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Abstract

When estimating the size of fiscal multipliers one has to take into consideration various structural characteristics of economies which, directly or indirectly, affect the transmission from government stimuli to economic activity. Thus, in this paper we use a 'bucket approach' to determination of the size of fiscal multipliers, which enables us to make presumptions on the size of fiscal multipliers, given the structural characteristics of selected Western Balkan economies – Croatia, Slovenia and Serbia. After this 'non-empirical' approach we use structural VAR framework to test our hypothesis derived from the 'bucket approach'. Our results confirmed the hypotheses on the relative size of the multipliers between these three peer countries, with Croatia having the highest spending multiplier and Slovenia the lowest one.

Key words

fiscal multipliers, Western Balkans, bucket approach, structural VAR

JEL classification

E62, C32, H20, H30, H50

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1. Introduction

Fiscal policy remained the main policy channel in most of the transition countries in Western Balkans. This can be understood as a result of several factors, such as the relatively big size and the role of government in these economies, various political-economical factors, but also as a result of some structural characteristics that limit the possibilities of monetary policy to play an important role in steering the economy during the boom-bust cycles.

Experience of Western Balkan countries during the recent crisis once again showed the reliance on the fiscal policy and its stabilization role, as almost all of the countries intervened in their fiscal systems on both, expenditure and the revenue side. However, economic developments in these countries varied significantly, with some of them still experiencing recession and others recording stable growth for few years already. Even though these differences cannot be attributed to fiscal policy alone, there are many policy discussions that argue how fiscal measures played an important role in (de)stimulating economic recovery from 2009 onwards.

In this paper we will analyze the effectiveness of fiscal policy (measured by the size of fiscal multipliers) in three Western Balkan countries: Croatia, Slovenia and Serbia. These countries are primarily selected because data availability for other countries is very limited. Also, it is interesting to notice that these countries have many structural similarities, but different monetary policy and exchange rate regimes, with Slovenia as a member of Eurozone, Croatia with an exchange rate as a main policy anchor and high eurisation and Serbia with inflation targeting and also high degree of eurisation. Such characteristics can also affect the effectiveness of fiscal policy.

Our analysis is conducted in two steps. In the first step we use a 'bucket approach' to the determination of the size of fiscal multipliers in order to analyze important determinants of the fiscal multipliers in these countries and form hypotheses on the relative size of the multipliers in selected countries. In the second step we use structural VAR framework to empirically test our hypotheses. Due to the fact that selected countries are small open economies, we use extended Blanchard-Perotti (2002) model which also includes the effects of movements in external demand on selected economies.

After a literature review presented in Section 2, in Section 3 we introduce and explain a 'bucket approach' to fiscal multipliers and form our hypothesis. In Section 4 we present structural VAR model and the method of identification, followed by data explanation in Section 5. Results are discussed in Section 6, after which we conclude in Section 7.

2. Research approach and literature review

Regarding a common history and similar structure of economies, in Western Balkan countries the Keynesian concept of stimulating economic activity is often advocated and the basis for the assessment of the effectiveness of discretionary fiscal policy measures in Keynesian sense is a concept of fiscal multiplier. The fiscal multiplier measures the impact of discretionary fiscal policy i.e. variation of taxes and public spending on output (GDP).

Estimation of fiscal multipliers is complex and tricky. It is difficult to isolate the direct effects of exogenous shocks of taxes and/or public spending i.e. discretionary fiscal measures on GDP. The main problem is the two-way relationships between these variables. Because of that there is no consensus on methodology for identification of such shocks or extraction of the exogenous component from observed fiscal outcomes. Broadly speaking, the literature relies on two main methods for estimation of fiscal multipliers: model-based approaches and empirical estimations.[1]

[1] For pros and cons of empirical versus model-based estimates see Batini et al. (2014).

Model based estimations are mainly advanced models which simulate fiscal shocks, like DSGE models. DSGE literature is growing as are different DSGE models like real business cycle (RBC) models and New Keynesian (NK) models (Leeper et al., 2012). On another hand, empirical estimations are based on vector autoregressive (VAR) models which can be systematized in several categories. First, in VAR literature four main identification approaches have been used: 1) narrative approach (Ramey & Shapiro, 1999), 2) calibrated elasticises (Blanchard & Perotti, 2002), 3) sign restrictions (Mountford & Uhlig, 2002 & 2009), and 4) recursive structure (Kamps & Caldara, 2006). Second, analyses of empirical results include dynamic responses to different fiscal shocks and/or calculation of impact and cumulative fiscal multipliers and frequently interpretation of historical facts. Further, current research is more focused on adopting VAR methodology to the stage of the business cycle (regime-switching models) because there are strong theoretical and empirical arguments that multipliers are higher in times of crisis (Auerbach & Gorodnichenko, 2012). That is important because underestimation of fiscal multipliers can lead to growth forecast errors (Blanchard & Liegh, 2013).

Identification process and structural characteristics of fiscal system defined by Blanchard and Perotti (2002) became a benchmark for majority of structural VAR (SVAR) and panel VAR (PVAR) approaches for estimation of fiscal multipliers.[2] In this research we will also use Blanchard and Perotti (2002) identification method. The original model of Blanchard and Perotti (1999) takes only three variables: government spending, net taxes and real GDP.[3] Regarding that all Western Balkan countries are small open economies, the original identification method is extended by introducing variable that represent external (foreign) demand shocks. Such adjusted Blanchard-Perotti methodology, after it was originally presented in Ravn & Spange (2012) for Denmark, was also used in Deskar-Škrbić et al. (2014) for Croatia.

