Macroeconomic effects of fiscal policy in a small open economy

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MACROECONOMIC EFFECTS OF FISCAL POLICY IN A SMALL OPEN ECONOMY: THE CASE OF CROATIA

DOCTORAL THESIS

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MAKROEKONOMSKI UČINCI FISKALNE POLITIKE U MALOJ OTVORENOJ EKONOMIJI: SLUČAJ HRVATSKE

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SUMMARY

This doctoral dissertation represents a collection of three inter-related scientific papers that investigate the macroeconomic effects of fiscal policy in Croatia. The main goal of this dissertation is to extend the existing empirical literature on the macroeconomic effects of fiscal policy in Croatia in two ways. First, all research questions in this dissertation are contextualized in a small open economy analytical framework. Previous research on the effects of fiscal policy in Croatia has overlooked the importance of the effects of the openness of the economy on the size of fiscal multipliers. Secondly, this dissertation aims to show that calibrated small-scale small open economy New Keynesian dynamic stochastic general equilibrium (DSGE) models could be used for simulations of the effects of fiscal policy in Croatia and contribute to the understanding of various channels and complex relations between fiscal and macroeconomic variables. Empirical results, based on structural vector autoregressive models (SVAR), suggest that the effects of fiscal policy in Croatia are Keynesian in nature. A rise of government consumption has positive effects on GDP, private aggregate demand, private consumption, employment and prices. On the other hand, a rise in net indirect taxes has negative effects on private aggregate demand and private consumption. However, results also suggest that the effectiveness of fiscal policy in Croatia is constrained by the openness of the economy and the level of public debt as both factors reduce the size of fiscal multiplier. Also, increased public consumption deepens the trade deficit, which puts pressure on external imbalances. Thus, in academic and public debates on the role and possibilities of fiscal policy in Croatia, one should always keep in mind that Croatia is a small, open and relatively highly indebted economy. Such characteristics of the economy put notable challenges for fiscal policy makers in Croatia.

Keywords: small open economy, fiscal policy, SVAR, DSGE, Croatia

SAŽETAK

Ova doktorska disertacija predstavlja skup od tri povezana objavljena znanstvena članka u kojima se istražuju makroekonomski učinci fiskalne politike u Hrvatskoj. Osnovni cilj ove disertacije je proširiti i dopuniti postojeću empirijsku literaturu o makroekonomskim učincima fiskalne politike u Hrvatskoj na dva načina. Prvo, sva istraživačka pitanja u ovoj disertaciji su kontekstualizirana u analitičkom okviru malog otvorenog gospodarstva. Prethodna istraživanja o učincima fiskalne politike u Hrvatskoj su previdjela važnost učinaka otvorenosti ekonomije na veličinu fiskalnih multiplikatora. Drugo, ova disertacija pokazuje da se kalibrirani novo-kejneizijanski dinamički stohastički modeli (DSGE) malog otvorenog gospodarstva mogu koristiti za simulaciju učinaka fiskalne politike u Hrvatskoj i doprinijeti boljem razumijevanju različitih kanala i kompleksnih odnosa fiskalnih i makroekonomskih varijabli. Empirijski rezultati, temeljeni na strukturnim vektorskim autoregresivnim modelima (SVAR), pokazuju da su učinci fiskalne politike u Hrvatskoj kejnezijanskog duha. Povećanje državne potrošnje ima pozitivan učinak na BDP, privatnu agregatnu potražnju, privatnu potrošnju, zaposlenost i cijene. S druge strane, povećanje neto indirektnih poreza ima negativan učinak na privatnu agregatnu potražnju i privatnu potrošnju. Međutim, rezultati također pokazuju da je učinkovitost fiskalne politike u Hrvatskoj ograničena otvorenošću ekonomije i razinom javnog duga budući da oba faktora smanjuju veličinu fiskalnog multiplikatora. Također, povećanje državne potrošnje produbljuje trgovinski deficit, što stvara pritisak na vanjske neravnoteže. Zato bi sudionici akademskih i javnih rasprava o ulozi i mogućnostima fiskalne politike u Hrvatskoj uvijek trebali imati na umu da je Hrvatska malo, otvoreno i relativno visoko zaduženo gospodarstvo. Takva obilježja gospodarstva pred nositelje fiskalne politike u Hrvatskoj stavljaju značajne izazove.

Ključne riječi: mala otvorena ekonomija, fiskalna politika, SVAR, DSGE, Hrvatska

EXTENDED SUMMARY

*Macroeconomic Effects of Fiscal Policy in a Small Open Economy: the case of C*roatia is a doctoral dissertation that consists of three inter-related published papers focusing on the macroeconomic effects of fiscal policy in small open economies, using the evidence from Croatia. The main goals of this doctoral dissertation are to empirically determine and analyze the effects of fiscal policy on various macroeconomic variables in Croatia in an open economy analytical framework and to test the adequacy of a small open economy New Keynesian DSGE model for the analysis and simulations of macroeconomic effects of fiscal policy in Croatia. Through three central chapters, this dissertation deals with various aspects of the effectiveness of fiscal policy in an open economy framework.

Chapter 2 focuses on the estimation of the size of fiscal multipliers in Croatia in an open economy framework. The results in this chapter are based on estimated SVAR models, identified by the extended version of Blanchard-Perotti (B-P) procedure. The results of estimated models indicate that reactions of private consumption and private aggregate demand can be described as Keynesian. However, the government consumption multiplier and the net indirect tax multiplier, which measure the effects of a unit increase in fiscal variables on private consumption and private aggregate demand, are lower compared to estimates in previously used closed economy models, which is an important novel result in domestic empirical literature.

Chapter 3 provides a comparison of the size of government consumption multipliers in three peer small open economies – Croatia, Slovenia and Serbia. There are four SVAR models estimated for all countries in the analysis. Closed economy model, closed economy model with public debt and two versions of open economy models. The main results point that the closed model multiplier of government consumption in all countries is notably higher compared to the multiplier estimated in the open economy framework. Also, the inclusion of public debt in the closed economy model reduces the size of the multiplier. Next, the definition of the openness of the economy notably affects the size of the multiplier

as the multipliers estimated in models with foreign demand as an indicator of openness are significantly lower compared to models with imports-exports ratio. This can be explained by the fact that imports-export ratio reflects only the so-called ‘leakage effect’, while foreign demand includes many other trade and financial linkages.

Chapter 4 brings another important novelty to domestic literature as the macroeconomic effects of fiscal policy in Croatia are analyzed through the lens of small open economy New-Keynesian DSGE model, calibrated to fit Croatian data. The results of the simulation show that employment and output react positively to the increase of government consumption, which is in line with Keynesian theory. Higher government consumption in the model increases inflation through the mechanism of New-Keynesian Phillips curve. Finally, net exports deteriorate as increased consumption leads to stronger imports. Results from the model simulation are then compared to results of the empirical VAR model. Impulse responses from the empirical model mostly match the results from the calibrated model. Increase in government consumption has a positive effect on employment (not statistically significant), output and prices react positively, while trade balance deteriorates. These results indicate that the presented DSGE model can be a useful starting point and a toolkit in fiscal policy analysis in Croatia. However, the presented model is a calibrated small scale model. Future research should be based on larger models with alternative estimation methods.

Keywords: small open economy, fiscal policy, SVAR, DSGE, Croatia

Contents

1. INTRODUCTION

> *"Perfectly reasonable economists can and do disagree on the basic theoretical effects of fiscal policy, and on the interpretation of the existing empirical evidence"* – Roberto Perotti (2007)

1.1. Motivation

Croatia is a small open economy with nominal exchange rate as a nominal monetary policy anchor and a managed floating exchange rate regime. Under such framework, the maneuvering space of monetary policy is fairly limited,[1] which makes fiscal policy a key macroeconomic policy instrument in Croatia, in terms of its stabilization function in the economy (Musgrave, 1959). The role and importance of fiscal policy will become even more pronounced after Croatia joins the euro area and adopts common monetary policy, steered by the European Central Bank (ECB)[2]. Thus, understanding the effectiveness and limitations of fiscal policy is of great importance for both academics and policy makers in Croatia.

Empirical literature investigating the stabilization effects of fiscal policy, through the effects of government consumption and taxes on (components of) aggregate demand, started to develop during seventies and eighties. Up to mid-1970s, the view on the effects of fiscal policy was primarily of Keynesian nature and fiscal policy was seen as an important policy tool for economic stabilization (Solow and Blinder, 1973; Stein, 1990). However, this view started to change after the revival of the Ricardian equivalence hypothesis[3] (Barro, 1974) which challenged the nature and effectiveness of fiscal policy. Some of the most influential empirical papers of the time (e.g. Tanner, 1979 and Kormendi, 1983) showed that fiscal expansion can lead to a decrease of aggregate demand through negative effect on private consumption. Barro (1981) emphasized that the effects of fiscal policy on economic activity can differ, depending on whether changes in fiscal variables are transitory or permanent. Barro (1979) concluded that neither economic theories nor empirical analyses provided convincing evidence on the effectiveness of fiscal policy. Feldstein (1982) found that Ricardian

[1] For detailed discussions on monetary policy instruments and limitations of monetary policy see Lang and Krznar (2004) and Šimović, Ćorić and Deskar-Škrbić (2014).
[2] Croatia adopted the *Strategy For The Adoption Of The Euro In The Republic Of Croatia* in 2017. Letter on participation in ERM II is expected in 2019.
[3] The hypothesis is explained in the next sub-sections.

equivalence theorem is contradicted by the data, while Aschauer (1985) and Hall (1986) found empirical support for this theorem. Lack of empirical evidence and consensus on the effectiveness of fiscal policy led to a decline of the role of fiscal policy and the role of demand management was assigned to monetary policy[4]. This change was also reflected in literature. According to Krugman (2009), between 1980s and 2000s "the whole discussion of fiscal policy essentially disappeared from Macroeconomics", while Solow (2002) emphasizes that "serious discussion of fiscal policy has almost disappeared".

However, in late 1990s and early 2000s empirical literature on the effects of fiscal policy started to grow again and after the Great Recession of 2008 both academics and policy makers started to appreciate the role of fiscal policy again, as monetary policy in many countries hit the "zero lower bound" and faced the "liquidity trap". While discussions and literature on fiscal policy during 1970s and 1980s were mostly focused on the relations between government and private consumption (and partially on crowding out effect of fiscal policy), new discussions and empirical literature are aimed at the estimation of the size of *fiscal multipliers*. Reliable estimates of the size of fiscal multipliers require identification of exogenous fiscal shocks, i.e. fiscal shocks that are orthogonal to business cycle. There are several main approaches to the identification of fiscal shocks. The first, so-called *narrative approach* (Ramey and Shapiro, 1998; Romer and Romer (2010), exploits historical information on legislated fiscal actions to define the date, volume and motivation of fiscal shocks, which enables researchers to separate between fiscal actions that are motivated by reactions on business cycle movements and those that are motivated by some exogenous decisions. The second approach is based on vector autoregressive (VAR) models identified by the *recursive approach* and zero restrictions (Choleski decomposition and causal ordering of the variables), proposed by Fatas and Mihov (2001). The third and probably the most popular approach was proposed by Blachard and Perotti (2002)[5] (thus called *Blanchard-Perotti* approach) who identify VAR models by imposing zero and non-zero restrictions (estimated elasticities of automatic stabilizers) on the relations between fiscal shocks and economic variables. Mountford and Uhlig (2009) use *signs restrictions* to distinguishing fiscal shocks from business cycle shocks. Finally, to avoid

[4] Additional reasons for skepticism related to fiscal policy are given in Auerbach (2012).
[5] Also used in this dissertation.

problems with identification of fiscal shocks, some authors propose the use of cyclically adjusted primary balance (CAPB) as a measure of fiscal policy (e.g. Alesina and Ardagna 2010). These approaches are discussed in more detail in the central chapters of the dissertation.

Domestic literature on the effectiveness of fiscal policy and macroeconomic effects of fiscal policy is relatively plentiful and up-to date. Starting with early works, Pivac and Jurun (2002) use vector error correction model (VECM) and find positive relationship between the share of budget in GDP and GDP. Also based on VECM, Benazić (2006) shows that an increase of government expenditures leads to an increase of GDP (and government revenues). Rukelj (2009) employs structural VEC model to analyze the interaction of fiscal and monetary policies in Croatia and concludes that the effects of fiscal policy shock on economic activity are mostly positive, but that they depend on the identification of the model. Vizek and Tkalec (2010) use multiple linear regression and show that government expenditures mostly reduce output in manufacturing sectors (crowding out effect). Ravnik and Žilić (2011) use structural VAR (SVAR) model, based on Blanchard-Perotti (BP) identification scheme, and find that government expenditure shock decreases industrial production and government revenue shock increases industrial production in the short run. Sever, Drezgić and Blažić (2011) employ VAR models and estimate the effects of various categories of government expenditure on GDP and show that some categories increase GDP (capital expenditures and consumption of goods and services), while other categories have negative effect on GDP (wages, subsides). Šimović and Deskar-Škrbić (2013) base their research on three-variable BP SVAR model and estimate positive multipliers of government expenditures (and negative multiplies of indirect taxes, although not statistically significant). Grdović Gnip (2014) follows a similar approach but expands the three-variable BP SVAR model with regime-switching four-variable model and estimates positive government spending multipliers and negative tax multipliers. The author also shows that the size of government spending multiplier increases in recession. Grdović Gnip (2015)[6] uses a five-variable BP SVAR model and estimates government spending multipliers and negative tax multipliers. Šimović (2017) shows that high levels of public debt reduce the effectiveness of fiscal policy as it reduces the size of government spending multiplier.

[6] Published as a working paper in 2013.

These papers provide a solid and informative state-of-the art analytical framework and can serve as an important analytical background for discussions on the macroeconomic effects of fiscal policy in Croatia. However, all presented papers overlooked the importance of external shocks for macroeconomic developments in Croatia although they are important drivers of GDP and inflation (Jovičić and Kunovac, 2015; Dumičić, Palić and Šprajček, 2015). Thus, models based on specifications without the external variables (shocks) most likely suffer from the omitted-variable bias. More precisely, estimation of the effects of fiscal policy on macroeconomic variables in Croatia that disregard the importance of external shocks for macroeconomic developments, could lead to overestimated effects of fiscal policy and overestimated size of fiscal multipliers. Thus, more credible results on the macroeconomic effects of fiscal policy in Croatia require modelling an approach that takes into account the fact that Croatia is a small open economy, strongly exposed to external developments. This dissertation seeks to fill this gap in the domestic literature by analyzing the effects of fiscal policy in Croatia in an *open economy analytical framework*.

