2011. How do fiscal shocks affect the macroeconomic dynamics in the Slovenian economy. *Prikazi in analize* 2/2011 [online]. Available at: <http://www.bsi.si/library/includes/datoteka.asp?DatotekaId=4444>.

49. Jorda, O., 2005. Estimation and Inference of Impulse Responses by Local Projections. *American Economic Review*, 95 (1), pp. 161-182. doi: 10.1257/0002828053828518

50. Kaminsky, G., Reinhart, C. and Vegh, C., 2004. *When It Rains It Pours: Procyclical Capital Flows and Macroeconomic Policies*. Cambridge: MIT Press.

51. Kirchner, M., Cimadomo, J. and Hauptmeier, S., 2010. Transmission of government spending shocks in the euro area: Time variation and driving forces. *ECB Working Paper Series* 1219 [online]. Available at: <http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1219.pdf>.

52. Koop, G. M., Pesaran, H. and Potter, S. M., 1996. Impulse Response Analysis in Multivariate Models. *Journal of Econometrics*, 74 (1), pp. 119-147. doi: 10.1016/0304-4076(95)01753-4

53. Krusec, D., 2003. The effects of fiscal policy on output in a structural VEC model framework: The case of four EMU and four non-EMU OECD. *European University Institute Working paper* [online]. Available at: <http://economics.soc.uoc.gr/macro/8conf/docs/dkrusec.PDF>.

54. Krznar, I., 2011. Identifikacija razdoblja recesija i ekspanzija u Hrvatskoj. *Istraživanja* I-32 [online]. Available at: <http://www.hnb.hr/publikac/istrazivanja/i-032.htm>.

55. Lonzano, I. and Rodriguez, K., 2009. Assessing the Macroeconomic Effects of Fiscal policy in Colombia. *Borradores de economia* 552/2009 [online]. Available at: <http://www.banrep.gov.co/docum/ftp/borra552.pdf>.

56. Lütkepohl, H., 2005. *New Introduction to Multiple Time Series Analysis*. Berlin: Springer. doi: 10.1007/978-3-540-27752-1

57. MacKinnon, J. G., 1996. Numerical Distribution Functions for Unit Root and Cointegration Tests. *Journal of Applied Econometrics*, 11 (6), pp. 601-618. doi: 10.1002/(SICI)1099-1255(199611)11:6<601::AID-JAE417>3.0.CO;2-T

58. Mancellari, A., 2011. Macroeconomic effects of fiscal policy in Albania: a SVAR approach. *Bank of Albania Working Paper* 05(28) 2011 [online]. Available at: <http://www.bankofalbania.org/web/Macroeconomic_effects_of_fiscal_policy_in_Albania_A_Svar_approach_6225_2.php?kc=0,27,0,0,0>.

59. Marcellino, M., 2002. Some Stylized Facts on Non-Systematic Fiscal Policy in the Euro Area. *CEPR Discussion Papers* No. 3635.

60. Mikulić, D. and Lovrinčević, Ž., 2000. Procjena tromjesečnog BDP-a za razdoblje od Q1 1994 do Q4 1996 – rashodni pristup. *Ekonomski pregled*, 51 (9-10), pp. 1006-1032.

61. Mirdala, R., 2009. Effects of Fiscal Policy Shocks in the European Transition Economies. *MPRA Paper* No. 19481 [online]. Available at: <http://mpra.ub.uni-muenchen.de/19481/>.

62. Mountford, A. and Uhlig, H. 2005. What are the Effects of Fiscal Policy Shocks? *SFB 649 Discussion Paper* 2005-039. Berlin: Humboldt University.

63. Mountford, A. and Uhlig, H., 2002. What Are the Effects of Fiscal Policy Shocks? *CEPR Discussion Paper* No. 3338.

64. Owyang, M. T., Ramey, V. A. and Zubairy, S., 2013. *Are Government Spending Multipliers State Dependent? Evidence from U.S. and Canadian Historical Data* [online]. Available at: <http://www.economicdynamics.org/meetpapers/2013/paper_290.pdf>.

65. Pappa, E., 2003. New-keynesian or RBC transmission? *The effects of fiscal policy in labour markets* [online]. Available at: <http://www.aueb.gr/crete2004/docs/Pappa.pdf>.