Before moving to final research approach it is necessary to emphasize some obstacles and solutions for the research problem. The main obstacle in research identification was the lack of data i.e. quarterly data are not available through a sufficient period to include more explanatory and control variables. Other option was to use monthly data but then identification assumptions would be violated and the discretionary part of fiscal policy could not be isolated. For advanced economies Perotti (2002) presents the minimal set of variables necessary for the study of the dynamic effects of fiscal policy changes, which include short-term interest rates and price levels. Regarding emerging and developing countries, other variables can be included like current account, real effective exchange rate and monetary policy interest rate (Ilzetzki et al., 2013). Because data availability limits the scope of empirical research we partially consulted a narrative 'bucket approach' developed by Batini et al. (2014). Batini et al. (2014) suggest that beside conjectural factors, six structural characteristics determine the size of fiscal multipliers: trade openness, labor market rigidity, the size of automatic stabilizers, the exchange rate regime, the debt level and the public expenditure management and revenue administration. These entire factors can be useful control variables.

In the case of the lack of quarterly data PVAR estimations are often used, especially for developing and low-income countries (Ilzetzki et al., 2013; Kraay, 2013; Gonzalez-Garcia et al., 2013; Hory, 2014), which was also an option for this study. However, because of poor existing empirical literature we decided to use SVAR estimation regarding data and model identification related problems. SVAR for single country gives better estimation of the fiscal multipliers for each observed country that common PVAR approach and enable us to compare obtained results. Because our secondary goal is to compare the effects of fiscal policy in various countries we will follow a standard comparative framework proposed by Perotti (2002) for selected OECD countries, but also in Mirdala (2009) where the analysis was conducted for Central and Eastern European (CEE) countries.

[2] For the literature review on the estimation of the size of fiscal multipliers, based on different methods and made for different countries see Spilimbergo et al. (2009), Ramey (2011), while the detailed methodology using SVAR is possible to review in Ilzetzki et al. (2013) and Caldara & Kamps (2012). For existing estimations of the fiscal multipliers estimations in emerging market and low-income economies see Batini et al. (2014).

[3] Later in Perotti (2002) this model is extended by adding short-term interest rates and price levels.

Further, generally little is known about size of the fiscal multipliers in developing and low-income economies. Similar conclusion can be driven for CEE economics[4], and even less in some Western Balkan countries where empirical literature is significantly scarce. Regarding SVAR based methodology and Blanchard and Perotti (2002) identification method there are several papers, mostly for Croatia and Slovenia, that investigate the effects of fiscal policy on economic activity and some of them even estimate the size of fiscal multipliers. Table 1 gives a brief overview of findings and fiscal multipliers estimates in mentioned papers.

Majority of papers deals with Croatia in closed economy model (Ravnik & Žilić, 2011; Šimović & Deskar-Škrbić, 2013; Grdović Gnip, 2013 and 2014). Only one study uses open economy framework and suggests that multipliers are lower in an open economy model (Deskar-Škrbić et al., 2014). Ravnik & Žilić (2011) and Grdović Gnip (2013) use a multivariate Blanchard-Perotti SVAR methodology to analyze disaggregated short-term effects of fiscal policy on economic activity, inflation, and short-term interest rates in Croatia. Šimović & Deskar-Škrbić (2013) analyze the dynamic effects of fiscal policy and estimate the size of fiscal multipliers at different levels of government, using a closed economy model. Further, Grdović Gnip (2014) developed smooth transition VAR (STVAR) to isolate the fiscal policy impact for periods of expansion and recession. Regarding methodological and data issues[5] Croatia has rather good empirical literature that in most cases support Keynesian assumptions.

For Slovenia only Jemec et al. (2013) paper is found that uses 'small' SVAR with three variables in closed economy framework. Slovenia is included in Crespo Cuaresma et al. (2011) along with four other CEE countries (Hungary, Slovakia, Czech Republic, and Poland). Crespo Cuaresma et al. (2011) use different open economy framework, exploring the cross-border spillovers and the transmission of a foreign fiscal policy shock (assumed to be generated in Germany) to key macroeconomic variables. Both Croatia and Slovenia are included in PVAR estimations of fiscal multipliers in Ilzetzki et al. (2013) and Hory (2014). In other observed countries literature is significantly scarce. Only research results for Serbia were found in Hinić et al. (2013).

As mentioned before, empirical SVAR analysis includes: (a) dynamic responses to different fiscal shocks and/or (b) calculation of fiscal multipliers and (c) interpretation of historical facts. Regarding fiscal multipliers, cumulative multipliers are considered to be the most appropriate measure, usually larger that peek and impact multipliers, but they are rarely reported.[6] According to existing literature (Table 1), Western Balkan countries have rather high short-term (cumulative) multipliers. Compared to other developing countries they can be classified into high multiplier category (0.7-1.0) in normal times (Batini et al., 2014). We expect that open economy framework will somewhat mitigate the size of fiscal multipliers and provide more real estimates for all observed countries.

[4] Beside before mentioned Mirdala (2009) paper that studies effects of fiscal policy in six CEE countries (Czech republic, Hungary, Poland, the Slovak Republic, Bulgaria and Romania), Crespo Cuaresma et al. (2011) studies five CEE countries (Hungary, Slovakia, Czech Republic, Poland and Slovenia). For SVAR estimates also see Baxa (2010) for Czech Republic, Mancelarri (2011) for Albania, Muir & Weber (2013) for Bulgaria and Stoian (2012) for Romania. For PVAR estimates that include CEE countries see Ilzetzki et al. (2013) and Hory (2014).

[5] Ravnik & Žilić (2011) use monthly data and proxy variable for output, and along with Grdović Gnip (2013, 2014) they use central government data for fiscal variables.

[6] For different types and measurements of fiscal multipliers see Spilimbergo et al. (2009: 2).