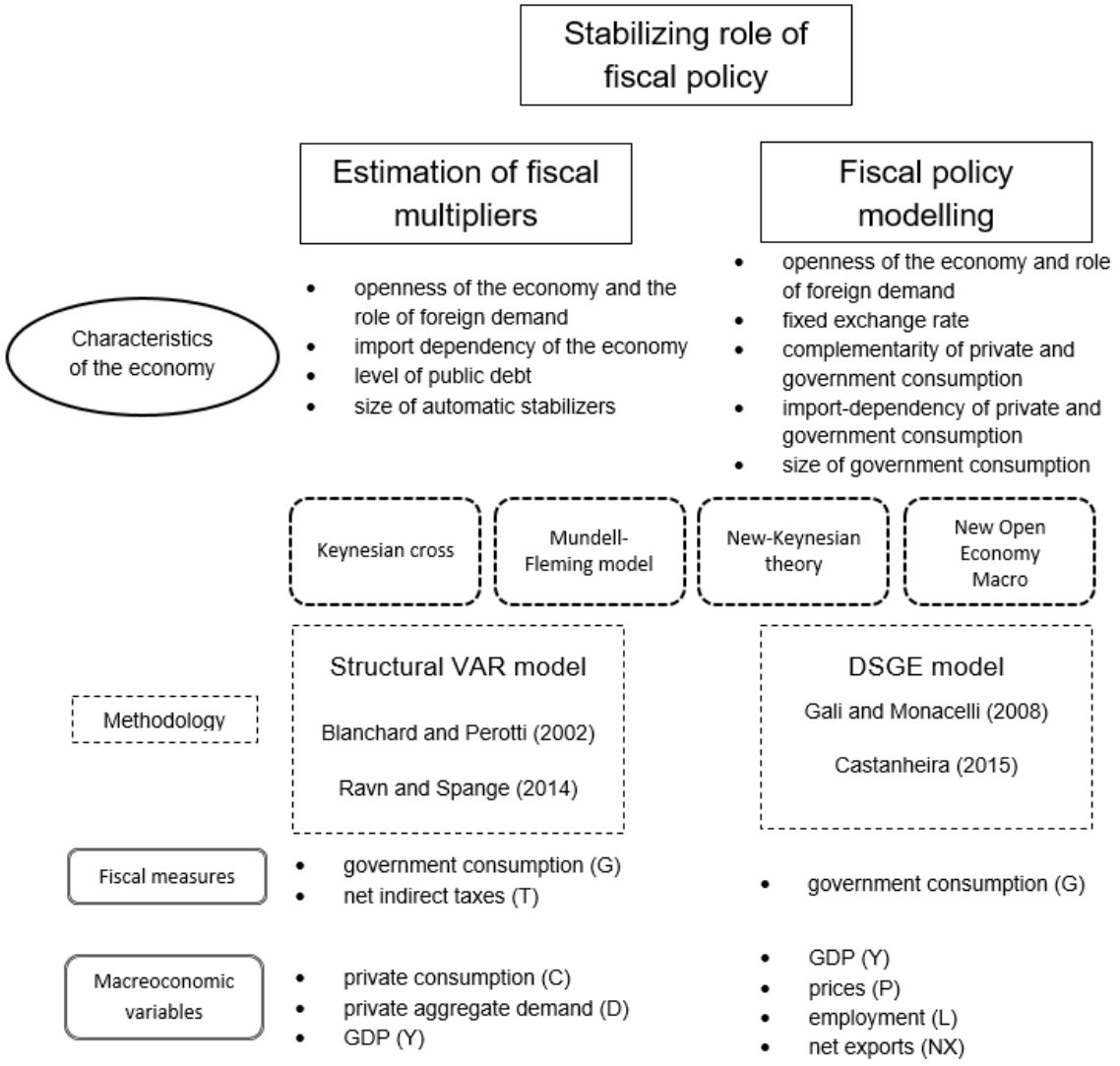
Empirical literature on the effects of fiscal policy in open economies is mostly based on panel data analysis. Authors investigate various aspects of fiscal policy in small open economies, such as the effects of fiscal policy on trade balance (e.g. Lane and Perotti, 2003; Beetsma and Giuliodori, 2011; Ilzetzki et al., 2013), differences in the size of fiscal multipliers between countries with fixed exchange rate regime and floating exchange rate regime (e.g. Corsetti et al, 2012; Ilzetzki et al., 2013), effects of fiscal policy on real exchange rate (e.g. Monacelli and Perotti, 2006; Benetrix and Lane, 2010) or the effects of openess of the economy on the size of fiscal multipliers (Ilzetzki et al., 2013; Riguzzi and Wegmueller, 2016). These papers mostly provide empirical support for some of the key theoretical propositions. First, fiscal policy is more effective in countries with fixed exchange rate. Next, fiscal expansion leads to a deterioration of trade balance and an appreciation of exchange rate. Finally, a high degree of openness of the economy reduces the size of fiscal multiplier through the so-called leakage effect, as stronger domestic demand, supported by fiscal expansion, leads to a rise in imports (detailed discussion on these theoretical propositions follows in the next section). While there is a solid number of panel-based research on this matter, time series VAR literature is relatively scarce. Papers directly incorporating the effects of the openness of the economy in SVAR models (to author's knowledge) are Ravn and

Spange (2014) and Teodovski, Petrevski, Bogoev (2016). Having this in mind, this dissertation also contributes to the empirical fiscal literature by analyzing the effects of the openness of the economy on the effectiveness of fiscal policy in a time series methodological framework.

1.2. Conceptual and theoretical framework

As already noted, the focus of this dissertation is on the stabilization role of fiscal policy in Croatia. The assessment of the stabilization effects of fiscal policy is based on two inter-related empirical approaches, which are illustrated in Figure 1.1.

Figure 1.1 Conceptual framework



Source: author

The first approach is based on the estimation of fiscal multipliers through structural vector autoregressive (SVAR) models. This approach builds on earlier works of

Blanchard and Perotti (2002) and Ravn and Spange (2014). The second approach is oriented towards modelling of macroeconomic effects of fiscal policy through the lens of a small-scale open economy dynamic stochastic general equilibrium (DSGE) model. The methodological framework in this part of the research follows the seminal paper by Gali and Monacelli (2008), adjusted by Castanheira (2015).

The theoretical foundations of this dissertation are Keynesian in nature. Starting from the concept of *fiscal multiplier*, derived from the so-called *Keynesian cross*, through the *Mundell-Fleming* open economy model, which is the extension of Keynesian IS-LM model, to the *New Open Economy Macroeconomics* models, primarily based on *New-Keynesian* theory. These concepts are explained in more detail in the following sub-sections.

1.2.1. Keynesian cross and the concept of fiscal multiplier

The modern theory of the economic multiplier was developed in the 1930s, parallel with the development of Keynesian theory of aggregate demand. The concept was introduced in the paper of Keynes's student Richard Kahn (1931), who concentrated on the relations between investments and unemployment.

However, the concept was globally popularized in Samuelson's *Economics* (1948). In this textbook Samuelson developed the *Keynesian cross* model, which analytically captures the main foundations of Keynes's *General Theory of Employment, Interest and Money* (1936). In this model, *multiplier* is defined as a factor of proportionality that measures how much an endogenous variable (aggregate demand) changes in response to a change in some exogenous variable (e.g. investments, exports, government consumption, autonomous consumption, tax rate etc.).

Fiscal multiplier then measures how much aggregate demand changes in response to changes in government consumption or taxes. More precisely, the fiscal multiplier shows how much aggregate demand changes (in units) following the one-unit change in government consumption or taxes. Thus, we distinguish between *government consumption multipliers* and *tax multipliers*.

More formally, the fiscal multiplier can be derived from the main equations of the Keynesian cross model, based on the theory of *aggregate demand*.

Following Gartner (2009), aggregate demand (Z) in the *open economy* is defined as the total demand for final goods and services in an economy at a given time. It is comprised of the demand of households (private consumption, C), investors (investments, I), government (government consumption, G), demand for exports (export, X) and demand for imports (M).

$$Z = C + I + G + X - M \tag{1.1}$$

Private consumption depends on the *marginal propensity to consume c*, which is the proportion of an aggregate raise in income that a consumer spends, and *disposable income*, which is defined as the total income minus taxes *(Y-T)*, while taxes are function of the total income *T=tY*. Also, imports are determined by the *marginal propensity to import m*, which shows how imports change with each unit rise or decline in total income. Having this in mind, we can rewrite the previous equation:

$$Z = c(Y - tY) + I + G + X - mY \tag{1.2}$$

According to the *circular flow of the economy* model, total aggregate demand equals total income/output, i.e. *Y=Z*, so equation (2) can be written as:

$$Y = c(Y - tY) + I + G + X - mY \tag{1.3}$$

Solving this equation for *Y*, we get:

$$Y = \frac{1}{1 - c(1 - t) + m}(I + G + X) \tag{1.4}$$

Based on equation (4), we can define the government consumption multiplier as:

$$\frac{\Delta Y}{\Delta G} = \frac{1}{1 - c(1 - t) + m} \tag{1.5}$$

which shows that an increase of government consumption by 1 unit increases total output by $\frac{1}{1-c(1-t)+m}$ units. Keynesian cross model shows that the size of the fiscal multiplier in open economies depends on marginal propensity to consume, tax rate and *marginal propensity to import*.

In a closed economy model there is no external sector so a closed economy multiplier is, by definition, larger than an open economy multiplier, as imports represent a so-called *leakage* from the circular flow of the economy.

Closed economy model Open economy model

$$\frac{1}{1-c(1-t)} > \frac{1}{1-c(1-t)+m}$$

Thus, the size of fiscal multipliers in open economies is lower compared to more closed economies due to the "leakage effect" of imports on domestic economy. The higher the *import-dependency* of the economy, the lower the size of fiscal multiplier.

This relation is important and represents one of the main foundations in the empirical part of this dissertation. As previously noted, other papers focused on the estimation of fiscal multipliers in Croatia (e.g. Šimović and Deskar-Škrbić, 2013 and Grdović Gnip, 2013 and 2014) based the estimation methodology on a closed economy framework. However, the discussion in the following sub-section suggests that this approach, although very informative, is not suitable for the analysis of the effects of fiscal policy in Croatia, as this country has all the features of a small, open and strongly import-oriented economy.

1.2.2. Fiscal policy and the exchange rate regime - Mundell-Fleming framework

The open economy version of the Keynesian cross gives an important insight into the relevance of the openness of the economy for the size of the fiscal multiplier. However, besides the degree of openness of the economy, the effectiveness of fiscal policy in small open economies depends on another important characteristic of the economy – the adopted exchange rate regime.

The choice of the exchange rate regime affects the behavior of central banks on the foreign exchange and, consequently, the money market. More precisely, in the context of the effectiveness of fiscal policy, the choice of the exchange rate regime determines the nature of fiscal-monetary policy mix. Generally, an appropriate coordination of fiscal and monetary policy is decisive for the achievement of macroeconomic policy goals (Kuttner, 2002) and the lack of coordination can lead to a suboptimal mix of polices (Nordhaus, 1994).

The most commonly used model for the analysis of the effects of fiscal policy and coordination of fiscal and monetary policy in an open economy framework is the *Mundell-Fleming model* (Mundell, 1963; Fleming, 1962).

This model represents an extended version of the Keynesian IS-LM model (Hicks, 1937), which combines goods market (IS curve, derived from the Keynesian cross) and money market (LM curve, derived from the money market with the Keynesian function of demand for money) in a closed economy. The Mundell-Fleming model extends the IS-LM model by introducing the external sector through foreign exchange market, which balances the relations between the current account (goods and services) and the capital account (financial flows) of the balance of payments.

The effects of fiscal policy on output in the Mundell-Fleming model are also determined by the size of the open economy fiscal multiplier as in the Keynesian cross[7], but the ultimate effect depends on the exchange rate regime. In case of flexible exchange rate regime, the central bank does not react on changes on the foreign exchange market, prompted by the effects of fiscal policy changes. The effectiveness of fiscal policy in this framework is thus determined by the effects of exchange rate on output. On the other hand, in case of fixed exchange rate regime, the central bank will react to changes on the foreign exchange market through FX interventions. Thus, in case of fixed exchange rate regime, the effectiveness of fiscal policy is determined by the reaction of monetary policy authority (on changes in exchange rate), which brings us to the importance of the aforementioned fiscal-monetary policy mix.

In order to explain these relations in more detail, Figure 1.2 shows the effects of expansionary fiscal policy (increase of government consumption) in the Mundell-Fleming model[8], under both exchange rate regimes.

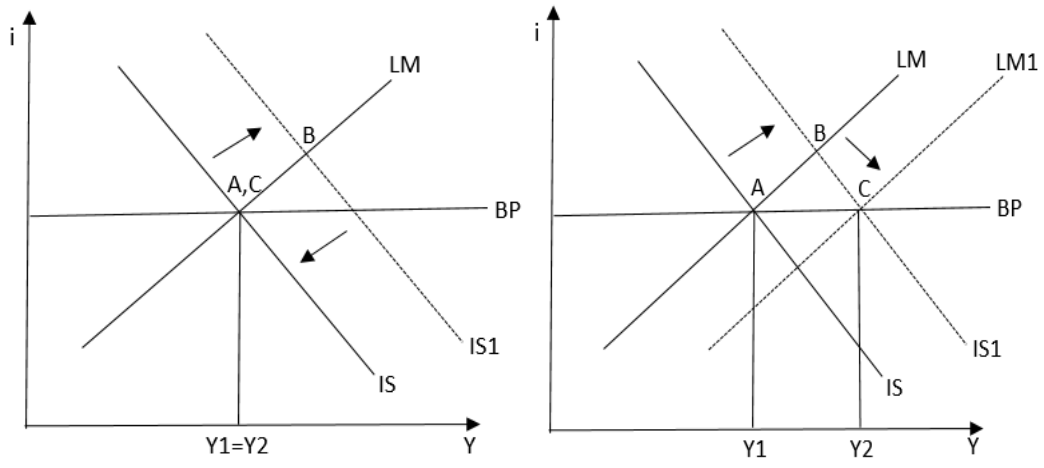
Initial equilibriums, determined by the relation between output (Y) and the interest rate (i), are marked by point A on both panels, (a) and (b). Fiscal expansion shifts the IS curve to the right in both cases, which temporarily increases output and leads to the increase of the interest rate on the money market, through the effect on demand for money, which brings the economy in a temporary equilibrium marked by point B. In temporary equilibrium B, domestic interest rate is above the world interest rate, which leads to the appreciation of domestic currency. Thus, the trajectory of the economy from the temporary equilibrium B to the final equilibrium C depends on the exchange rate regime.

[7] And the IS-LM model.

[8] In case of perfect mobility of capital. For detailed description and mathematical derivation of the Mundell-Fleming model see, for example, Gartner (2009).

Figure 1.2 Effects of fiscal policy in the Mundell-Fleming model

(a) flexible exchange rate (b) fixed exchange rate



Source: author

In case of a flexible exchange rate, the central bank will not react on appreciation pressures, which will lead to a fall of exports and a rise in imports, i.e. to a fall in net exports. This will shift the IS curve back to the initial equilibrium. i.e. A=C. Although the economy returned to the initial level of output, its composition changed, with a higher share of government consumption and imports and a lower share of exports.

On the other hand, in case of a fixed exchange rate, the central bank should intervene on the foreign exchange market on the buy side and increase the supply of domestic currency to tame appreciation pressures, which shifts the LM curve to the right (monetary expansion)[9]. Increased monetary supply leads to lower interest rates, which tames appreciation pressures and leads to increased investments. Such fiscal-monetary policy mix leads to a permanent increase of output and the economy lands in final equilibrium C. In this case the monetary policy *accommodates* to changes in fiscal policy, so the effect of monetary policy changes on interest rate and investments (following the change in fiscal policy) is sometimes referred to as *monetary accommodation channel* or *interest rate channel* (Ravn and Spange, 2014). Hence, the size of the fiscal multiplier in small open economies with a fixed exchange rate depends on the relations between the *leakage channel* (change of imports following the change of fiscal policy) and *monetary accommodation channel* (accommodation of

[9] FX interventions are the main monetary policy instrument in Croatia.

monetary policy to changes in fiscal policy). The domination of the *leakage channel* reduces the size of the fiscal multiplier.

Although the exchange rate regime does not affect the identification approach in SVAR models, it is one of the key assumptions for the modelling approach in New-Keynesian models (Gali, 2005), which will be discussed in more detail in the next sub-sections.

1.2.3. New Open Economy Macroeconomics and New-Keynesian SOE Models

The Mundell-Fleming model is a powerful analytical tool for the policy analysis in the open economy context. However, it belongs to the group of old macroeconomic models, which came under strong criticism during 1970s and 1980s (Lucas, 1976; Kydland and Prescott, 1982) due to a lack of firm microeconomic foundations. The development of macroeconomic theory towards the so-called “micro-based macro” also led to an evolution of the new field in macroeconomics and international economics - *New Open Economy Macroeconomics (NOME)*.

According to Corsetti (2007), the main goal of NOME is to provide a new theoretical framework for open economy analysis and design, which overcomes the limitations of the Mundell-Fleming model, but preserves the empirical framework and connection to policy debates of the traditional literature. NOME models, formally launched by Obstfeld and Rogoff (1995), complement and extend the Mundell-Fleming models by introducing the micro-foundations (economic agents based their decisions on optimization) and providing a general equilibrium framework of the analysis that creates a bridge between macroeconomic models and trade theory models.

A new generation of open economy macro models are the *New Keynesian (Small) Open Economy Models*, introduced in pioneering works by Clarida et al. (2002) and Galí and Monacelli (2005), further developed to include fiscal policy in Galí and Monacelli (2008). These models incorporate sticky prices and wages into optimization-based general-equilibrium models and introduce stochastic shocks, thus providing a rich analytical framework for the analysis of external and policy shocks in small open economies.

The modelling approach in the fourth chapter of this dissertation follows this strand of literature and builds on Galí and Monacelli (2008) and Castanheira (2015). In this sub-section I will present some of the key equations of the applied New-Keynesian open

economy model, crucial for understanding the calibration strategy. In addition, the presented model environment serves as a background for the next section, where I will discuss some of the main characteristics of Croatian economy that strongly affect the effectiveness of fiscal policy.

Firstly, one of the fundamental relations in fiscal DSGE models is that between government consumption and private consumption (Baxter and King, 1993). As private consumption is the largest macroeconomic aggregate, it is the main determinant of the size of the fiscal multiplier. Hence, the effectiveness of fiscal policy strongly depends on the effect of the changes in government consumption on private consumption.