66. Pappa, E., 2009. The effects of fiscal shocks on employment and the real wage. *International Economic Review*, 50 (1), pp. 217-244. doi: 10.1111/j.1468-2354.2008.00528.x

67. Parker, J., 2011. On Measuring the Effects of Fiscal Policy in Recession. *Journal of Economic Literature*, 49 (3), pp. 703-718. doi: 10.1257/jel.49.3.703

68. Perotti, R., 2000. What do We Know About the Effects of Fiscal Policy?, XII Riunione scientifica, Pavia 6-7 ottobre 2000, Societa' italiana di economia pubblica [online]. Available at: <http://www-3.unipv.it/websiep/wp/013.pdf>.

69. Perotti, R., 2002. What do We Know About the Effects of Fiscal Policy? In Bordignon, M. and D. da Empoli eds. *Politica fiscale: flessibilità dei mercati e crescita*. Milano: Franco Angeli.

70. Perotti, R., 2004. Estimating the effects of fiscal policy in *OECD countries*, *Proceedings, Federal Reserve Bank of San Francisco* [online]. Available at: <http://www.frbsf.org/economics/conferences/0503/fpoecd.pdf>.

71. Ramey, V. A. and Shapiro, M. D., 1998. Costly Capital Reallocation and the Effects of Government spending. *Carnegie-Rochester Conference series on Public Policy,* 48 (June), pp. 145-194. doi: 10.1016/S0167-2231(98)00020-7

72. Ramey, V. A. and Zubairy, S., 2013. *Government Spending Multipliers in Good Times and in Bad: Evidence from U.S. Historical Data* [online]. Available at: <http://weber.ucsd.edu/~vramey/research/RZUS.pdf>.

73. Ramey, V. A., 2011. Can Government Purchases Stimulate the Economy? *Journal of Economic Literature*, 49 (3), pp. 673-685. doi: 10.1257/jel.49.3.673

74. Ravnik, R. and Žilić, I., 2011. The use of SVAR analysis in determining the effects of fiscal shocks in Croatia. *Financial theory and practice*, 35 (1), pp. 25-58.

75. Rodden, J. and Wibbles, E., 2010. Fiscal Decentralization and The Business Cycle: The Empirical Study Of Seven Federations. *Economics and Politics,* 22 (3), pp. 37-67.

76. Romer, C. and Bernstein, J., 2009. *The Job Impact of the American Recovery and Reinvestment Plan*. Council of Economic Advisors, January 9th 2009.

77. Rukelj, D., 2009. Modelling Fiscal and Monetary Policy Interactions in Croatia Using Structural Vector Error Correction Model. *Privredna kretanja i ekonomska politika*, 121, pp. 27-58.

78. Šimović, H. and Deskar-Škrbić, M., 2013. Dynamic effects of fiscal policy and fiscal multipliers in Croatia. *Zbornik radova Ekonomskog fakulteta u Rijeci*, 31 (1), pp. 55-78.

79. Sims, C. A., 1980. Macroeconomics and Reality. *Econometrica*, 48 (1), pp. 1-48. doi: 10.2307/1912017

80. Sims, C. A., Stock, J. and Watson, M. W., 1990. Inference in Linear Time Series Models with Some Unit Roots. *Econometrica*, 58 (1), pp. 113-144. doi: 10.2307/2938337

81. Spilimbergo, A., Symansky, S. and Schindler, M., 2009. Fiscal multipliers. *IMF Staff Position Note* 09/11 [online]. Available at: <http://www.imf.org/external/pubs/ft/spn/2009/spn0911.pdf>.

82. Stock, J. and Watson, M., 2007. Why has U.S. Inflation Become Harder to Forecast? *Journal of Money, Banking and Credit*, 39 (1), pp. 3-33. doi: 10.1111/j.1538-4616.2007.00014.x

83. Terasvirta, T., 1994. Specification, estimation and evaluation of smooth transition autoregressive models. *Journal of the American Statistical Association* 89, pp. 208-218.

84. Weise, C. L., 1999. The Assymetric Effects of Monetary Policy: A Nonlinear Vector Autoregression Approach. *Journal of Money Credit and Banking*, 31 (1), pp. 85-108. doi: 10.2307/2601141

85. Woodford, M., 2010. Simple Analytics of the Government Expenditure Multiplier, *NBER Working Paper* 15714, NBER [online]. Available at: <http://www.nber.org/papers/w15714>.