Table 1 Effects of fiscal policy and fiscal multipliers in former Yugoslavian countries: overview of SVAR based research. Source: authors

Authors	Sample, methodology and identification method	Variables	Short-term multipliers* and other estimates	Fiscal policy effects
Croatia				
Ravnik & Žilić (2011)	2000M1-2009M12 central government data for fiscal variables VAR Blanchard & Perotti (2002)	5 variables: Base index of industrial production (output proxy), government revenues and expenditures, inflation and short-term interest rate	No estimates G – T +	Fiscal shocks have the greatest effect on the interest rate, and the weakest on the inflation rate. Shocks in the expenditures have a short-term negative effect on the industrial production, and tax shocks a positive one. Neither of results was significant. Fiscal shocks on output are not compatible with Keynesian theory.
Šimović & Deskar-Škrbić (2013)	2004Q1-2012Q4 SVAR Blanchard & Perotti (2002)	3 variables: AD of private sector (private consumption+gross fixed investment), indirect tax revenues and total expenditures	General level G 2.18 T -1.32 Central consolidated level G 1.58 T -2.15 Central level G 0.82 T -0.63 Cumulative multipliers for 4 and 8 quarters and peek multipliers provided.	Results show difference in the size of the multipliers between three levels of government consolidation, highest at general level where id higher ratio of capital expenditures. Results are compatible with Keynesian theory.
Grdović Gnip (2013)	1996Q1-2011Q4 consolidated central government data for fiscal variables SVAR Blanchard & Perotti (2002)	5 variables: real GDP, government revenues and expenditures, inflation and short-term interest rate (additionally model extended for private consumption and private investments, labor market variables (employment and wages), different components of expenditures (current and capital) and taxes (direct and indirect))	G 2.45 T -2.35 Cumulative multipliers for 4, 8, 12 and 16 quarters provided.	Results show that output moves in line with Keynesian propositions in baseline and extended model. The negative effect of the tax shock is mostly driven by indirect taxes, while the positive effect of a government spending shock is influenced by government consumption and government investment.
Grdović Gnip (2014)	1996Q1-2011Q4 consolidated central	3 variables: real GDP , net expenditures and net revenues	G + T-	Results show that during recessions fiscal multipliers in Croatia tend to be much

	government data for fiscal variables SVAR Blanchard & Perotti (2002); STVAR Auerbach & Gorodnichenko (2010)	Alternative models: additionally model extended for private consumption or private investments and unanticipated component of the fiscal instrument as fifth variable in extended STVAR)	Short-term multipliers are not provided. For all models cumulative multipliers for 8, 12 and 20 quarters, impact and peek multipliers are provided.	larger and move in line with Keynesian assumptions. During recession government purchases of goods and services seems to be the most effective fiscal instrument for boosting economic activity.
Deskar-Škrbić et al. (2014)	2000Q1-2012Q2 SVAR Blanchard & Perotti (2002)	4 variables: real GDP components (AD of private sector and private consumption for alternative model) , government consumption, net indirect taxes, foreign GDP	G + T- Impact multipliers discussed in text (usually less than 1, for G peek multiplier is higher than one in both models).	Results are compatible with Keynesian theory in both models. Multipliers are lower in open economy model than in closed economy model which is also in accordance with economic theory.
Slovenia				
Crespo Cuaresma et al. (2011)**	1996Q1–2009Q4 SVAR Blanchard & Perotti (2002)	7 variables: domestic output (GDP), foreign fiscal balance, government purchases of goods and services, net taxes, nominal effective exchange rate, inflation and short-run interest rate	G 0.00 T 0.02 Cumulative multipliers for 2, 4 and 8 quarters provided.	Results show negative cross-border fiscal spillovers to a fiscal expansion in Germany. For domestic fiscal shocks non-Keynesian responses are present in Slovenia.
Jemec et al. (2013)	1995Q1–2010Q4 SVAR Blanchard & Perotti (2002)	3 variables: real GDP (private consumption and investments for alternative model), net taxes, government spending	G + T - Impact multipliers discussed in text (for G higher than 1, for T less than 1).	Results show that output moves in line with Keynesian propositions in both models in short-term. Both spending and tax effects becomes insignificant in the period following the shock.
Serbia				
Hinić et al. (2013)	Sample n.a. SVAR Blanchard & Perotti (2002)	5 variables: Gross value added without agriculture (output), net taxes, government spending, inflation, short term nominal interest rate	G 0.77 T 0.77 Impact and cumulative multipliers up to 12quaters reported.	Results suggest that an increase in public consumption increases the non-agricultural economic activity. Estimated impact of fiscal policy on interest rates suggests accommodative monetary policy conditions.

Source: Authors

Note: *Short-term multipliers are cumulative multipliers that range for time of impact to one year (4 quarters) span. G stands for spending multiplier and T stands for tax multiplier; ** Only results for Slovenia are reported.

3. Determinants of fiscal multipliers and the 'bucket approach'

The size of fiscal multipliers is determined by various structural and conjectural characteristics of economies. Basic, theoretical, multiplier is determined by the marginal propensity to consume, marginal propensity to import and the tax burden. However, these three factors are not sufficient for explanation of differences in the effectiveness of fiscal policy in empirical analysis.

Empirical studies show that there are a lot more factors that can affect the size and a sign of fiscal multipliers and thus determine effectiveness of fiscal policy. These determinants are a basis for a 'bucket approach' for measuring the size of fiscal multipliers proposed in Batini et al. (2014) which we will use to set our hypotheses about the size of fiscal multipliers in selected Western Balkan countries (which will be empirically evaluated in the following section of the paper).

The bucket approach bunches countries into three groups that are likely to have similar impact multiplier values based on their structural and conjectural characteristics. Following Batini et al. (2014) determinants that will be analysed in this paper are presented in Table 2.