If the increase of government consumption *crowds out* private consumption, fiscal policy would be ineffective in stimulating the economy. On the other hand, if the fiscal stimulus, through an increased government consumption, leads to an increase in private consumption (*crowd in effect)*, the fiscal impulse will propagate strongly through the economic system. The crowding out effect is usually explained through the so-called *Ricardian equivalence*, popularized by Robert Barro during 1970s (Barro, 1974; Barro, 1979). This hypothesis states that (forward-looking) consumers, whose consumption decisions are based on an intertemporal budget constraint, will react on current increase of government consumption by a reduction of private consumption as they expect future increase of taxes needed to finance future maturities of currently increased borrowing[10]. On the other hand, standard Keynesian models assume that current private consumption is determined by current disposable income and not expectations on future income. In this case, increased government consumption will lead to an increase in private consumption if it is not financed through higher current taxes. If government consumption *crowds out* private consumption these variables can be seen as *substitutes*, while in case of positive relationship between these variables they can be seen as *complements*. Thus, this relation represents one of the most important assumptions in the calibration of fiscal DSGE models.

However, this assumption is not sufficient for the detailed analysis of government-private consumption nexus. It is also important to make the assumption on the mechanism that relates consumers' utility and government consumption. This dissertation follows the strand of literature that uses non-separable preferences over

[10] This hypothesis can also be explained through the effects of current government consumption on the present value of after-tax income.

private and public consumption, which allow the direct effect of government consumption on consumers' utility (Kormendi 1983, Aschauer 1985; Coenen et al., 2013).

Non-separable consumer utility function can be defined as:

$$E_0 \sum_{t=0}^{\infty} \beta^t U(\widehat{C}_t, N_t) = E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{\hat{C}_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi}}{1+\varphi}\right) \tag{1.6}$$

where $\widehat{C}_t$ is effective consumption, N_t hours worked, σ^{-1} is the measure of relative risk aversion and the inverse of the intertemporal elasticity of substitution, φ is the inverse of the elasticity of labour supply and β is the subjective discount factor. Effective consumption is a composite index of private consumption (C_t) and government consumption (G_t) and it is given by:

$$\hat{C}_t \equiv \begin{cases} [(1-\vartheta)C_t^{1-v} + \vartheta G_t^{1-v}]^{\frac{1}{1-v}}, & if\ v \neq 1 \\ C_t^{(1-\vartheta)} G_t^{\vartheta}, & if\ v = 1 \end{cases} \tag{1.7}$$

ϑ is the share of government consumption in the economy. The parameter v^{-1} defines intertemporal complementarity or substitutability between private and public consumption. As explained above, if these two types of consumption are substitutes, government consumption would crowd out private consumption and reduce the effectiveness of fiscal policy. If $\sigma^{-1} > v^{-1}$ private and public consumption are complements, if $\sigma^{-1} > v^{-1}$ then private and public consumption are substitutes and if $\sigma^{-1} = v^{-1}$ goods are not related.

The importance of the relation between private and government consumption affected the choice of variables in the second chapter of this dissertation, where the focus is on the effects of fiscal policy changes on private consumption (and private aggregate demand). The obtained results indicate that government and private consumption in Croatia are complements, which gives an important insight for the calibration strategy in the fourth chapter of the dissertation.

Secondly, in modelling the effects of fiscal policy in small open economies one has to have in mind that both private consumption and government consumption are based on the basket of products which contains both domestically produced and imported goods, which also affects the effectiveness of fiscal policy through the previously

explained leakage effect of import. Thus, baskets of private and government consumption in small open economies can be defined as:

$$C_t = \left[(1-\alpha)^{\frac{1}{\eta}}(C_{H,t})^{\frac{\eta-1}{\eta}} + \alpha^{\frac{1}{\eta}}(C_{F,t})^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta-1}{\eta}} \quad (1.8)$$

$$G_t = \left[(1-\chi)^{\frac{1}{\eta}}(G_{H,t})^{\frac{\eta-1}{\eta}} + \chi^{\frac{1}{\eta}}(G_{F,t})^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta-1}{\eta}} \quad (1.9)$$

The parameter η defines complementarity or substitutability of domestic and imported goods and α and χ are shares of products purchased abroad. If domestic and foreign goods are complements, then the increase of private and government consumption will increase imports. The importance of these relations is taken into account in the calibration strategy in the fourth chapter of the dissertation, with special focus on import-dependency of private and government consumption, which is described in more detail in the next section.

Thirdly, the effects of fiscal policy in closed and open economies do not differ only in the size of the multiplier. Fiscal policy in open economies does not only affect internal macroeconomic balances (output, inflation, employment etc.) but also external balances, i.e. current account balance or, more precisely, trade balance (net exports). This brings us closer to the literature on the so-called *twin deficit hypothesis* (see for example Abell, 1990; Baxter, 1995; Kim and Roubini, 2004), which states that there is a causal relationship between government deficit and current account deficit.

The relation between government consumption and net exports in this dissertation is described through the function of net exports. Net exports depend on both private consumption (C_t) and government consumption (G_t). If demand for private and government consumption exceeds total domestic income (negative savings), the economy runs a trade deficit, and *vice versa*.

$$nx_t = \frac{NX_t}{Y} \approx \frac{1}{Y}\left[Y_t - \frac{P_{H,t}}{P_t^C}C_t - \frac{P_{H,t}}{P_t^G}G_t\right] \quad (1.10)$$

Finally, as noted above, the exchange rate regime is one of the most important determinants of the effectiveness of fiscal policy. Thus, adequate calibration of the exchange rate regime in economic models is one of the crucial steps. In this dissertation I assume that the exchange rate regime in Croatia can be described as

fixed rather than flexible, despite the formal definition of a *managed floating exchange rate* regime, as variability of EUR/HRK is fairly low (the characteristics of the exchange rate regime in Croatia are discussed in more detail in the next section).

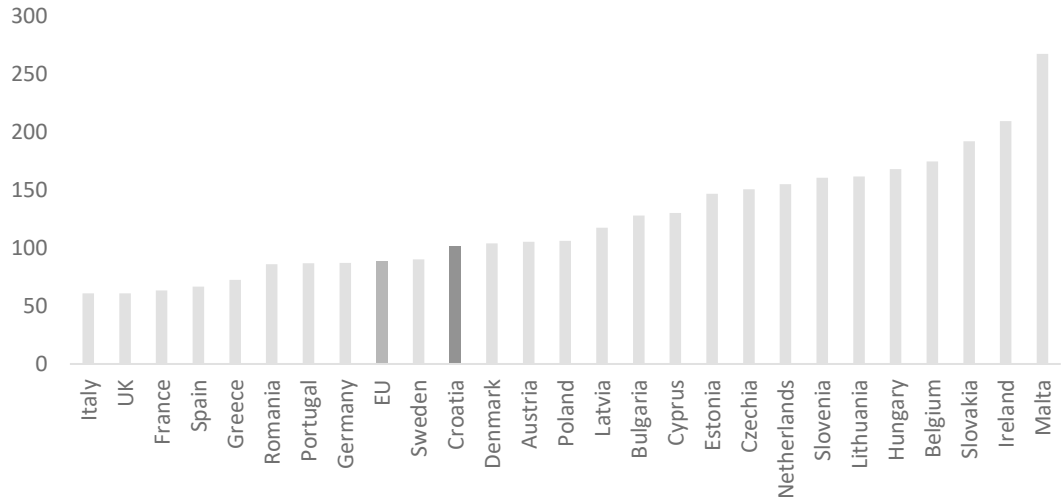
1.3. Some stylized facts of Croatian economy

The choice of an adequate modelling approach depends heavily on the characteristics of the economy being analyzed. Thus, in this section I provide a brief overview of the most important characteristics of Croatian economy, with the focus on the openness of the economy, import dependency, importance of external shocks, exchange rate developments, level of government consumption and indirect taxes and the relation between private and public consumption.

1.3.1. Degree of openness and import dependency

Economic openness is commonly measured by the ratio of the sum of imports and exports to GDP, i.e. by the share of international trade in GDP. Figure 1.3 shows that the share of international trade in GDP in Croatia exceeds 100% of GDP, which puts Croatia above the EU average. On the other hand, compared to other small open economies in the EU, the share of international trade in GDP is relatively modest.

Figure 1.3 Degree of trade openness in the EU in 2018 (% of GDP)

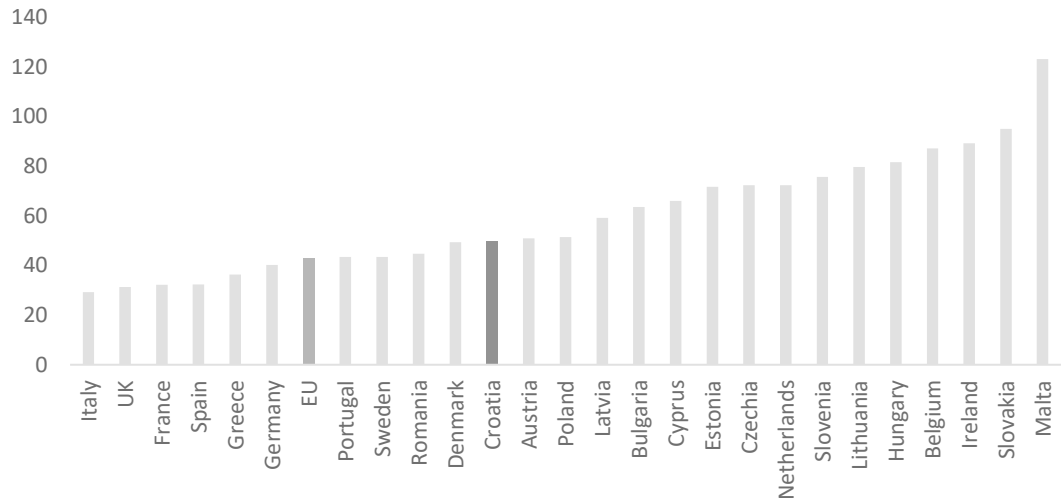


Source: Eurostat

However, as noted above, in the context of the effectiveness of fiscal policy the most important aspect of openness is import dependency of the economy (due to the *leakage effect*). Thus, Figure 1.4 shows the share of imports in GDP in the EU. With

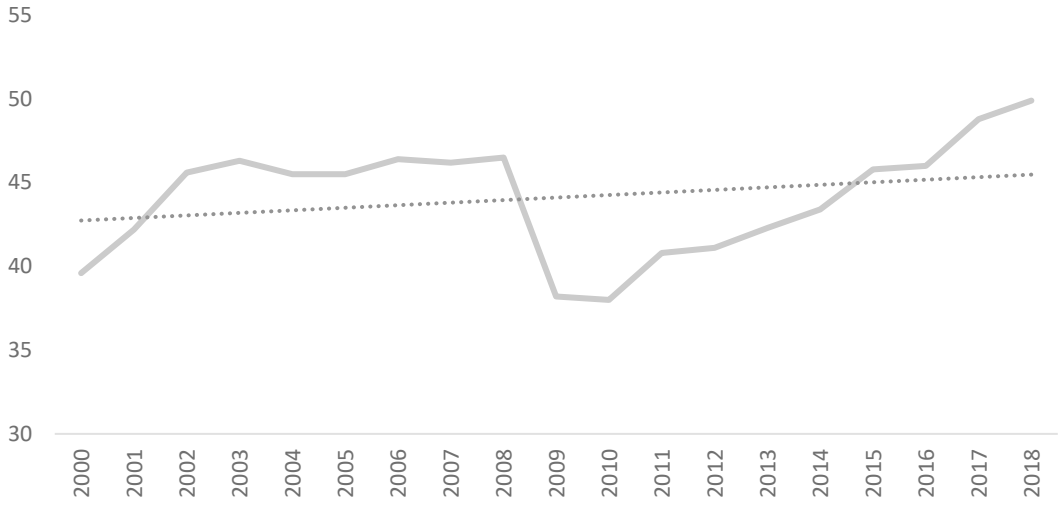
the share of 50% of GDP, Croatia also stands above the EU average. In this case the distance from the EU average is larger, indicating that Croatia differs from the EU average more in import dependency of the economy than in total openness of the economy. Also, it is important to emphasize that the share of imports in GDP is increasing over time (Figure 1.5). In the period from 2000 to 2018 the share of imports increased by around 10pp of GDP.

Figure 1.4 Share of imports in GDP in the EU in 2018 (%)



Source: Eurostat

Figure 1.5 Share of imports in GDP in Croatia (%)



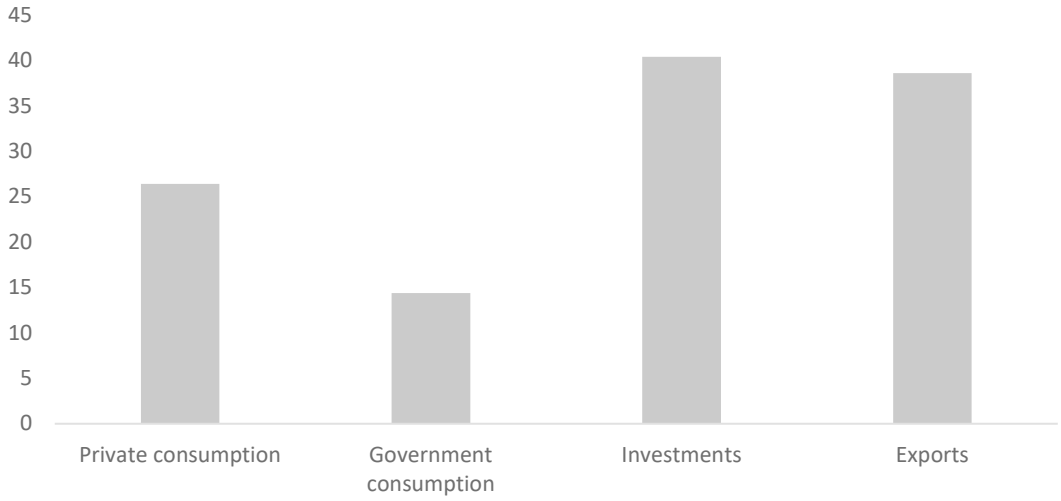
Source: Eurostat

Besides the analysis of the total share of imports in GDP it is important to analyze the share of imports across institutional sectors. As showed in equations (8) and (9), the

effectiveness of fiscal policy depends on import dependency of both private and government consumption.

By using data from input-output tables, it is possible to calculate total import dependency of the components of final demand, which is presented in Figure 1.6. The figure shows that import dependency of private consumption stands around 25%, while import dependency of government consumption stands around 15% (the increase of government consumption by 1 billion HRK leads to the increase of imports by 150 million HRK). These numbers suggest that the *leakage effect* is present in both the direct effect of the increase of government consumption on GDP (initial increase of G) and the multiplicative effect, which mostly depends on the import dependency of private consumption. Figure 1.6 is based on numbers for 2013 (due to data availability) so it can be expected that import dependency is currently more pronounced (as Figure 1.5 indicates).

Figure 1.6 Import dependency of the components of final demand (% of total) in 2013



Source: Mikulić (2018)

The data presented in this sub-section support the choice of the open economy framework of the analysis in this dissertation. In addition, the presented data also affect the choice of variables in empirical models, which will be explained in more detail in a later section.

1.3.2. Importance of external developments for Croatian economy

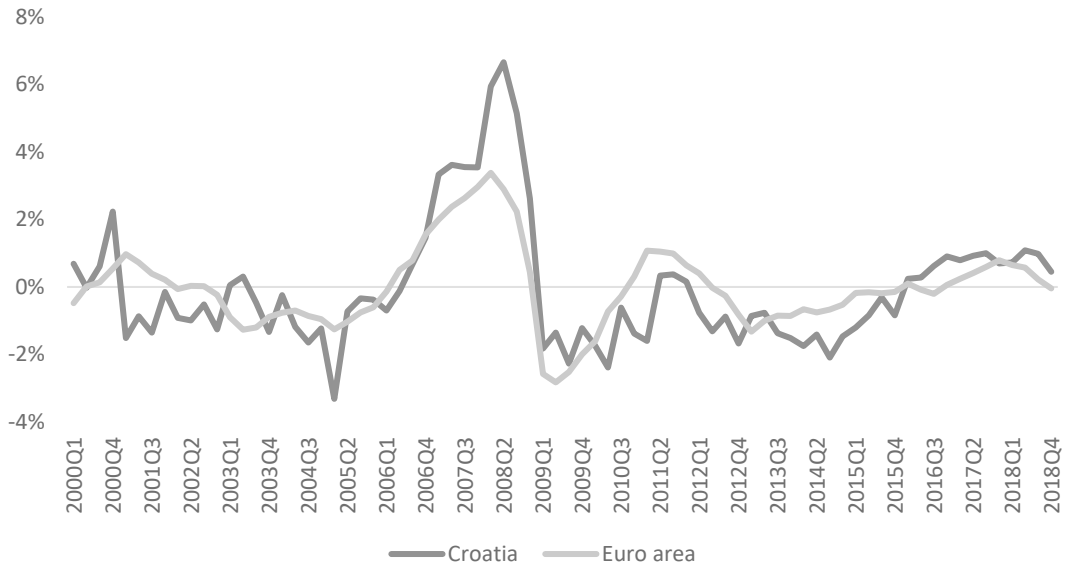
Import dependency is one of the most important aspects of economic openness. However, linkages between domestic economy and foreign economies are more complex and include various direct and indirect channels of transmission of external shocks to domestic economies (trade channel, financial channels, supply chain channel etc.).