Table 2 Determinants of the size of fiscal multipliers*. Source: authors, following Batini et al. (2014)

Structural	**Effect on the size**
Trade openness	High degree of economic openness reduces the size of fiscal multiplier through the 'outflow effects' of the imports
Labor market rigidities	Rigid labor markets are less responsive to economic movements and as such they are reducing the effectiveness of fiscal policy (smaller fiscal multipliers)
Automatic stabilizers	Stronger automatic stabilizers reduce the size of fiscal multipliers, because automatic response of public revenues and expenditures on economic cycles offsets part of the fiscal stimulus
Exchange rate regime	Countries that have flexible exchange rate regime have lower fiscal multipliers because effects of fiscal policy on domestic economy are limited by the effects on international flows (finance and trade)
Level of public debt	Countries with high levels of public debt have lower fiscal multipliers because additional fiscal expansion can lead to increase in risk premium and decrease private sector confidence, thus de-stimulating consumption and investment
Conjectural	
Business cycle phase	Fiscal policy is more effective in conjectures than in expansionary phase of business cycle**
Monetary policy stance	If monetary policy is constrained (by structural characteristics of transmission mechanism or ZLB) effectiveness of fiscal policy (fiscal multiplier) is higher

Source: Authors, following Batini et al. (2014)

* We exclude public sector effectiveness from the analysis because most of Western Balkan countries don't have such measures; **For sources and explanation see Batini et al. (2014), pp. 10

As for the critical values and measures of some of the above determinants we assume:

1. The country is relatively closed if the ratio of imports to domestic demand is below 30 percent on average over the past five years, as in Batini et al. (2014).

2. Labour market is relatively rigid if the Labour market efficiency indicator is equal or below 4 on the scale 1-7, measured by the World Competitiveness Report.

3. Automatic stabilizers measured by the ratio of total public spending to nominal GDP are small if the ratio is below 0.40, as in Batini et al. (2014).

4. Public debt is 'stable' or 'acceptable' if the level of public debt is below 60% of GDP[7]

In Table 3 we present data on these structural characteristics in Croatia, Slovenia and Serbia.

Table 3 Determinants of the size of fiscal multipliers in Croatia, Slovenia and Serbia. Source: authors

Structural	Croatia	Slovenia	Serbia	Effect on the size
Trade openness 2007-2013*	0.43	0.69	0.46	Although all three countries can be considered as 'open', share of imports in domestic demand in Slovenia is substantially higher compared to peers so we expect that its fiscal policy is mostly constrained by the openness indicator
Labor market rigidities 2007-2013	4.1	4.2	4.0	All countries have relatively rigid labor markets, but the effects of fiscal policy could be most effective in Serbia
Automatic stabilizers 2007-2013	0.46	0.48	0.47	All countries can be considered to have relatively strong automatic stabilizers and the effects of this determinant on fiscal multipliers are relatively equal
Exchange rate regime	'Fixed'	Fixed	Flexible	Given the fixed exchange rate framework, effects of fiscal policy should be more effective in Croatia and Slovenia
Level of public debt 2007-2013	0.53 (ESA 2010)	0.41 (ESA 2010)	0.42 (national methodology)	Public debt in all countries is below 60% of GDP threshold, although Croatia has the highest ratio so this observation should be taken into account
Conjectural				
Business cycle phase (recessionary years in the whole analyzed period, %)	38%	25%	18%	Croatia experienced the longest recessionary phase during the analyzed period so, given the above explained assumptions, we could expect that fiscal policy should by more effective in Croatia, compared to peers
Monetary policy stance	Constrained (transmission mechanism and high eurization) no key policy rate	Constrained EA member	Constrained** (transmission mechanism and high eurization) key policy rate	Monetary policy is constrained in all analyzed countries which should positively affect the size of fiscal multiplier

Source: Authors

*We use this period to capture pre-recession and recession phase of the business cycle

** Serbia had real exchange rate anchor since 2003, and informal inflation targeting through 'inflation objectives' since September 2006 (Barisitz 2004, 2007), but monetary policy is largely constrained by the high euroization of the domestic economy (Hinić et al., 2013)

[7] We use Maastricht criteria as a treshold, unlike Batini et al. (2014) which use tresholds for EME's of 40% and advanced economies of 100% of GDP

Following the 'bucket approach' we assign a value of 1 to the determinants which imply that fiscal multipliers should be high in some country and value of 0 if the determinant constrains the size of the multiplier. Following Batini et al. (2014), countries with total scores of 0 to 3 may be assumed to have 'low' multipliers; countries with total scores of 3 or 4 have 'medium' multipliers; and countries with total scores of 4 to 6 end up in the 'large' multiplier category.

Table 4 'Bucket approach' in Croatia, Slovenia and Serbia. Source: authors

	Croatia	**Slovenia**	**Serbia**
Trade openness	0	0	0
Labor market rigidities	0	0	1
Automatic stabilizers	0	0	0
Exchange rate regime	1	1	0
Level of public debt	1	1	1
TOTAL:	**2**	**2**	**2**

Source: Authors

From Table 4 we can conclude that all countries should belong to the countries with low fiscal multipliers. According to Batini et al. (2014) these countries should have the size of the impact multiplier between 0.1 and 0.3, but these bounds should also be adjusted for the phase of business cycle and a monetary policy stance, such that:

- If the economy is at the lowest point of the cycle, lower and upper bound of the multipliers range should be scaled-up by 60 percent. If on the other hand, the economy is at a peak, both bounds should be decreased by 40 percent and when the output gap is zero, no adjustment should be made. In other cases the boundaries should be interpolated

- If monetary policy is at the effective lower bound and is fully constrained, both bounds of the multiplier range should be increased by 30 percent. If the monetary policy is constrained by other considerations, it should be interpolated between 0 and 30 percent

Based on data on the phase of the business cycle, presented in Table 3, we assume that the bounds for Croatia should be scaled-up by approximately 30%, in Slovenia by 15% and in Serbia by 12%[8]. As for the monetary policy stance, we assume that we could scale-up the boundaries by 15% in all countries[9]. So, based on the bucket approach, the size of fiscal multipliers should be between: 0.15-0.45 in Croatia and 0.13-0.40 in Slovenia and Serbia.

However, although informative and innovative, bucket approach is relatively rigid. Firstly, all determinants have the same weight in the calculation process. Second, the binary division on 0 and 1 limits the manoeuvring space so, for example, although Slovenia is much more open in terms of foreign trade than Croatia and Serbia, all three countries have the share of imports in domestic demand above thresholds and thus take a value of 0 in calculation.

So in this paper we will take these limitations into the consideration and use 'narratives' presented in Table 3 to make our assumptions on the size of fiscal multipliers in a way that we assume that Croatia will have the largest multiplier, followed by Serbia and then Slovenia. Given that all countries are

[8] 60% bound multiplied by the % of analyzed period in which country experienced recession

[9] Monetary policy in these countries is not on the effective zero bound, as there is some maneuvering space for monetary authorities through standard instruments like reserve and capital requirements etc.

relatively similar in the context of labor market flexibility, automatic stabilizers, public debt and monetary policy stance, we expect that the business cycle phase, with longest recession in Croatia, and trade openness, with Slovenia with the biggest share of imports in domestic demand, will play the key role.

In the next section we present our empirical methodology that will be used to test these assumptions.

4. Methodological approach

Given data limitations and relatively short time series, in choosing the adequate model for empirical analysis we assume that economy openness is the most important characteristic for all countries in estimating the size of fiscal multipliers.

Openness of the economy can influence fiscal policy through three channels: trade channel, real exchange rate channel and interest rate channel, and the size of the fiscal multiplier depend on the interaction between these different channels. The total impact of external expansion on domestic output is expected to be positive if the trade and exchange rate effects outweigh the negative interest rate effect. Regarding 'fixed' exchange rate regimes and rather undeveloped capital markets[10] , we believe that trade channel prevails in the most of countries when describing cross-border spill overs. That is why adjusted Blanchard-Perotti methodology for small open economies with fixed exchange rate developed by Ravn & Spange (2012) is optimal starting point this research.

The baseline model of this analysis is the reduced form VAR model:

$$X_t = \alpha + \beta D_t + \gamma T_t + \sum_{i=1}^{p} A_i X_{t-i} + u_t, \qquad (1.1)$$

which includes deflated and seasonally adjusted log-values of net indirect tax revenue (T_t) , total general government spending (G_t), domestic demand (DD_t), foreign GDP[11] (F_t), which comprise the vector of the variables of interest $X_t = [T_t, G_t, DD_t, F_t]$. Exogenous variables included in the model are constant (α), time trend[12] (T_t) and a 'crisis' dummy variable (D_t), which takes a value of 1 from 1Q09-4Q09, which represents the period in which all three countries took the 'strongest hit' to GDP during the crisis. Vector $u_t = [t, g, dd, f]'$ represents the vector of innovations of the reduced model (RF), $u_t \sim (0, \sum_u)$. Number of time lags is set according to SIC and HQ criteria[13]. Greater number of lags isn't desirable due to the short time-series as well.

Reduced form of the model (1.1) gives information about RF innovations. RF innovations are correlated and represent linear combination of structural innovations, which prevents their precise

[10] Capital markets are generally shallow, illiquid and underdeveloped. In such conditions assets are less liquid and prices more volatile. Behavior of interest rates may be difficult to explain with large number of factors which affect yield curve (Aljinović et al., 2008; Zoričić & Orsag, 2013). Further, hard pegs and high euroisation influenced that central banks interest rates where and remained non-referent. For example, in Croatia central banks' money issuing function was reduced to an instrument of foreign exchange auctions, while the open market operations as the main instrument of modern monetary policy were and are of secondary importance (Ćorić et al., 2015).

[11] Calculated as a sum of gross domestic products of Germany, Austria and Italy as these countries are the main, or one of the main trade partners to selected economies.

[12] ADF test i Zivot-Andrews stationarity tests show that all variables are trend stationary so the inclusion of trend guarantees model stability in which the variables are included in logarithmic form; results of these tests can be delivered on request

[13] Croatia 3, Slovenia 2, Serbia 1

economic interpretation. Linear combination of structural innovations (shocks) can be displayed as follows:

$$t_t = a_1 dd_t + a_2 f_t + \beta_2 e_t^G + \beta_1 e_t^t \quad (1.2)$$

$$g_t = b_1 dd_t + b_2 f_t + \beta_4 e_t^T + \beta_3 e_t^g \quad (1.3.)$$

$$dd_t = c_1 t_t + c_2 g_t + c_3 f_t + \beta_5 e_t^{dd}, \quad (1.4.)$$

$$f_t = d_1 t_t + d_2 g_t + d_3 dd_t + \beta_6 e_t^f, \quad (1.5.)$$

where e_t^t, e_t^g, e_t^{dd} i e_t^f represent uncorrelated structural shocks of taxes, government spending, personal consumption and foreign demand.

In matrix form:

$$\begin{pmatrix} 1 & 0 & a_1 & a_2 \\ 0 & 1 & b_1 & b_2 \\ c_1 & c_2 & 1 & c_3 \\ d_1 & d_2 & d_3 & 1 \end{pmatrix} \begin{pmatrix} t_t \\ g_t \\ dd_t \\ f_t \end{pmatrix} = \begin{pmatrix} \beta_1 & \beta_2 & 0 & 0 \\ \beta_4 & \beta_3 & 0 & 0 \\ 0 & 0 & \beta_5 & 0 \\ 0 & 0 & 0 & \beta_6 \end{pmatrix} \begin{pmatrix} e_t^t \\ e_t^g \\ e_t^{dd} \\ e_t^f \end{pmatrix} \quad (1.6.)$$

equation (1.2) shows that the model assumes that four factors can cause unexpected tax changes during one quarter: reactions on unexpected changes in domestic consumption, reactions on unexpected changes in foreign demand, and reactions on structural shocks in government spending or taxes. Other equations are interpreted in a similar manner.