Thus, to get a broader view on the relevance of external developments for domestic economies, economists analyze the so-called synchronization and coherence of business cycles between domestic economy and foreign economies. In this section I will briefly present some evidence on the strong synchronization of business cycles in Croatia and the euro area, as the most important trading partner area for Croatia. For a more detailed analysis of this matter, in the context of the theory of optimum currency area[11], see Kotarac, Kunovac and Ravnik (2017).

According to Arčabić (2011), one of the mostly applied methods in the analysis of business cycle synchronization is the analysis of correlation between cyclical components of GDP, extracted using the Hodrick-Prescott filter (Hodrick-Prescott, 1997). Figure 1.7 shows the developments of the cyclical component of GDP for Croatia and the euro area, while Figure 1.8 shows the moving (rolling) correlation (5 year window) between these variables. The figures indicate that there is a high degree of synchronization of business cycles in Croatia and the euro area, which suggests that external developments have important effects on economic conditions in Croatia. This conclusion is in line with more detailed analyses presented in Arčabić (2011) and Kotarac, Kunovac and Ravnik (2017).

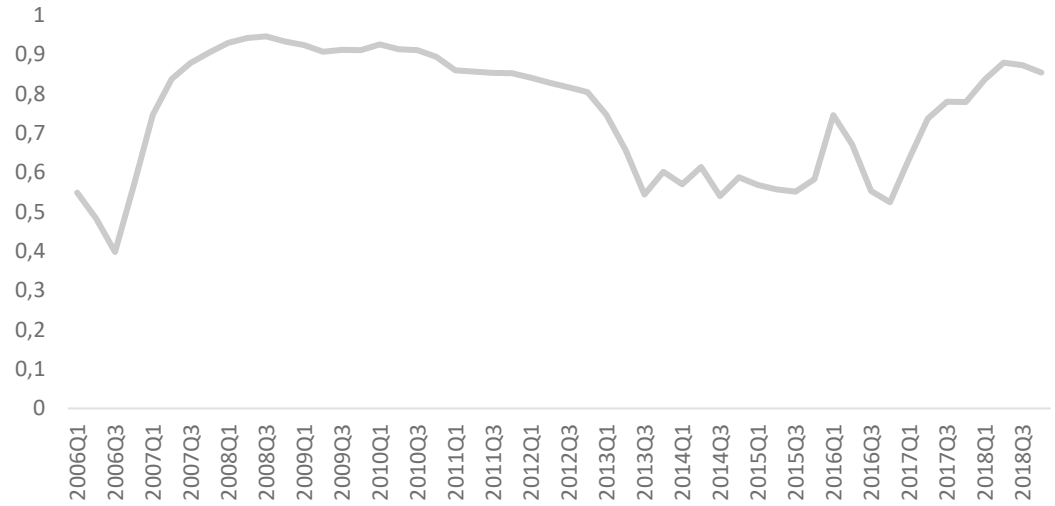
[11] For Croatia, as a candidate for ERM II and the euro area, it is especially important to analyze the synchronization with business cycles in the euro area. The optimum currency area theory (OCA) posits that the cost of the loss of monetary sovereignty would be negligible if business cycles between euro candidate country and the euro area were synchronized.

Figure 1.7 Cyclical components of GDP in Croatia and the euro area (percentage deviations from the long-term trend) (%)



Source: Eurostat

Figure 1.8 Moving correlation between cyclical components of GDP in Croatia and the euro area (5 year)* (%)



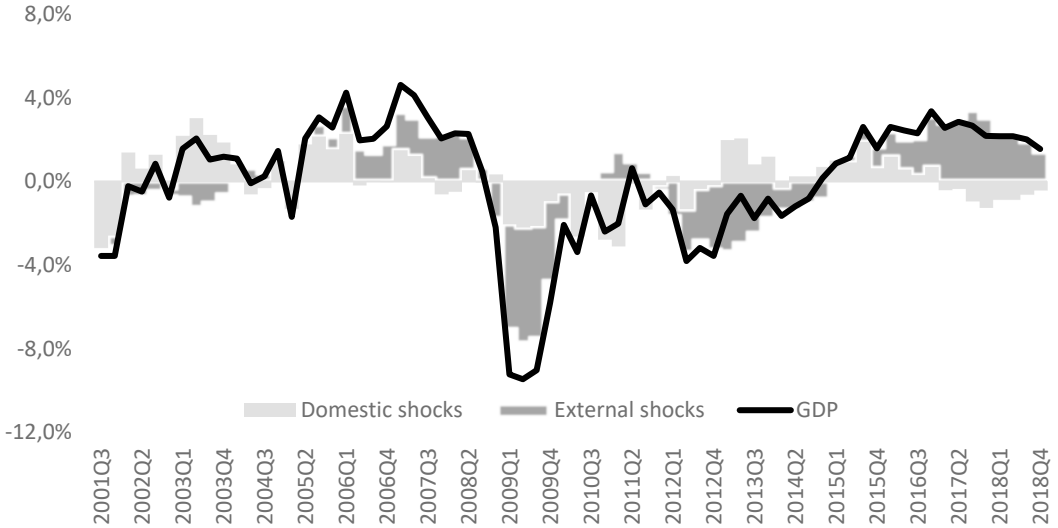
*Note: (-1) negative correlation, (0) no correlation, (1) positive correlation

Source: authors' calculations

Besides the correlation of business cycles, the importance of external developments for domestic economies can be analyzed directly through the analysis of the effects of external shocks on domestic macroeconomic variables. Recent literature shows that macroeconomic developments in Croatia are mostly determined by external shocks (Dumičić, Palić and Šprajček, 2015; Jovičić and Kunovac, 2017; Kotarac, Kunovac and

Ravnik, 2017). This is also illustrated in Figure 1.9, which shows the historical decomposition of Croatian GDP[12], indicating that external shocks have a notable effect on economic activity in Croatia.

Figure 1.9 Historical decomposition of Croatian GDP from 2001 to 2018 (y-o-y, %)*



*GDP data corresponds to the deviation of original figure from the baseline

Source: author's calculations

These findings have important repercussions for the choice of modelling approach. As Dumičić, Palić and Šprajček (2015) conclude, the inclusion of the euro area variables is necessary for macroeconomic modelling of the Croatian economy. This view also supports the choice of modelling approach in this dissertation, especially the inclusion of external demand variable in estimated SVAR models, which could, at least partially, tackle the problem of omitted variable bias explained in the introduction.

1.3.3. Exchange rate developments in Croatia

As noted in the previous section, the exchange rate regime can have a notable effect on the effectiveness of fiscal policy. Thus, the assumption on the characteristics of the exchange rate regime is one of the most important assumptions in economic models. In this dissertation the Croatian exchange rate regime is modelled as a fixed exchange rate, despite the fact that the Croatian National Bank formally implements the policy of

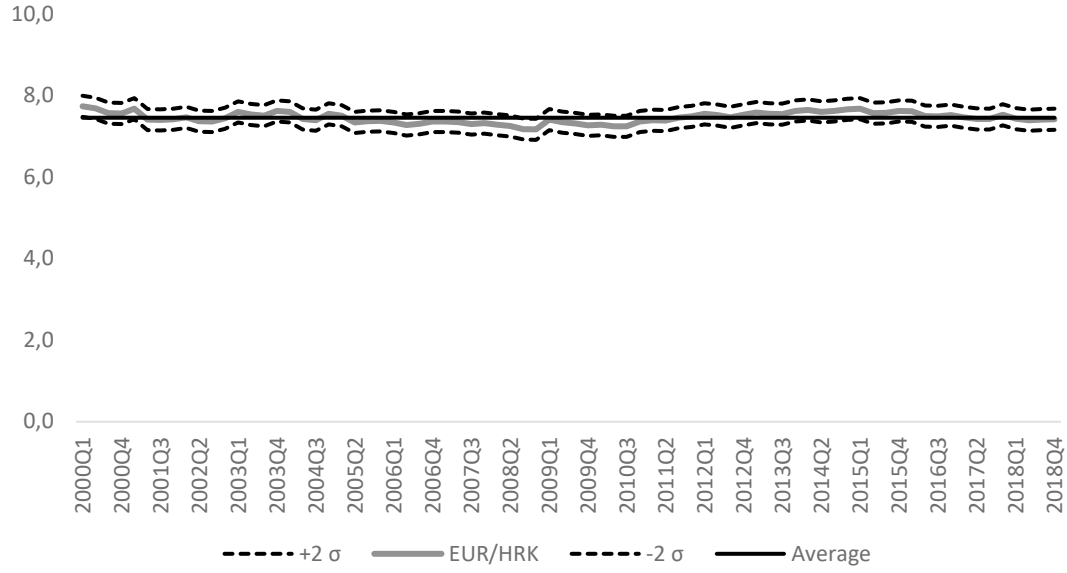
[12] The figure is based on a small scale BVAR model with Croatian GDP and inflation and the euro area GDP and inflation. I identify structural shocks by imposing sign restrictions on the effects of shocks on variables and by assuming block exogeneity. I follow similar literature and assume that positive demand shocks increase GDP and inflation contemporaneously, while positive supply shocks increase GDP and lower inflation in both blocks.

the managed floating exchange rate. This assumption was also adopted in Arčabić et al. (2016a and 2016b) and Palić (2018).

The rationale for such an assumption stems from the fact that the variability of EUR/HRK is fairly low. Standard deviation of quarterly changes in EUR/HRK from 2000 to 2018 stands at 0.13. Figure 1.10 shows developments of EUR/HRK in this period and illustrates the stability of this exchange rate. Low variability of EUR/HRK led the IMF to classify the exchange rate regime in Croatia as *stabilized arrangement*[13] in 2017 (IMF, 2017).

The stability of the EUR/HRK exchange rate in Croatia can be explained by the choice of the nominal exchange rate as the nominal anchor of monetary policy, due to a high degree of euroisation in the economy. In such a framework, FX interventions act as a key monetary policy instrument in Croatia (for detailed discussion on the choice of monetary and exchange rate regime in Croatia see Lang and Krznar, 2004 and for the causes of euroisation see Dumičić, Ljubaj and Martinis, 2017).

Figure 1.10 Developments of EUR/HRK from 2000 to 2018



Source: CNB; author's calculations

[13] Classification as a stabilized arrangement entails a spot market exchange rate that remains within a margin of 2 percent for six months or more (with the exception of a specified number of outliers or step adjustments) and is not floating.

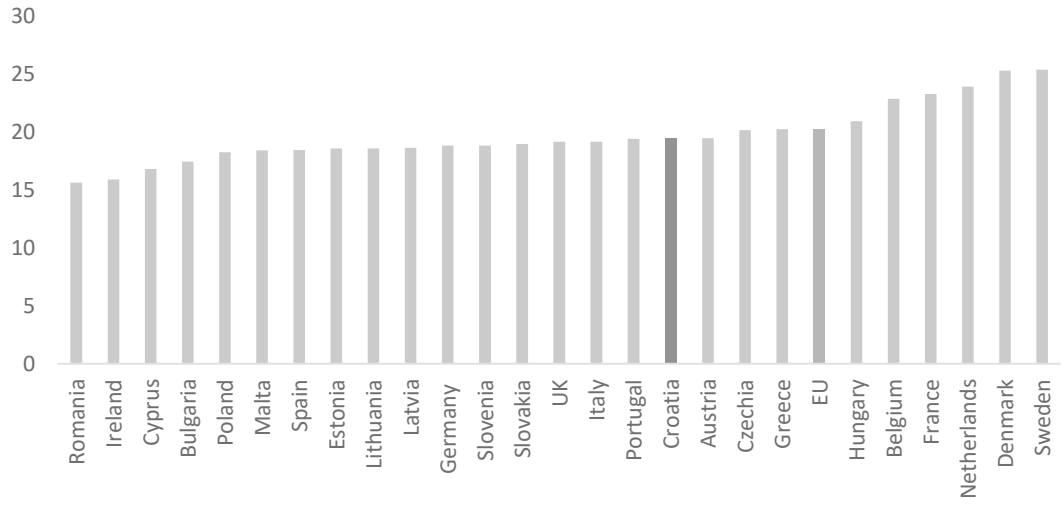
1.3.4. Level of government consumption and indirect taxes

The key fiscal variables analyzed in this dissertation are government consumption and indirect taxes (less subsidies). The choice of variables is based on previously presented theoretical framework showing that the concept of fiscal multiplier and the analysis of the effects of fiscal policy in economic theory are based on the system of national accounts (SNA) (aggregate demand identity).

Based on ESA 2010 methodology, the total general government consumption is defined as the sum of compensation of employees, intermediate consumption, consumption of fixed capital, operating surplus, other taxes on production and social transfers in kind via market producers, less the other subsidies on production and sales of goods and services. Indirect taxes are defined as taxes on production and imports.

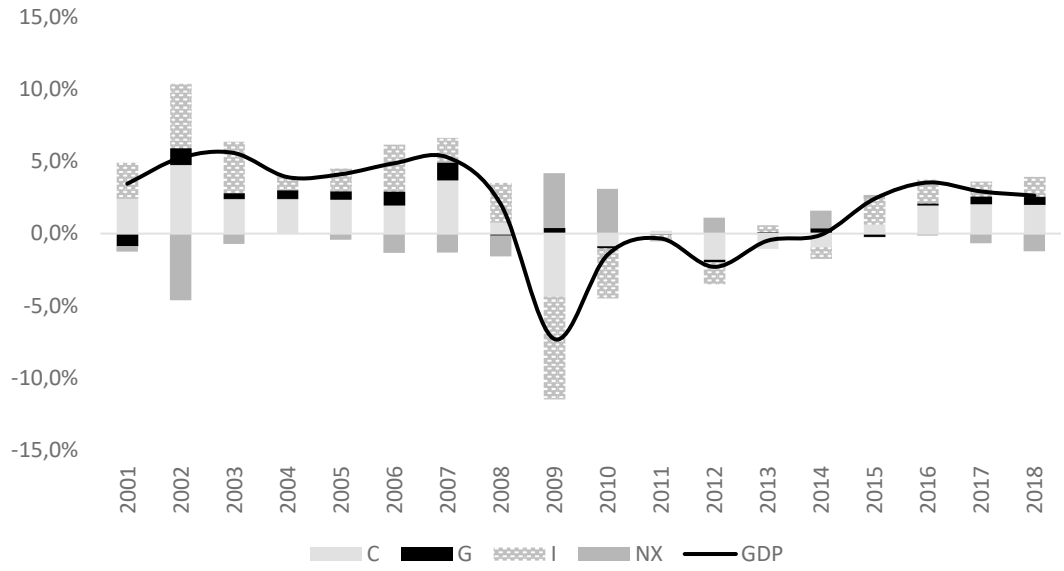
Figure 1.11 shows the level of total general government consumption in the EU from 2000-2018. With the average share of around 20% of GDP Croatia belongs to the group of countries with a relatively high share of total general government consumption in GDP. It is especially interesting to notice that this share is among the highest in the group of New Member States.