In order to identify this system, $2K^2 - \frac{1}{2}K(K+1)$ limitations are to be set (Lutkepohl, 2005), which have to have a strong base in economic theory. As the number of endogenous k=4, 22 limitations are needed. Basic model implies 16 limitations, so 6 more are to be added.

Quarterly data frequencies have the greatest significance in the process of identification. It is due to the assumption that economic policymakers cannot react to changes in the economic environment in one quarter. There are different informational, administrative and procedural barriers for reacting in such short period, e.g. most of the statistical reports are published with a couple of months or quarters of delay; there are procedural barriers inside of the parliament etc. Therefore the reaction of fiscal variables on changes in economic activity can only be automatic, i.e. the consequence of automatic stabilizers' activity. That fact allows setting the limitations in the model based on empirical estimation of exogenous elasticities of fiscal variables in relation to changes of certain macroeconomic aggregates. To be more precise, parameter a_1 and b_1 can be interpreted as (automatic) elasticities of tax revenue and expenditures according to aggregate demand changes.

Data on tax elasticity for Croatia is taken from Ravnik & Žilić (2011) and Šimović (2012) so we assume that $a_1 = 0.89$, for Slovenia from Jemec at al. (2013) so $a_1 = 0.87$ and Serbia from Hinić et al. (so $a_1 = 0.9$. Based on the common approach in the literature (e.g. Blanchard Perotti, 2002; Ravn & Spange, 2012) we assume that government spending cannot react to changes in the economic environment and thus we assume that $b_1 = 0$.

In order to identify other parameters of the system, Blanchard & Perotti (2002) recommend calculation of cyclically adjusted residuals, which are uncorrelated with structural shocks in GDP (and personal consumption) so they can be used as instruments for t_t and g_t in IV regression of income and personal consumption on t_t and g_t, which results in parameters c_1 and c_2.

Parameters β_2 and β_4 show the reaction of taxes on changes in government spending and vice versa. In order to identify the system, it is necessary to assume that one of these parameters is equal to 0, i.e. that there is no reciprocity. This paper assumes that tax revenues react to changes in government spending, and not vice versa, so β_4=0. Blanchard & Perotti (2002) showed that the results of the model can hold this assumption (i.e. they are robust).

The last three limitations are implied in the assumption that foreign demand affects all endogenous variables, and that there is no effect the other way around so $d_1 = d_2 = d_3 = 0$.

It is possible to estimate this model in order to get information about structural innovations which are not correlated, so that one can give an economic interpretation of the conclusion of the analysis of impulse response functions (IRF).

An analysis of model adequacy has been conducted for the model (1.1) in all countries and the results of the analysis of residuals (autocorrelation test and heteroscedasticity test) and stability tests show that the models are adequate and stable (Appendix 1).

5. Data

Data source on the components of GDP, GDP of main trade partners and the size of general government consumption and net indirect taxes is Eurostat, with all data at constant prices and exchange rate from 2005. All variables are in millions of euro. Data series applies to 2001Q1-2014Q1 period for Croatia and Slovenia and 2003Q1-2014Q1 for Serbia. All data has been seasonally adjusted using the method ARIMA X12.

Aggregate demand of the private sector is calculated as sum of personal consumption and investment, as in Giordano et al. (2005). This indicator gives information on the effect of fiscal variables on the private sector, thus eliminating possible correlation between fiscal shocks and GDP components related to government spending, high correlation between GDP and the component of GDP government spending (G) and high correlation of net exports and foreign demand variable, which could significantly violate some important econometric assumptions. Also, total GDP includes components such as inventory and import level, which domestic fiscal shocks cannot directly affect. These components are affected by the changes in determinants of personal consumption. Mechanism of the instantaneous effect of fiscal shocks of consumption and indirect taxes on export has not been elaborated in economic literature.

In our analysis we use indirect taxes for three reasons: (i) as it has been mentioned in the introduction, the goal of the paper is to analyze effects of fiscal policy on aggregate demand. In theory, personal income tax and profit tax mostly affect aggregate supply, modelling the behaviour of workers and companies; (ii) SVAR models are more suitable for the analysis of aggregate demand shocks (Ravn & Spange, 2012; Blanchard-Perotti, 2002). Due to complexity of the mechanism of the effect of taxes on aggregate supply, broader methodological framework of DSGE model is required to analyze their effects; (iii) tax systems in Croatia, Slovenia and Serbia are mainly consumption-oriented and the most of discretionary changes since the beginning of the crisis were related to indirect taxes so we want to try to estimate the consequences of those changes.

6. Results

Based on SVAR analysis we derive impulse response functions, which can be recalculated to fiscal multipliers to show the effects of a one unit change of fiscal variables to the domestic demand, expressed in units (see for example Jemec et al. (2013) and Hinić et al. (2013)).

Following Splimbergo at al. (2011) in this section we present the results for three types of multipliers:

Impact multiplier

$$M = \frac{\Delta Y(t)}{\Delta G(t)}$$

Cumulative multiplier

$$M = \frac{\sum_{j=0}^{N} \Delta Y(t+j)}{\sum_{j=0}^{N} \Delta G(t+j)}$$

Peak multiplier

$$M = \max_{N} \frac{\Delta Y(t+N)}{\Delta G(t)}$$

The results are presented in Table 5 and we analyse the responses of domestic demand in 12 quarters after the initial shocks.

Table 5 Fiscal multipliers in Croatia, Slovenia and Serbia. Source: authors

	Government spending		
	Croatia	Slovenia	Serbia
Impact multiplier	0.3*	-0.1	-0.1
Cumulative multiplier (stat. siginificant at 95% level)	1.0 (1st-3rd quarter)	-0.3	0.1
Peak multiplier (quarter with max effect)	0.6 (2nd quarter)	0.0 (7th quarter)	0.4 (2nd quarter)

	Net taxes		
	Croatia	Slovenia	Serbia
Impact multiplier	-0.2	-0.3*	-1.5*
Cumulative multiplier (stat. siginificant at 95% level)	-0.2 (1st-2nd quarter)	-3.1 (1st-9th quarter)	1.3 (1st-3rd quarter)
Peak multiplier (quarter with max effect)	-0.2 (1st quarter)	-0.8* (3rd quarter)	-1.5* (1st quarter)

Source: Authors
*statistically significant at 95% level of confidence

Results presented in Table 5 are in line with the assumptions based on the 'bucket approach' and our 'narrative' presented in Table 3.

Impact government spending multipliers are showed to be relatively small, between -0.1 and 0.3, while net tax multipliers are also relatively small, besides in case of Serbia where the multiplier is greater than 1. As for the cumulative multipliers of government spending, our assumption of the effectiveness of fiscal policy in Croatia is confirmed, as the total effects of fiscal stimuli are greatest in Croatia. On the other hand, net tax multipliers are bigger in Slovenia, where the effect of the rise in indirect taxes is substantially larger than in Croatia. In Serbia cumulative response of domestic demand on shocks in net taxes is positive, which is counterintuitive, but such results are not uncommon in CESEE countries (see for example Mirdala et al. (2009) or Hinić et al. (2013)).

Before conclusion it is important to emphasize some methodological issues related to the results. First of all, the analysis was conducted on relatively short time series which can affect the results of the SVAR model which requires long time series, given its autoregressive and dynamic nature. Secondly, in this paper we used elasticities derived from other research which were calculated for periods which aren't in accordance with the analysed period in this paper. This is important because the choice of elasticities can significantly change the results and elasticities are one of the main determinants of differences in multiplier's sizes in different countries. Also, very important assumption which affects the multiplier's size is the assumption of government spending elasticity on changes in cycles. In this, as in most of the papers using Blanchard-Perotti methodology, this elasticity is assumed to be 0, but it would be appropriate to directly estimate the reactions of government expenditures on economic activity. Thirdly, the most common method for checking the robustness of SVAR models is the

breakpoint test, where the series is divided into two parts. Due to the small number of observations this test couldn't be applied in this paper.

Also, it is important to notice that that there are several already entrenched criticism of Blanchard-Perotti methodology: (i) as already mentioned, Caldara & Kamps (2012) emphasize the sensitivity of results on the assumptions on the size of elasticities; (ii) in the current debate on the effects of fiscal consolidation it is pointed out it is of great importance to include the feedback between the level of public debt and growth in the analysis of the effects of fiscal policy on economic growth; (iii) it is very important to explicitly model the effects of monetary policy in the fiscal SVAR analysis because the effectiveness of fiscal policy in large extent depends on the monetary policy stance; (iv) according to the results of switching regime models (eg. Auerbach and Gorodnichenko, 2012) the size of fiscal multipliers strongly depends on the stage of the business cycle; (v) recent research has shown that the size of fiscal multipliers strongly depends on economic environment (eg. Corsetti et al., 2012) so, for the robustness of the results, it is important to directly include structural characteristics of the economies such as level of debt, exchange rate regime, health of financial system etc.

In this paper it was impossible to include such 'control' variables due to a very limited length of all relevant time series. If we introduced a number of control variables, which are certainly very important, the OLS assumptions would be seriously violated (CLT) and the results would further lose on quality.

7. Conclusions

In the period from the beginning of 2000s to 2014, Croatia, Slovenia and Serbia can be described as small, open economies, with relatively rigid labour markets, strong automatic stabilizers, acceptable level of public debt and constrained monetary policy, which experienced a boom and bust cycle. Such structural characteristics are very important determinants of the effectiveness of fiscal policy in those countries and should be taken into the consideration in various policy discussions.

In this paper we used 'bucket approach' to determination of the size of fiscal multipliers to include all of these characteristics and based on the results of that approach we concluded that fiscal multipliers in these countries should be relatively small. However, although structurally similar, Croatia, Slovenia and Serbia have some specificities that allowed us to make assumptions on the differences of the size of fiscal multipliers between them. Thus our main hypotheses were that Croatia has the highest spending multiplier, followed by Serbia and Slovenia.

Our empirical results, based on SVAR methodology, confirmed our hypotheses on the relative size of the multipliers between these three peer countries, with Croatia having the highest spending multiplier and Slovenia the lowest one. Such results can be explained by the fact that Croatia recorded full six years of conjecture and empirical results in various papers show that fiscal policy is more effective in recession periods. On the other hand, Slovenia is the most open economy in this group, so the 'outflows' from the domestic economy are strongest.

Even though this research has several methodological limitations, explained above, these results can be used as a benchmark for discussions about the differences in the effectiveness of fiscal policy in these countries. Also, one of its contributions is that this is the first paper that uses 'bucket approach' to fiscal multipliers, after it was initially introduced in Batini et al. (2014).