Figure 1.11 Total general government consumption in the EU (average 2000-2018) (% of GDP)



Source: Eurostat

Figure 1.12 GDP components and contributions to growth in Croatia 2001-2018 (y-o-y, %)



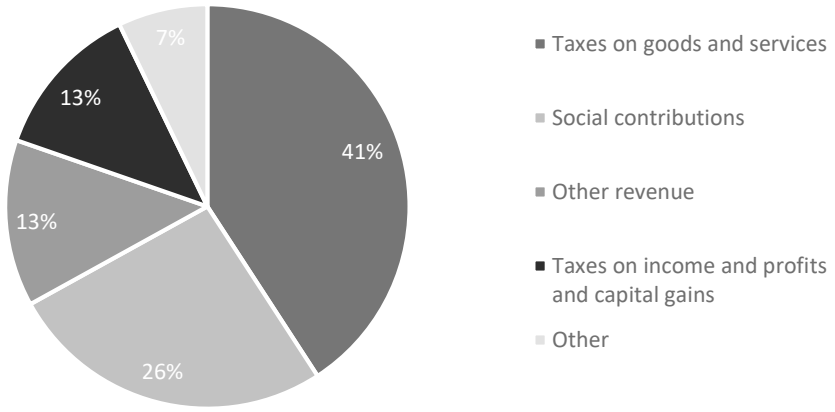
Source: Eurostat; authors' calculations

However, despite the relatively high share of total government consumption in GDP, the contribution of this fiscal category to GDP growth was relatively modest (Figure 1.12). During the prolonged recessionary period the contribution of total government consumption was mildly negative, contrary to the assumptions of the previously explained stabilization function of fiscal policy. The characteristics of fiscal policy in Croatia will be described in more detail in the next section.

As for the indirect taxes, this tax form is included in the analysis because the aim of this dissertation is to analyze the effects of fiscal policy on aggregate demand. According to the theory, income tax, social contributions and corporate tax are mostly affecting aggregate supply by influencing the behavior of employees and employers on the labor market (Jurković, 2002). Also, changes in indirect taxes can affect consumer behavior in a relatively short period of time (within a quarter or two), while the effects of changes in direct taxes affect the behavior of employees so that employees on the labor market take time due to various rigidities (Catalano and Pezzolla, 2015).

Indirect taxes (taxes on goods and services) represent the main source of financing of the general government budget in Croatia. Figure 1.13 shows that this tax form accounts for more than 40% of the total general government budget revenues.

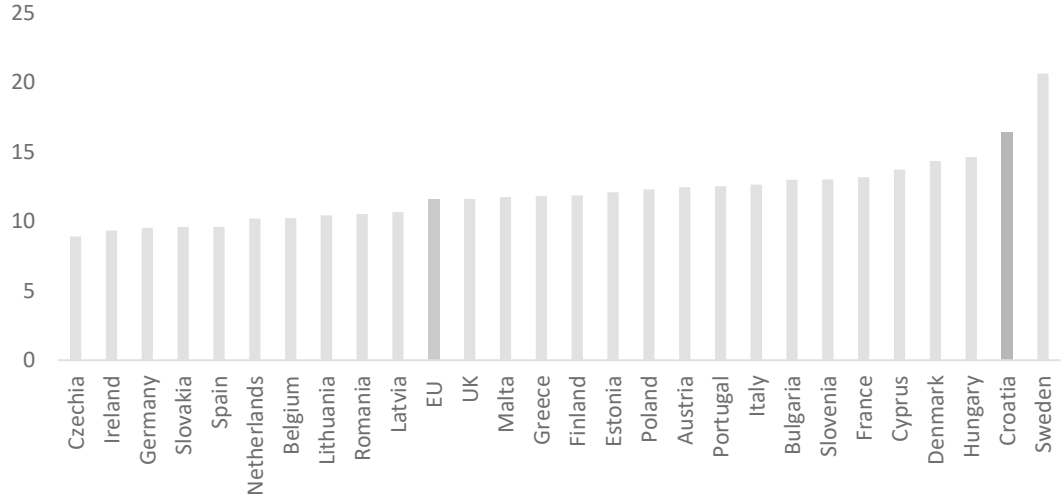
Figure 1.13 Revenues of general government budget in 2017



Source: authors

The relevance of indirect taxes in Croatian economy is more clearly illustrated in Figure 1.14 showing that Croatia has the second-largest share of indirect taxes in GDP in the EU, after Sweden. This figure indicates that Croatia has a strongly consumption-oriented tax system and that indirect taxes represent one of the most important tax policy instruments in Croatia.

Figure 1.14 Share of indirect taxes in GDP in the EU in 2017



1.3.5. Characteristics of fiscal policy in Croatia

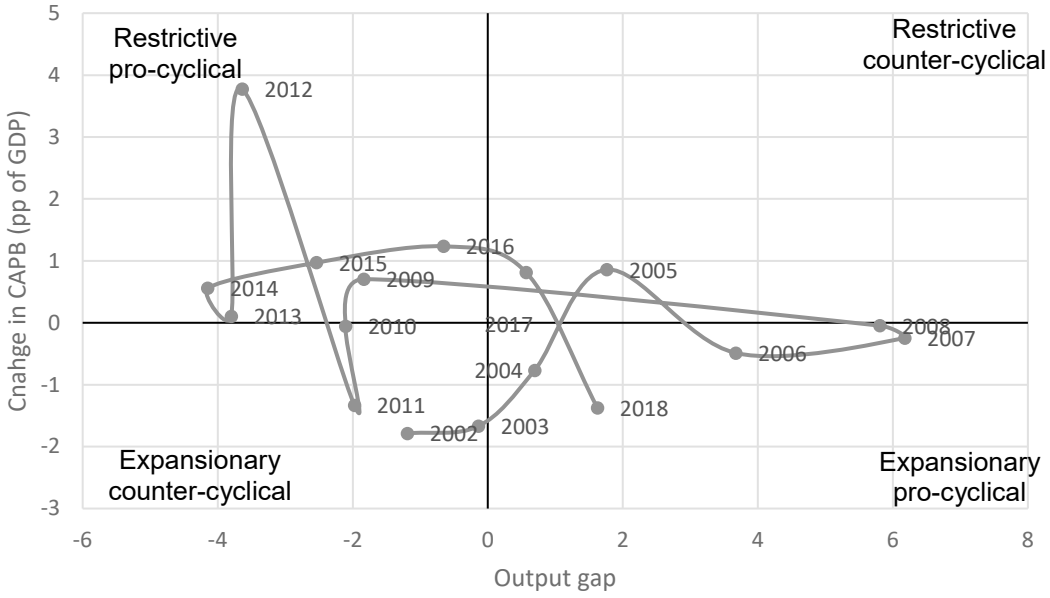
Fiscal developments in Croatia point to a pronounced pro-cyclical character of fiscal policy (Grdović Gnip, 2011; Šimović, Ćorić and Deskar-Škrbić, 2014; Deskar-Škrbić and Raos, 2018).

During the expansionary phase of business cycle in early 2000s Croatia continuously ran general government deficits, which additionally deepened at the outburst of the global financial crisis and global recession (Figure 1.15) which spilled over to Croatia, illustrating the importance of the aforementioned external shocks. During the prolonged recession in the period from 2009 to 2014 Croatia faced a significant increase of fiscal imbalances which resulted with the activation of the Excessive Deficit Procedure in 2014, immediately after Croatia joined the European Union in July 2013 (Šimović and Deskar-Škrbić, 2018).

Under such circumstances fiscal policy makers were forced to employ various consolidation measures. Deskar-Škrbić and Raos (2018) show that fiscal consolidation in Croatia in a recessionary period is mostly based on increasing tax burden through increase in value added tax (VAT) rates, introduction of one-off taxes and notable cuts in capital expenditures. Such measures most probably additionally deepened the recession as previously mentioned empirical literature showed that capital expenditures have a long lasting positive effect on GDP, while indirect taxes have a negative effect on GDP (Sever, Drezgić and Blažić, 2011, Šimović and Deskar-Škrbić, 2013; Šimović, Ćorić and Deskar-Škrbić, 2014, Grdović Gnip, 2015).

In 2015 fiscal policy took on a more expansionary tone as the government started to reduce the tax burden on employees (Šimović and Deskar-Škrbić, 2015), and in 2017 the government adopted a package of changes in the tax system aimed at an additional reduction of tax burden of employees, employers, reduction of regressive effects of VAT etc. (for a detailed overview of legislative changes see Zrinušić and Vuraić Kudeljan, 2016). As of January 2019 there were changes in the VAT system, mostly aimed at expanding the group of products to which a reduced VAT rate applies. These measures can again be seen as pro-cyclical as the government pursues an expansionary fiscal policy in the environment of an increasing positive output gap (Figure 1.15).

Figure 1.15 Character of fiscal policy in Croatia



Source: author

Figure 1.15 shows the diagram of fiscal policy stance, which is divided in four quadrants, depending on the relationship between output gap and change in cyclically adjusted primary balance (CAPB) (for a detailed discussion on the analysis of the cyclical character of fiscal policy see Grdović Gnip, 2011 and Deskar-Škrbić and Raos, 2018):

- expansionary pro-cyclical fiscal policy – expansion of CAP deficit or reduction of CAP surplus in an environment of positive output gap
- restrictive pro-cyclical fiscal policy – reduction of CAP deficit or increase of CAP surplus in an environment of negative output gap
- expansionary counter-cyclical fiscal policy – expansion of CAP deficit or reduction of CAP surplus in an environment of negative output gap
- restrictive counter-cyclical fiscal policy – reduction of CAP deficit or increase of CAP surplus in an environment of positive output gap

The figure shows that from 2002 to 2018 Croatia led either an expansionary pro-cyclical or a restrictive pro-cyclical fiscal policy for twelve out of seventeen years (70% of the analyzed period). Thus, in the observed period fiscal policy in Croatia failed to fulfill its important stabilization function, i.e. to act counter-cyclically and dampen the business cycle fluctuations in Croatian economy.

1.4. Research goals and research questions

The main goal of this dissertation is to extend the existing empirical literature on the macroeconomic effects of fiscal policy in Croatia in two ways. First, all research questions in this dissertation are contextualized in a small open economy analytical framework. Previous research on the effects of fiscal policy in Croatia has overlooked the importance of the effects of openness of the economy on the size of fiscal multipliers. Secondly, this dissertation aims to show that (calibrated) small-scale small open economy New Keynesian dynamic stochastic general equilibrium (NK DSGE) models could be used for simulations of the effects of fiscal policy in Croatia and contribute to the understanding of various channels and complex relations between fiscal and macroeconomic variables.

The central chapters of this dissertation raise and try to find answers to various research questions which are the foundation for extended discussion provided in the concluding chapter. This sub-section systematizes the key research questions, while the content of each chapter is presented in more detail in the next sub-section.

Chapter 2 analyses the effects of government consumption and net indirect taxes on private consumption and private aggregate demand in an open economy analytical framework. The key research questions tackled in this chapter are:

1. Is the response of private aggregate demand and private consumption to shocks in government consumption and net indirect taxes in Croatia Keynesian in nature?

2. Does the reaction of private consumption to government consumption shock point to the validity of the Ricardian equivalence theorem in Croatia?

3. Can private consumption and government consumption be seen as complements or substitutes? (i.e. is there evidence of crowding out effect in private consumption)

Chapter 3 compares the size of fiscal multipliers across several models (closed economy model, closed economy model with public debt, open economy model with foreign demand and open economy model with imports-exports ratio) and three small open economies - Croatia, Serbia and Slovenia. The purpose of this chapter is to discuss the following questions (for all analyzed countries):

1. Are government consumption multipliers estimated in an open economy framework smaller than those estimated in a closed economy framework?

2. What is the effect of public debt on the effectiveness of fiscal policy in terms of the effects on the size of the government consumption multiplier?

3. What is the difference between the effects of external trade and imports-exports ratio on the size of the government consumption multiplier?

4. Is there a difference in the size of government consumption multiplier depending on the exchange rate regime in analyzed countries?

Chapter 4 investigates the effects of government consumption shock in Croatia through calibrated small open economy New Keynesian DSGE model and compares the model-based impulse responses with empirical VAR-based impulse responses and tries to give more insight into the following research questions:

1. Does expansionary fiscal policy, based on the increase of government consumption, have an expansionary effect on GDP and employment in Croatia?

2. Can stronger government consumption create inflationary pressures in Croatia?

3. Is there empirical evidence that increased government consumption leads to deterioration of trade balance in Croatia?

4. Do impulse responses from the empirical VAR model match the results from the calibrated DSGE model?

1.5. Structure of the dissertation

This dissertation is written in the form of three published papers focusing on the effects of fiscal policy in small open economies, using the evidence from Croatia. The structure of the dissertation follows the structure of three papers, where each of them constitutes a separate chapter.

Besides the three central chapters, the dissertation includes the introductory chapter that defines the subject of the research, puts the topic of the dissertation in a broader conceptual framework, gives a brief overview of the relevant literature and provides some background for understanding of the key features of Croatian economy relevant for discussions on the effectiveness of fiscal policy. At the end of dissertation, a

concluding chapter summarizes the main findings of the dissertation, describes the key contributions to existing literature, and gives some insights for future research.

Chapter 2 deals with the effects of government consumption and net indirect taxes on private consumption and private aggregate demand and provides a first estimation of fiscal multipliers in Croatia in an open economy analytical framework. This chapter also gives and important insight into the validity of the Ricardian equivalence theorem in Croatia and gives empirical evidence on the discussion of substitutability vs complementarity of government and private consumption. This chapter is divided in seven sections. The introductory part is followed by a review of domestic and international literature focused on VAR-based methodology. The third section briefly explains the characteristics of fiscal policy and discusses the limited role of monetary policy that affects the functioning of the monetary-fiscal policy mix in Croatia. The next section describes the methodology, based on the extension of the B-P SVAR model by Ravn and Spange (2014), and emphasizes the importance of defining the research questions in an open economy framework. The data are discussed in the fifth section, while the sixth section presents results that: (i) point to a Keynesian reaction of private consumption and private aggregate demand to shocks in government consumption and indirect taxes and (ii) indicate that fiscal multipliers estimated in an open economy framework are lower compared to those estimated in a closed economy framework. Concluding remarks are given in the final, seventh section.

The next chapter, Chapter 3, investigates the effects of openness and indebtedness of the economy on the size of fiscal multiplier and analyzes the difference in the size of fiscal multipliers in three European small open economies with different exchange rate regimes, degree of openness and public debt levels - Croatia, Slovenia and Serbia. This chapter is also divided in seven sections, including the introductory and the concluding section. The second section, after the introduction, gives a broader conceptual background of the analysis and explains the main determinants of the size of fiscal multiplier through the so-called “bucket approach” to estimation of fiscal multipliers (Batini et al. (2014)). After the literature review in the third section, the fourth section presents the methodology and identification method for four different models: baseline closed economy B-P SVAR model, closed economy model extended with public debt and two different open economy models that differ by definition of external variables (import-export ratio or foreign demand). The fifth section presents the data,

while the sixth section discusses the obtained results. Results show that public debt and openness of the economy notably affect (reduce) the effectiveness of fiscal policy in terms of the size of government consumption multiplier in all analyzed economies. Results also indicate that there are some differences in the size of fiscal multiplier among countries, depending on the size of public debt and degree of openness of the economy.

Chapter 4 confronts calibrated small open economy dynamic stochastic general equilibrium New-Keynesian (NK DSGE) model with empirical data and discusses whether this model can be used for simulations of macroeconomic effects of fiscal policy in Croatia. Besides the introductory and the concluding section, this chapter includes four central sections. Literature review, presented in section two, focuses on the domestic literature on the effectiveness of fiscal policy and literature based on policy modelling. The third section presents the NK DSGE model, discusses the data, explains the calibration procedure and defines the empirical VAR model used to obtain the impulse responses of GDP, employment, prices and net exports to a government consumption shock. The fifth section presents the results that show that impulse responses from VAR model mostly match impulse responses from the calibrated model, which suggests that the presented NK DSGE can be seen as a useful toolbox for the analysis of complex relations between government consumption and macroeconomic variables in Croatia.

After the list of references, positioned after the concluding Chapter 5, there are appendices related to the three central chapters. These appendices include model stability and adequacy tests, data definitions and additional figures.

2. THE EFFECTS OF FISCAL POLICY IN A SMALL OPEN TRANSITION ECONOMY: CASE OF CROATIA[14]

2.1. Introduction

Current economic crisis has awoken the interest for researching the possibilities and limitations of the stabilization function of fiscal policy. This function is of very great importance in countries in which monetary policy is limited by some structural characteristics, as in Croatia which is a small open economy with managed exchange rate.

This paper analyses the short-term effects of the fiscal policy on economic activity (business cycle), through its effect on aggregate demand. Since Croatia is one of the European countries with longest recession period (recession in Croatia still lasts) it can be concluded that fiscal policy in between has not been adequate and that it's stabilization potentials have not been fully used, although there were many discretionary changes in fiscal system.

The focus of this paper is on discretionary measures of fiscal policy that are theoretically and empirically usually observed through the theory of fiscal multipliers. Thus, the indirect goal of the paper is to estimate the size of government spending multiplier and (indirect) taxes multiplier in Croatia, which is the first attempt in (publicly available) literature. The size of multiplier multiplier is determined by various structural characteristics of the economy and one of main and most important characteristics is country's openness in terms of foreign trade. Thus, the analysis in this paper is based on the fact that Croatia is a small and open economy.

After an overview of literature in the second part of the paper, the third part briefly explains econometric model that was used. It is a structural VAR model (SVAR) with Blanchard-Perotti method of identification. As Croatia is a small and open economy, model is extended with variables that represent foreign shocks using Ravn and Spange (2012) methodology. Fourth part analyzes used data. Fifth part of the paper shows effects of fiscal shocks on private consumption and private sector demand, as well as the results of calculation of the government spending multiplier and tax

[14] Published in co-autorship in *Acta Oeconomica*, Vol. 64 (S1), December 2014

multiplier. This part also gives a brief review of methodological limitations of results. The paper ends with a conclusion.

2.2. Literature review

Number of empirical studies on fiscal policy is extensive, but they can be structured in several directions. First, in VAR literature four main identification approaches can be found to identify fiscal policy shocks: 1) narrative approach (Ramey and Shapiro, 1999), 2) calibrated elasticities (Blanchard and Perotti 2002), 3) sign restrictions (Mountford and Uhlig 2002), and 4) recursive structure (Kamps and Caldara 2006). Second, analyses of empirical results include dynamic responses to different fiscal shocks and/or fiscal (tax and spending) multipliers, and frequently interpretation of historical facts. Third and last, VAR as standard methodology has developed into DSGE (dynamic stochastic general equilibrium) models. DSGE literature is growing as are different DSGE models like real business cycle (RBC) models and New Keynesian (NK) models. For DSGE literature review and methodology development see Leeper at al. (2012).

Basic papers using structural VAR model for estimating effects of fiscal policy is Blanchard and Perotti (2002) and it is still used as benchmark in analyses. Structural VAR approach predict that a positive spending shock (deficit financed i.e. leaving taxes unchanged) has a positive effect on output while a positive tax shock (leaving government spending unaffected) has a negative effect on output. The original model of Blanchard and Perotti (2002) takes only three variables: government spending, net taxes and real GDP, and the analysis was conducted for USA. Later Perotti (2002) extended the model by adding short-term interest rate and price levels, and expanding analyses including larger OECD countries (Germany, Great Britain, Australia, Canada). From those papers until today, a large variety of papers exist that use the Blanchard-Perroti identification method as benchmark methodology in the research of the effects of fiscal policy. The model has developed and was adjusted according to particularities of different economies. Table 2.1 gives a brief overview of research using SVAR methodology for estimations of effects of fiscal policy based on Blanchard-Perroti identification method.

Table 2.1 A brief literature rewiev

Authors	**Model and identificati on scheme**	**Period, frequency of data and country**	**Variables**	**Fiscal policy effects***
Perotti (2002)	SVAR BP 2002	Quarterly 1960-2001 U.S., Germany, Australia, Great Britain, Canada	Net tax revenue, government spending, GDP, interest rate, inflation rate	weak effect of fiscal shocks on GDP; multiplier less than 1 for all countries except U.S. in the 1980s; after 1980s government consumption effects are considerably weakened (multipliers are smaller, and government spending multiplier changes its algebraic sign)
Krušec (2003)	SVEC BP 2002	Quarterly (for each country different) USA, Great Britain, Canada, Australia, Germany, Italy, Finland	Government spending, net primary tax, real output, inflation rate, interest rate	positive government spending shock increases GDP, while a positive tax shock has a rather insignificant effect on the GDP
Giordano et al. (2005)	SVAR BP 2002	Quarterly 1982-2003 Italy	Net tax revenue, various components of public expenditure, private GDP, inflation, interest rates	a shock to government purchases of goods and services has a sizeable and robust effect on economic activity. effects of fiscal policy shocks on private consumption and investment are positive; shocks to net revenue have negligible effects on all the macroeconomic variables.
De Castro and De Cos (2006)	SVAR BP 2002	Quarterly 1980-2004 Spain	Net tax revenue, government spending, GDP, interest rate, inflation rate	government spending multiplier greater than 1 in the short run and negative in the long run; positive (insignificant) tax effect in the short run, negative in the long run; significant short-term effects of

				fiscal variables on prices and interest rates
Hur (2007)	Cholesky; SVAR BP 2002	Quarterly 1979-2001 South Korea	Government spending, tax revenue, GDP, foreign GDP and real effective exchange rate (exogenous variables)	weak and short-term effect of government spending and taxes on GDP; size of (cumulative) multipliers between -2 and -1.5 for taxes and 1.2-1.6 for government spending; weaker effect of fiscal shocks in the model with exogenous variables; author emphasizes problems with the significance of results
Baxa (2010)	SVAR BP 2002	Quarterly 1998-2009 Czech Republic	Government revenue, government spending, GDP, interest rate, inflation rate	Government spending has a considerable and significant effect (multiplier close to 2); tax revenue has a negative and insignificant effect on GDP
Auerbach and Gorodnichenko (2012)	SVAR BP 2002; Switching model	Quarterly 1947-2009 U.S.	Government spending, net tax revenue, GDP, different components of government spending, forecast errors	Fiscal multipliers' size varies depending on whether discretionary policies are introduced during recession or expansion; government spending multiplier (different components) is between 1 and 3.56, and tax multiplier between -0.99 and -0.08
Ravn and Spange (2012)	SVAR(X) BP 2002	Quarterly 1971-2011 Denmark	Government spending, personal consumption, net taxes, GDP, foreign GDP (exogenous)	Significant and positive effect of government spending on GDP in the short run (multiplier's size is 1.3); increasing taxes decreases GDP (multiplier is smaller than government spending multiplier); crowding out effect is present; multiplier's size varies in different periods (effects of fiscal shocks are greater in the second period

				when Denmark introduced fixed exchange-rate system)

Note: *The emphasis is on the effects of fiscal shocks on GDP and its components. Detailed results can be found in original papers.

For example, the broader literature review of the assessments of the effects of fiscal policy using SVAR methodology for several transition countries (Czech republic, Hungary, Poland, the Slovak republic, Bulgaria and Romania) can be found in Mirdala (2009). Further, see Baxa (2010) for Czech Republic, Jemec et al. (2011) for Slovenia, Mancellari (2011) for Albania.

When it comes to estimating the fiscal policy effects in Croatia, the literature is rather modest regarding SVAR methodology. Only two papers can be found in existing literature. Ravnik and Žilić (2011) use 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 and Deskar Škrbić (2013) analyze dynamic effects of fiscal policy and estimate the size of fiscal multipliers at different levels of government, using closed economy model.

2.3. Economic policy limitations and the role of fiscal policy in Croatia: a brief overview

The recent economic crisis has fully exposed the illogicality of the economic model in Croatia. The problems with the liquidity followed by the economic downturn in the European Union very quickly turned into a multi-year recession, with which Croatia is still faced. Since there is no more “cheap” money from abroad, the banks are convicted on domestic sources of funds. However, this is not causing a liquidity problem in Croatian banking sector because the domestic non-monetary sector is drained by the crisis so the demand on the credit market is very low.

Unfortunately, the contribution of the central bank to prevent negative trends is more than limited, because it is almost impossible to significantly change the existing conditions in monetary sphere of the economy. If the Croatian National Bank decides to abandon the exchange rate anchor or tries to implements strong monetary expansion using some unconventional measures that would inevitably lead to strong depreciation and would directly affect most of the debtors who are bound by the foreign

currency clause.[15] In addition, there would be an immediate increase in the external debt whose repayment already causes problems due to a decrease of the credit ratings and more expensive refinancing conditions.

Monetary policy has a narrowed space to maneuver as its contribution in Croatia is limited to price stability. The positive side of the maintenance of stable exchange rate as an indirect goal of the monetary policy will be perceived when entering exchange rate mechanism ERM 2. The ineffectiveness of the basic channels of the transmission mechanism and high risk premium of the country are disabling more important contribution to the economic growth and development. The reason for that lays in the fact that the channels of the transmission mechanisms usually do not react to the monetary impulses of the central bank.

Because of the existing restrictions of monetary policy, the only possibility for more significant activity in the conditions of crisis can be seen in the fiscal policy. However, due to hard budget constraint (high and ascending public debt, constant fiscal deficits, decrease of credit rating, increase of interest rates and more expensive market sources that finance the public debt) expansionary fiscal policy in Croatia could not be effective.

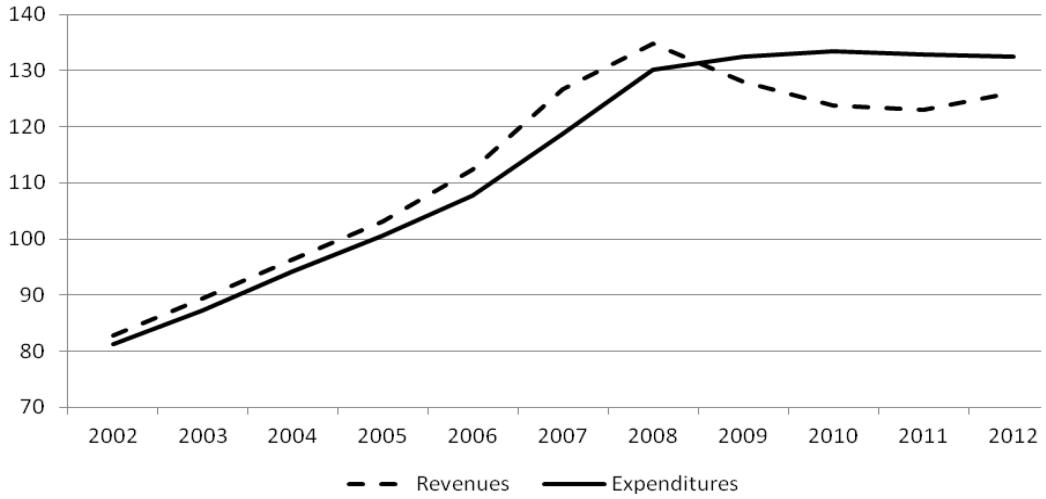
Figure 2.1 captures the movements of total revenues and expenditures of the general consolidated government in the last decade. Figure 1 indicates rather stable increase of both revenues and expenditures until beginning of economic crisis. A trend is consistent with GDP growth, but after GDP growth rate declines, problems in fiscal consolidation occurs especially in cutting public expenditures (compare with Figure 2).

Furthermore, during the last decade, Croatia achieved constant fiscal deficits regardless of the positive and relatively large GDP growth rate before the crisis (see Figure 2.2). During the same period the structure of government spending has not changed because it is primarily directed to meet current social needs (pensions, health care, agriculture subsidies, etc.), in order to preserve social peace and stability. The main prerequisites for more significant fiscal adjustment are the reforms within the mentioned (public) sectors. These reforms were not made in the observed period. The real need for fiscal consolidation has additionally caused (social) resistance to the changes and also provoked the instability of the government[16]. Without more

[15] Currency clause is used to hedge exchange rate risk in loan agreements.
[16] Two governments and even three prime ministers and three ministers of finance have changed in Croatia in period from 2008 till 2013.

significant reforms and fiscal consolidation, public debt significantly increased and when adding issued state guarantees it exceeds 60% of the GDP. In such conditions, the area of operation of fiscal policy has been further narrowed.

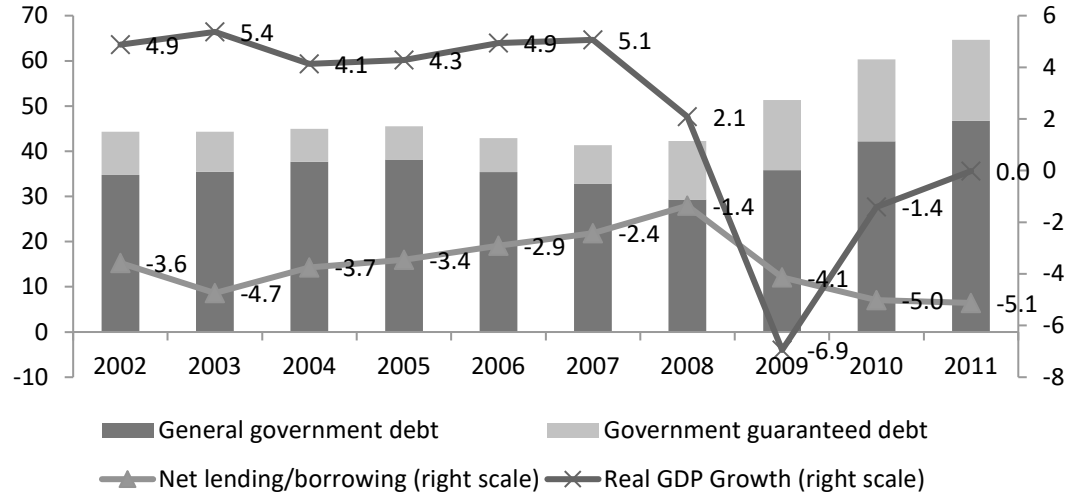
Figure 2.1 Revenues and expenditures, consolidated general government (billion HRK)



Note: transactions in nonfinancial assets, financial assets and liabilities are excluded.

Source: Ministry of Finance

Figure 2.2 Public debt, fiscal deficit and real GDP growth (in % GDP)



Source: Croatian National Bank and Ministry of Finance

With the assumption that the exchange rate and price stability have no alternative, Croatia has to accomplish reliable fiscal position as soon as possible. This implies a number of reforms within the public sector and abolition of certain social benefits. Moreover, it implies serious long-term budget planning and adequate public debt

management. The aim of this paper is to determine whether the fiscal policy in Croatia can achieve its stabilization function, i.e. do the fiscal multipliers have expected signs.

2.4. Methodology: open economy model

In contrast to Blanchard-Perotti identification method, Ravn and Spange (2012) analyze Denmark, a small, open economy with fixed exchange rate. As Croatia is a small and open economy with fixed exchange rate as well, this paper represents the first paper that uses adjusted Blanchard-Perotti methodology, after it was originally presented in Ravn and Spange (2012), for an open economy framework and generally one of the few that uses such framework for this type of analysis. Because Croatia is a small, open, highly dollarized, transition economy with managed exchange rate, this methodology can be the basis for a similar analysis for a number of developing countries with similar characteristics.

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

$$X_t = \Psi + \Phi D_t + \Gamma T_t + \sum_{i=1}^{p} A_i X_{t-i} + \sum_{j=1}^{p} B_j Z_{t-j} + u_t, \quad (2.1)$$

which includes deflated and seasonally adjusted values in log form of net indirect tax revenue (T_t) , total general government spending (G_t), personal or private consumption (C_t), foreign-trade weighted GDP[17] (F_t), which comprises of the vector of endogenous variables $X_t = [T_t, G_t, C_t, F_t]$. Exogenous variables included in the model are U.S. GDP (Y_t^{US}), constant (Ψ), time trend[18] (T_t) and 'crisis' dummy variable (D_t), which has a value of 1 from the beginning of the crisis (Q32008) (according to Krznar (2011) and Quandt-Andrews test of structural break). Vector $u_t = [t, g, y/c, f]'$ represents the vector of innovations of the reduced model (RF), $u_t \sim (0, \sum u)$.

Number of time lags is set to 1, according to SIC and HQ criteria. Greater number of lags isn't desirable due to the short time-series as well. Also, considering the frequency of data, selection of one time lag has its anchor in economic intuition. One time lag

[17] Calculated as weighted average of GDP of three main Croatian trade partners in the EU – Germany, Italy and Slovenia, in accordance to information about statistics on nominal effective exchange rate of Croatian National Bank.

[18] 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.

applies to endogenous variables and an exogenous variable, which indicates an external shock affecting the economic activity of main trade partners and Croatia. Model also assumes that economic activity of main trade partners has an effect on the Croatian economy, and that economic activity in Croatia doesn't affect the activity of main trade partners and the U.S.