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Appendix 1: Stability and model adequacy tests

VAR Stability Check

Croatia	
Root	**Modul**
0.141723 - 0.899262i	0.910361
0.141723 + 0.899262i	0.910361
-0.600313 - 0.648507i	0.883707
-0.600313 + 0.648507i	0.883707
-0.117479 - 0.699563i	0.709359
-0.117479 + 0.699563i	0.709359
0.611134 - 0.276192i	0.670647
0.611134 + 0.276192i	0.670647
-0.561397 - 0.245452i	0.61271
-0.561397 + 0.245452i	0.61271
0.376118 - 0.281800i	0.469975
0.376118 + 0.281800i	0.469975

Slovenia	
Root	**Modul**
0.968733	0.968733
0.775573 - 0.198030i	0.800456
0.775573 + 0.198030i	0.800456
0.592958	0.592958
-0.137523 - 0.317440i	0.345949
-0.137523 + 0.317440i	0.345949
-0.217495	0.217495
0.101383	0.101383

Serbia	
Root	**Modul**
0.911161	0.911161
0.771840 - 0.1	0.804764
0.771840 + 0.	0.804764
0.551078	0.551078

VAR Residual Serial Corelation Test

	Croatia	
	LM-test	**Prob**
1	13.27796	0.6523
2	21.13447	0.1734
3	25.03253	0.0693
4	12.47861	0.7104
5	18.68398	0.2854
6	12.65239	0.698
7	22.55614	0.1261
8	25.95724	0.0546
9	10.04066	0.8645
10	7.007351	0.9731

	Slovenia	
	LM-test	**Prob**
1	15.11049	0.5166
2	12.45825	0.7119
3	21.35742	0.1652
4	27.41979	0.037
5	14.88092	0.5334
6	13.13172	0.6631
7	20.43666	0.2012
8	38.68605	0.0012
9	11.32961	0.7887
10	30.21328	0.0169

	Serbia	
	LM-test	**Prob**
1	19.22014	0.2574
2	10.58721	0.8342
3	9.116896	0.9085
4	19.30896	0.253
5	18.45963	0.2977
6	14.73992	0.5438
7	13.87437	0.6081
8	14.58748	0.555
9	13.07763	0.6671
10	14.96319	0.5273

VAR Residual Heteroskedasticity Test

Croatia		
Joint test:		
Chi-sq	**df**	**Prob.**
195.3837	190	0.3791

Slovenia		
Joint test:		
Chi-sq	**df**	**Prob.**
204.213	180	0.1042

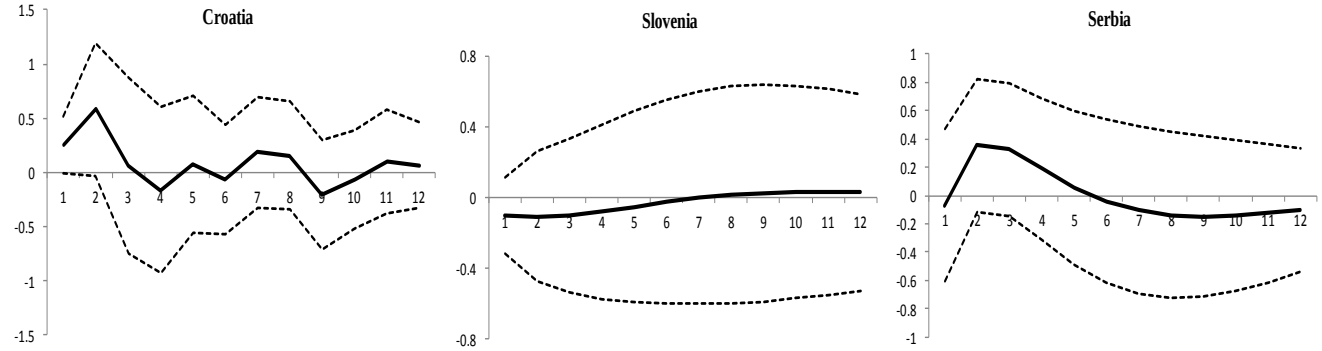
Serbia		
Joint test:		
Chi-sq	**df**	**Prob.**
93.04629	80	0.151

Source: Authors' calculations

Appendix 2: Dynamic multipliers – graphical presentation

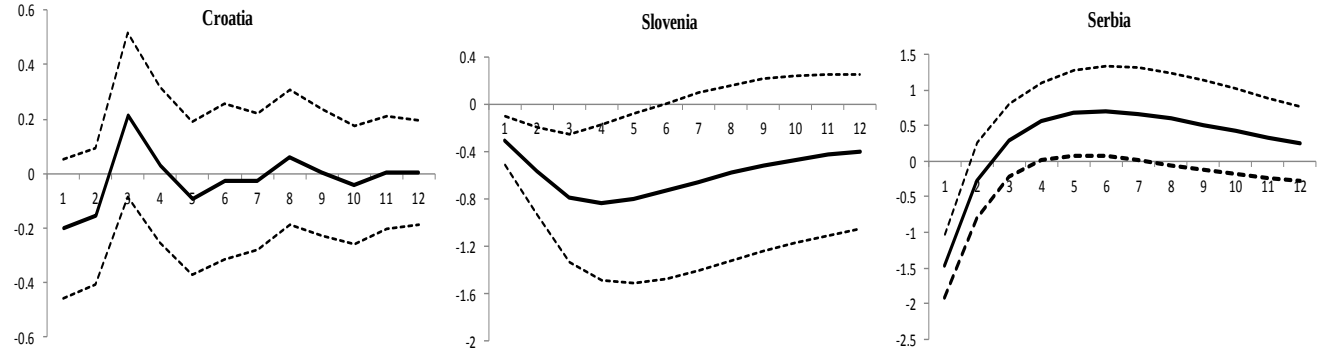
Fig 1: Dynamic multipliers

Spending multipliers



*dashed lines represent 95% level of confidence
Source: Authors' calculations

Tax multipliers



*dashed lines represent 95% level of confidence
Source: Authors' calculations