Reduced form of the model (2.1) gives information about RF innovations. RF innovations are correlated and represent linear combination of structural innovations, which prevents their precise economic interpretation. Linear combination of structural innovations (shocks) can be displayed as follows:[19]

$$t_t = a_1 c_t + a_2 f_t + \beta_2 e_t^G + \beta_1 e_t^t \qquad (2.2)$$

$$g_t = b_1 c_t + b_2 f_t + \beta_4 e_t^T + \beta_3 e_t^g \qquad (2.3.)$$

$$c_t = c_1 t_t + c_2 g_t + c_3 f_t + \beta_5 e_t^c, \qquad (2.4.)$$

$$f_t = d_1 t_t + d_2 g_t + d_3 c_t + \beta_6 e_t^f, \qquad (2.5.)$$

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

In matrix form:

$$\begin{pmatrix} 1 & 0 & a_1 & a_2 \\ 0 & 1 & b_1 & b_2 \\ c_1 & c_2 & 1 & c_3 \\ d_1 & d_2 & d_3 & 1 \end{pmatrix} \begin{pmatrix} t_t \\ g_t \\ c_t \\ f_t \end{pmatrix} = \begin{pmatrix} \beta_1 & \beta_2 & 0 & 0 \\ \beta_4 & \beta_3 & 0 & 0 \\ 0 & 0 & \beta_5 & 0 \\ 0 & 0 & 0 & \beta_6 \end{pmatrix} \begin{pmatrix} e_t^t \\ e_t^g \\ e_t^c \\ e_t^f \end{pmatrix} \qquad (2.6.)$$

Equation (2.2) 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, $2\mathrm{K}^2 - \frac{1}{2}\mathrm{K}(\mathrm{K}+1)$ restrictions are to be set (Lűtkepohl, 2005), which have to have a strong base in economic theory. As the number of

[19] In the case of estimating the effect of shocks on aggregate demand of the private sector, variable c_t is replaced with variable y_t.

endogenous k=4, 22 restrictions are needed. Basic model implies 16 restrictions, 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 information, 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 restrictions 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.

The total calculated elasticity equals $a_1 = 0.95$.[20] According to Blanchard-Perotti (2002), Ravnik and Žilić (2010), Hur (2007), Ravn and Spange (2012), all coefficients related to the equation of the reduced innovation of government spending should equal zero. The reason for that is found in the assumption that the government spending is completely under the control of the economic policy that cannot react within the same period on the changes in the economy. However, Caldara (2011) warns about the "automatic" reaction of the government spending components (which are related to unemployment) to the business cycle. Taking into account this correlation it is necessary to calculate the exogenous elasticities of those components to the changes in the business cycle. Yet, according to the Grdović Gnip (2011) estimation, that elasticity in Croatia is very small (-0.01). Therefore in this paper we also assume that the total expenditures cannot have an influence on the changes in the aggregate demand within the same quarter, hence $b_1 = 0$.

In order to identify other parameters of the system, Blanchard and Perotti (2002) recommend calculation of cyclically adjusted residuals, which are uncorrelated with

[20] The calculation of the elasticities in relation to the income is given by the calculation of elasticity of tax components to their basis and elasticities of each base to the income. The needed data for the calculation of tax elasticity was taken from Ravnik and Žilić (2011) and Šimović (2012). The rest of the elasticities are author's calculations.

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 da 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 and Perotti (2002) showed that the results of the model can hold this assumption (i.e. they are robust).

The last three restrictions 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). The results of the analysis of residuals and stability test show that the model is adequate and stable. After estimating the structural form of the model, tests were repeated (they include tests for residual normality). That hasn't changed the conclusion on the model adequacy.

2.5. Data

Data source on the components of GDP in Croatia, GDP of main trade partners and the size of general government consumption and net indirect taxes is Eurostat. All data is at constant prices and exchange rate from 2005. U.S. income data has been taken from FRED database and was converted based on Eurostat data. All variables are in millions of euro. Data series applies to 2000Q1-2012Q2 period, and 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 (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.

Analysis uses indirect taxes for three reasons: (i) the goal of the paper is to analyze effects of fiscal policy on aggregate demand. In theory, income taxes mostly affect aggregate supply, modeling the behavior of workers and companies; (ii) SVAR models are more suitable for the analysis of aggregate demand shocks; (iii) Croatian tax system is mainly consumption-oriented and the majority of discretionary measures were related to indirect taxes so we want to try to estimate the consequences of those changes. As in all papers using Blanchard-Perotti (2002) methodology, taxes are in net form. In this paper we deduct subsidies from indirect taxes according to ESA 95 methodology, whereas other papers deduct interest and social expenditures from total tax revenue. Total general government spending is also based on ESA 95 methodology (European Commission, 2012, 17-21). It comprises of individual and collective general government spending. The paper uses this indicator of government spending for three reasons: (i) Croatian data on total general government expenditures is available from the third quarter of 2004 – a period too short to be analyzed; (ii) the level of aggregation of consolidated central government's total expenditures category, which has been adjusted to changes in GFS methodology 1986.-2001., is too high, and certain components cannot be compared; (iii) most papers (Blanchard-Perotti (2002) and Perotti (2002)) which use SVAR methodology for estimating multiplier size use data on current consumption (goods and services consumption) and investment spending of the government, for which data is not available in Croatia.

2.6. Results

This part only shows reactions of personal consumption and private AD on structural shocks in net indirect tax revenue and in total spending of central government[21].

[21] Due to extensiveness of presentation other results can be sent upon request.

Impulses show multiplier's size comparable to similar researches (Mancelarri, 2011; Hur, 2007; Šimović and Deskar-Škrbić, 2013).

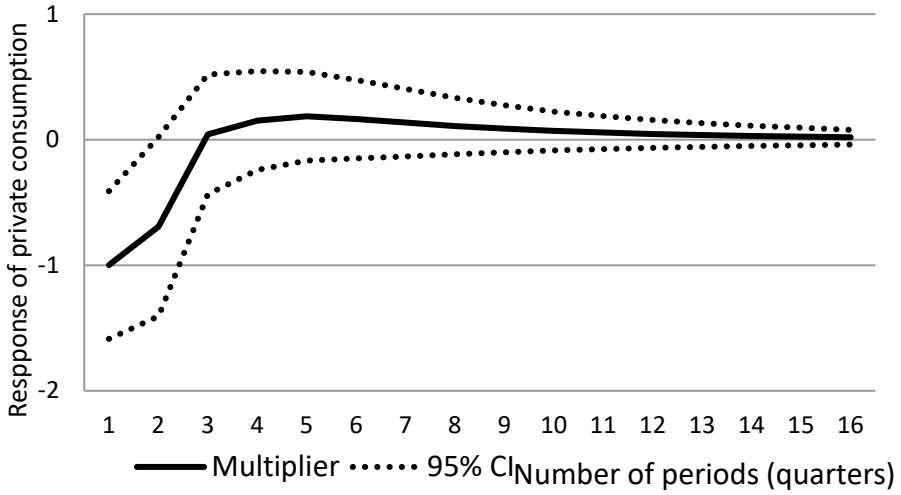
2.6.1. Multiplier in an open economy model

Figure 2.3 shows the effect of one unit shock in net indirect tax revenue on personal consumption. The effect is statistically significant in first two quarters after the shock. Multiplier size is -0.99 in the first quarter and -0.69 in second quarter. The effect becomes slightly positive in the third quarter (average size is 0.08), and it stays on approximately that level before disappearing after the fourth year. However, multiplier is statistically insignificant in that period.

Figure 2.4 shows the effect of one unit shock of government spending on personal consumption. The effect is statistically significant in first five quarters after the shock. Multiplier size is in range between 0.92 in first quarter and 0.83 in the fifth. Multiplier is the greatest in the third quarter (1.03), which is not in accordance with theoretical assumption of gradually decreasing effect after the first period. However, it matches the movements in other papers such as Ravn and Spange (2012).

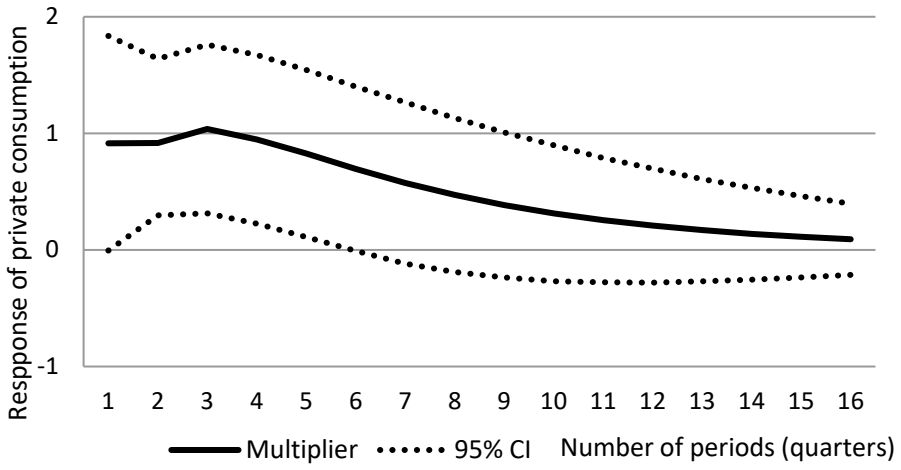
Figures 2.5 and 2.6 show the effects of shocks in fiscal variables on private aggregate demand. Tax effect is negative and statistically significant only in the first period. Multiplier size in the first quarter is higher compared to previous case with personal consumption. This can be explained through consumption and investment relation (investment accelerator), as consumption is one of key determinants of investment. Government spending effect becomes significant in the second quarter after the shock and lasts for five quarters. Multiplier is once again higher in comparison to personal consumption, which can be explained through accelerator mechanism as well. It is worth mentioning that multiplier's size is, in accordance with theory, lower than in closed economy model which was explored by Šimović and Deskar Škrbić (2013).

Figure 2.3 Indirect tax multiplier (private consumption)



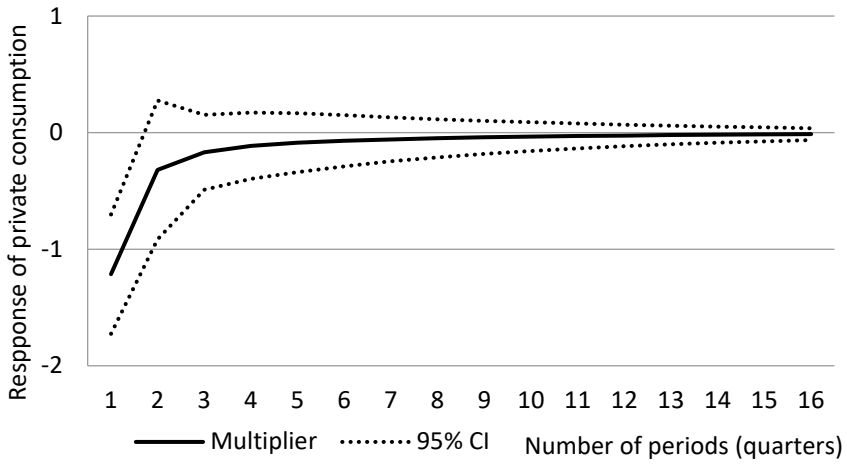
Source: authors' calculations.

Figure 2.4 Government spending multiplier (private consumption)



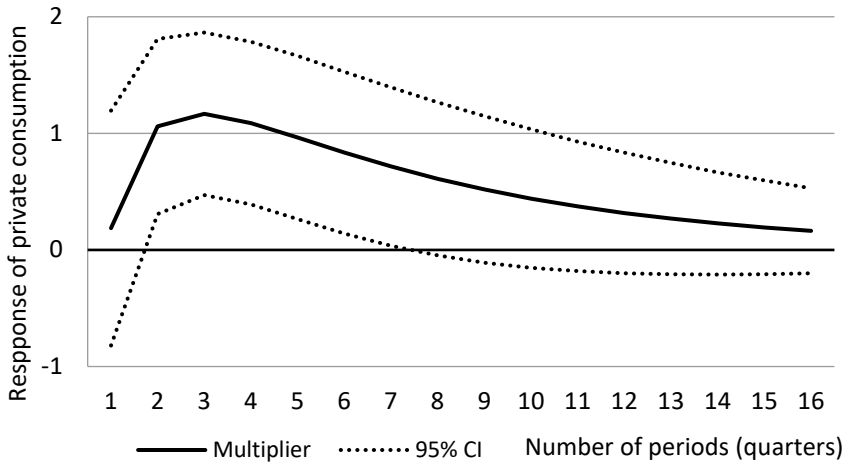
Source: authors' calculations.

Figure 2.5 Indirect tax multiplier (private AD)



Source: authors' calculations.

Figure 2.6 Government spending multiplier (private AD)



Source: authors' calculations.

2.6.2. Research limitations

Aforementioned results point to several methodological limitations. First of all, these results are to be taken *cum grano salis* due to relatively short time series and its characteristics, such as the structural break from the beginning of the crisis in 2008.

Further, fiscal multiplier is originally defined as the effect of unit change of fiscal variables on the total income, and this paper analyses effects on personal consumption and private demand. Selection of other endogenous and exogenous variables could result in other conclusions. That is why authors will continue this research and assess

models with other set of variables. Nevertheless, great number of research shows that multiplier's size is largely determined by the stage in a business cycle (it is higher in recessions). As Croatia is in recession for more than 40% of analyzed period, it can be concluded that multiplier size is partially overestimated.

Paper uses elasticities from other research but has shown to be theoretically appropriate for Croatia. Literature emphasizes the choice of elasticity as one of the most important determinants for differences in multiplier's sizes in different countries. Thereby, key assumption which affects the multiplier's size is government spending elasticity on changes in cycles. In this, as in most of the papers using Blanchard-Perotti methodology, multiplier's size is assumed to be 0.

Share of consumption defined according to ESA 95 and of indirect taxes in chosen macroeconomic variables is lower compared to other definitions. As the formula for calculation of multiplier uses inverse share of aforementioned variables, it can be concluded that lower shares increase multiplier's size.

It is important to notice that that there are several already entrenched criticism of Blanchard-Perotti methodology: (i) as already mentioned, Caldara and 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) switching regime models suggests that multipliers size strongly depends on the stage of the business cycle (eg. Auerbach and Gorodnichenko, 2012); (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 include in the analysis structural characteristics of the economies such as level of indebtness, exchange rate regime, health of financial system etc. But, despite all the criticism Blanchard-Perotti methodology is still the most widely used framework for fiscal policy analysis in time series framework.

In this paper it was impossible to include different control variables due to very limited length of all relevant time series. If the authors have 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. Thus, in the future analysis of the effectiveness of fiscal policy in Croatia it is of great importance to use the panel or cross-section time series framework because that is the only way to achieve a sufficient number of observations to include the control variables mentioned above.

In future research, chosen model can be expanded with other structural characteristics of the Croatian economy, e.g. exchange-rate regime, public and external debt, capital market development, investor perception, expectations etc. Also, in addition to effects of government spending, literature often analyzes the effects of government investment on economic activity, which hasn't been done here due to lack of data.

2.7. Conclusion

This paper provides first fiscal multiplier estimations in open economy model in Croatia. Estimated multiplier size in this paper corresponds to intervals set out in literature. In both observed open economy models expenditure multiplier size is at its peak above 1, for several quarters remain rather strong and then gradually decreasing. Results show negative tax multiplier in both models, where they are rather strong in first two quarters and then rapidly diminishing. In case of private consumption model tax multiplier is -0.99 in the first quarter, -0.69 in second quarter, than becoming slightly positive and rapidly diminishing, while in aggregate demand model in first quarter above 1 but then even more rapidly diminishing. Also, multiplier's size is, in accordance with theory, lower than in closed economy model, which presents another expected limitation for Croatian (fiscal) policy makers.

Since Croatian economy is in recession from the second half of 2008, it can be concluded that fiscal policy in past four years has not been adequate and that its stabilization potentials have not been fully used, although there were many discretionary changes in fiscal system. The relevance of this paper can be found in exploring the possibilities and limitations of fiscal policy measures in macroeconomic management of Croatian economy, which is of great importance due to the fact that Croatia is a small open economy with a managed exchange rate. Furthermore, the relevance of this and potential future research is even greater in the context of the accession to the EU and euro area, because monetary sovereignty and the possibilities of Croatian monetary policy will be further reduced.

3. THE EFFECTIVENESS OF FISCAL SPENDING IN CROATIA, SLOVENIA AND SERBIA: THE ROLE OF TRADE OPENNESS AND PUBLIC DEBT LEVEL[22]

3.1. Introduction

The recent economic crisis has motivated research and discussions on the efficiency of fiscal policy stabilization function. This trend has gripped (post)transition countries, including former Yugoslav countries. Fiscal policy in these countries has always played a crucial role in achieving economic and social goals. Although the economic and social development of former Yugoslav countries ran independently over the past 25 years, their common economic history, similar structural characteristics, and European integration processes influenced the resulting resemblance in fiscal policy approach and issues. High unemployment rate, trade imbalances, high level of external and public debt remain the prevailing economic problems of these countries. There are many structural similarities which can be observed between these countries, however, they do differ when it comes to monetary policy and exchange rate regimes. Slovenia is a member of the euro zone, Croatia is the country with the exchange rate as the main monetary policy anchor and a high level of euroisation and, lastly, Serbia is the country with the monetary strategy of inflation targeting and high degree of euroisation as well. Such characteristics can affect the effectiveness of fiscal policy. However, economic development in these countries varied significantly: some of them experienced recession over a longer period of time while others recorded a stable growth over the past few years. Even though these differences cannot be attributed to fiscal policy alone, there are many policy discussions emphasizing the importance of fiscal measures in (de)stimulating economic recovery since 2008 onwards (OECD, 2009; IMF, 2009, 2010).

This paper aims to analyse the effects of discretionary measures of fiscal spending on economic activity and the size of fiscal impulses in former Yugoslav countries. The research covers Slovenia, Croatia, and Serbia due to limited data availability.[23] The

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[23] For other former Yugoslav countries, we were unable to conduct analyses due to a lack (Bosnia and Herzegovina, Montenegro) or unavailability (Macedonia) of required data. Kosovo was excluded from the analysis due to the aforementioned reasons and also due to the fact that Kosovo was an administrative part of Serbia until 2008.

main theses of this paper are as follows: (i) foreign demand is an important factor, which can annul the effects of fiscal policy on domestic demand; (ii) effectiveness of fiscal policy is weaker in economies with a higher degree of trade openness; and (iii) effectiveness of fiscal policy is lower in countries with a higher debt-to-GDP ratio.

The empirical part of the paper is based on a structural VAR (SVAR) framework, i.e. on the identification scheme proposed by Blanchard and Perotti (2002). Since the selected countries represent small open economies, the analysis required the use of the extended Blanchard-Perotti (2002) model which also includes the effects of changes in external demand on selected economies.

We have structured the paper so that, following the Introduction, Section 2 presents the research approach. Section 3 presents the literature overview, while Section 4 focuses on the SVAR model and the identification method. Section 5 explains the data, while the results are discussed in Section 6. The paper ends with the Conclusion.

3.2. Research approach

The Keynesian concept of economic activity stimulation is often advocated in former Yugoslav countries due to various structural characteristics, limitations of the monetary policy, and a significant role of the public sector even though literature on the effectiveness of fiscal policy remains relatively scarce.

Estimating the effects of fiscal policy on economic activity is a rather complex task, especially isolating the direct effects of exogenous (discretionary) shocks of taxes and/or public spending. What represents the main issue is a two-way relationship between these variables. Due to this relationship, no consensus has been reached with regard to the methodology used for the identification of such shocks. The same applies to the extraction of the exogenous component from the observed fiscal outcomes. Generally, the literature relies on two main methods for the estimation of fiscal multipliers: model-based approaches and empirical estimations.[24]

Model-based estimations are mainly advanced models which simulate fiscal shocks. DSGE models are an example of such models. There is a growing DSGE literature, as well as different DSGE models, such as real business cycle (RBC) models and New Keynesian (NK) models (Leeper et al., 2012). The empirical estimators are based on

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

vector autoregressive (VAR) models, which can be systematised in several categories. In VAR literature, four main identification approaches have been used: 1) the narrative approach (Ramey and Shapiro, 1999); 2) the calibrated elasticities approach (Blanchard and Perotti, 2002); 3) the sign restrictions approach (Mountford and Uhlig, 2002 and 2009); and 4) the recursive structure approach (Kamps and Caldara, 2006). Further on, the analyses of empirical results include dynamic responses to different fiscal shocks, and/or calculation of impact, cumulative fiscal multipliers, and frequently also the interpretation of historical facts. What can be observed in contemporary research is the focus towards the incorporation of VAR methodology into a business cycle stage (regime-switching models). This is mainly due to the strong theoretical and empirical arguments which state that multipliers are higher in times of crisis (Auerbach and Gorodnichenko, 2012). This is important because the underestimation of fiscal multipliers can lead to growth forecast errors (Blanchard and Liegh, 2013).

The identification process and the structural characteristics of fiscal systems, as defined by Blanchard and Perotti (2002), became a benchmark for the vast structural VAR (SVAR) and panel VAR (PVAR) approaches for the estimation of fiscal multipliers.[25] In this research we will also use the Blanchard-Perotti (2002) identification method. The original Blanchard- Perotti model (2002) includes only three variables: government spending, net taxes, and real GDP.[26] Since all former Yugoslav countries are small open economies, the original identification method is extended by introducing variables which represent external (foreign) demand shocks. Such an adjusted form of the Blanchard-Perotti (BP) methodology, after it was originally presented in Ravn and Spange (2012) for Denmark, was also used in Deskar-Škrbić et al. (2014) for Croatia.

In cases when quarterly data are missing, PVAR estimations are often used. This is particularly applicable for developing and low-income countries (Ilzetzki et al., 2013; Kraay, 2013; Gonzalez-Garcia et al., 2013; Hory, 2014) and it was also a possibility for this study. However, SVAR for a single country gives better estimation of fiscal multipliers for each observed country than a common PVAR approach. Thus, it enables

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

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

us to compare the obtained results. Since our goal is to compare the effects of fiscal policy in various countries, we will follow a standard comparative framework based on separate (S)VAR models, proposed by Perotti (2002) for the selected OECD countries and Mirdala (2009) for Central and Eastern European (CEE) countries.

Prior to covering the methodological approach, it is necessary to emphasize some obstacles to the research problem. The main obstacle in research identification was the lack of data, i.e., quarterly data were unavailable throughout a sufficient period to include more explanatory and control variables. Another option was to use monthly data. However, the identification assumptions would have been violated then and the discretionary part of the fiscal policy could not have been isolated. For advanced economies, Perotti (2002) presents the minimal set of variables necessary for the study of the dynamic effects of fiscal policy changes. These include short-term interest rates and price levels. As for emerging and developing countries, other variables can be included, such as current account, real effective exchange rate, and monetary policy interest rate (Ilzetzki et al., 2013).

Since data availability limits the scope of empirical research, we partially consulted a narrative ‘bucket approach’ developed by Batini et al. (2014). This approach suggests that besides conjectural factors, six structural characteristics determine the size of fiscal multipliers: trade openness, labour market rigidity, the size of automatic stabilizers, the exchange rate regime, the debt level, and the public expenditure management and revenue administration. These factors, accompanied by an explanation of the mechanism and influence on the effectiveness of fiscal policy, are presented in Table 3.1.

Table 3.1 Determinants of the effectiveness of fiscal multipliers*

Structural	**Effect on the size**
Trade openness	High degree of economic openness reduces the effectiveness of fiscal spending 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
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 effectiveness of fiscal spending 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 effectiveness of fiscal spending 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

* We exclude public sector effectiveness from the analysis because most of transition countries don't have such measures

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

This entire list of factors can be utilized as control variables. However, in our paper we have opted to analyse the importance of two factors: trade openness and public debt level since we see these two as the main differentiating factors. The rationale behind

such an approach is the following: the level of rigidity of the labour market is very similar in the countries analysed[27], the effects of the exchange rate regime[28] can be analysed only in a panel or a cross-section framework and the role of automatic stabilisers is annulled by the BP approach.

3.3. Literature review

As mentioned, there are several different methodological approaches measuring the dynamic effects of fiscal policy. To ensure comparability, the literature review will focus mainly on papers using the SVAR approach. Although there are many scientific articles related to fiscal multipliers, there is still a lot to ascertain regarding their characteristics and determinants, especially in developing and low-income countries.[29]

Several papers deal with the dynamic effects of fiscal policy and fiscal multipliers in Central and Eastern European (CEE) countries.[30] Mirdala (2009) studied the effects of discretionary fiscal policy in six CEE countries, i.e., transition countries (the Czech Republic, Hungary, Poland, Slovakia, Bulgaria, and Romania) associated with an increase in government expenditures. The results suggest the existence of a positive impact of government expenditure shock on real output. This presence was the strongest for the Czech Republic and Bulgaria. Furthermore, Crespo Cuaresma et al. (2011) study the transmission from foreign fiscal policy shocks, as well as domestic fiscal shocks, to key macroeconomic variables in five CEE countries (Hungary, Slovakia, the Czech Republic, Poland, and Slovenia). All observed countries respond to fiscal expansion abroad with fiscal easing at home. This response is stronger on the

[27] According to the Global Competitiveness Report, labour market efficiency is between 4 and 4.2 in these countries. Furthermore, the transition process from planned to market economy is the slowest when it comes to labour market issues, and, ironically, it is additionally challenged by immigration issues as well. Experience from other CEE countries shows that labour market conditions slowly tend to improve with the EU accession process (Schreiner, 2008).

[28] The hard pegs and nominal exchange anchors prevail in former Yugoslav countries (Croatia, B and H, and Macedonia). Also, in some countries (Slovenia and Montenegro) the euro became the official currency (Slovenia and Montenegro). The only exception is Serbia, with a real exchange rate anchor since 2003 and an informal inflation targeting through "inflation objectives" since September, 2006 (Barisitz, 2004, 2007). However, monetary policy there is largely constrained by high euroisation of the domestic economy (Hinić et al. 2013).

[29] The assessments of the size of fiscal multipliers, based on different methods, created for different countries, and a detailed review of literature related to the assessments of the effects of fiscal policy are available in Spilimbergo et al. (2009), Ramey (2011), and Batini et al. (2014). Elaborate methodology using SVAR, that is, the SVEC model, is available in Ilzetzki et al. (2013) and Caldara and Kamps (2012). OECD publishes reports which provide model-based estimates of multipliers for their membership (OECD, 2009).

[30] For PVAR estimates that include CEE countries, see Ilzetzki et al. (2013) and Hory (2014).

expenditure than on the revenue side. With domestic fiscal shocks, a positive output response to domestic spending shocks exists in Hungary, Slovenia, and Slovakia (only long-term), while a negative output response to domestic taxation shocks exists in Hungary, Slovakia, and Poland (only short-term).

Several scientific articles cover the estimates of fiscal dynamic effects for single CEE countries using SVAR-based methodology and the BP identification method. Baxa (2010) calculates that government spending in the Czech Republic has a considerable and significant effect (multiplier close to 2) on GDP, while, on the other hand, tax revenue has a negative and insignificant effect. Muir and Weber (2013) calculated that the first-year spending multipliers are around zero (0.04) while revenue multipliers are 0.3.

Results show that the impact of fiscal policy on GDP is larger in downturns than in expansions, and investment (capital) spending and direct taxes are associated with the largest effects on GDP, as opposed to transfers and indirect taxes. Also, for Bulgaria, Karagyozova-Markova et al. (2013) calculate fiscal multipliers using several approaches including BP identification.[31] The results are broadly consistent with Muir and Weber's (2013) findings, with regard to the spending multiplier. Positive cumulative impact to GDP is in the range of 0.2 to 0.4. However, there is a lot of uncertainty in relation to the size of tax multipliers, being negative in Q1 and Q12, but positive in Q4 and Q8. Stoian (2012) analysed the effects of fiscal policy and fiscal multipliers in Romania. The character of fiscal policy was mostly procyclical with weak spending and tax multipliers. Compensations for public employees on the expenditure side, and indirect taxes on the revenue side, have a greater impact on GDP than other expenses and taxes. Boiciuc (2015) also analyses the effects of fiscal policy shocks in Romania. He found fiscal multipliers to be rather weak but in line with the Keynesian theory. Finally, findings of the Albania study conducted by Mancelarri (2011) show that tax cuts have the highest cumulative impact to GDP, with the multiplier reaching a peak of 1.65 after five quarters. Both capital and current expenditure multipliers have a positive

[31] Some of the mentioned articles use other approaches along with the BP identification method. Muir and Weber (2013) use IMF's Global Integrated Monetary and Fiscal Model (GIMF). Boiciuc (2015) and Karagyozova-Markova et al. (2013) also use the approach- and time-varying parameter VAR model. Fiscal multiplier estimations do not vary among different methods. Also, in a recursive approach, Karagyozova-Markova et al. (2013) include foreign demand to the list of endogenous variables because Bulgaria is a small open economy and external shocks have a strong effect on domestic output.

impact on GDP, with the capital spending multiplier higher (peak 0.95 after the first quarter) than the current spending multiplier (peak 0.69 after the first quarter).

For former Yugoslav countries, there are several papers considering the effects of fiscal policy on economic activity. Some of them even estimate the size of fiscal multipliers. Table 3.2 provides a brief overview of the findings and fiscal multipliers estimates in four former Yugoslav countries: Croatia, Slovenia, Serbia, and Macedonia.[32] We show only articles using SVAR methodology and BP identification method.

Table 3.2 Literature review

Authors	**Sample, methodology and identification method**	**Variables**	**Short-term multipliers* and other estimates**	**Fiscal policy effects**
Croatia				
Ravnik and Žilić (2011)	2000M1-2009M12 central government data for fiscal variables VAR Blanchard and 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 result was significant. Fiscal shocks on output are not compatible with Keynesian theory.
Šimović and Deskar-Škrbić (2013)	2004Q1-2012Q4 SVAR Blanchard and 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	5 variables: real GDP, government revenues	G 2.45 T -2.35	Results show that output moves in line

[32] For Bosnia and Herzegovina and Montenegro we have not found any papers.

	consolidated central government data for fiscal variables SVAR Blanchard and Perotti (2002)	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))	Cumulative multipliers for 4, 8, 12 and 16 quarters provided.	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 government data for fiscal variables SVAR Blanchard and Perotti (2002); STVAR Auerbach and Gorodnichenko (2010)	3 variables: real GDP , net expenditures and net revenues Alternative models: additionally model extended for private consumption or private investments and unanticipated component of the fiscal instrument as fifth variable in extended STVAR)	G + T- Short-term multipliers are not provided. For all models cumulative multipliers for 8, 12 and 20 quarters, impact and peek multipliers are provided.	Results show that during recessions fiscal multipliers in Croatia tend to be much 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 and 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 and 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 and 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 and Miletić (2013)	Sample n.a. SVAR Blanchard and 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. The estimated impact of fiscal policy on interest rates suggests accommodative monetary policy conditions.

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.

Source: authors

Most articles cover Croatia and most of them use a closed-economy model (Ravnik and Žilić, 2011; Šimović and Deskar-Škrbić, 2013; Grdović Gnip, 2014 and 2015). Two papers use an open-economy framework because they assume that the multipliers are lower in an open- economy model (Deskar-Škrbić et al., 2014; Šimović et al., 2014). Ravnik and Žilić (2011) and Grdović Gnip (2015) use multivariate BP SVAR methodology to analyse disaggregated short-term effects of fiscal policy on economic activity, inflation, and short-term interest rates in Croatia. Šimović and Deskar-Škrbić (2013) analyse the dynamic effects of fiscal policy and estimate the size of fiscal multipliers at different levels of government, using a closed- economy model. Furthermore, Grdović Gnip (2014) developed a smooth transition VAR (STVAR) to isolate the fiscal policy impact for periods of expansion and recession. As for methodological and data issues,[33] Croatia has considerable empirical literature which mostly supports Keynesian assumptions.

For Slovenia there is only the Jemec et al. (2013) article using a 'small' three-variable SVAR in a closed-economy framework, with fiscal multipliers being in line with the Keynesian theory. Also, Slovenia is considered in Crespo Cuaresma et al. (2011) along with four other CEE countries (Hungary, Slovakia, the Czech Republic, and Poland). Crespo Cuaresma et al. (2011) use a different open-economy framework. They explore the cross-border spill-overs and transmission of a foreign fiscal policy shock (assumed to be generated in Germany) to key macroeconomic variables. Considering all

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

structural factors, Crespo Cuaresma et al. (2011) conclude that a foreign fiscal shock coming from Western to Eastern Europe will most certainly affect the domestic fiscal variables. In Serbia and Macedonia, literature including (S)VAR methodology remains scarce. The only research results for Serbia were found in Hinić et al. (2013) and for Macedonia in Filipovski et al. (2016). The main results are reported in Table 2.

As mentioned before, empirical SVAR analysis includes: (a) dynamic responses to different fiscal shocks; and/or (b) a calculation of fiscal multipliers; and (c) an interpretation of historical facts. As for fiscal multipliers, cumulative multipliers are considered to be the most appropriate measure, usually larger than peak and impact multipliers. However, they are rarely reported. Per existing literature (Table 2), former Yugoslav countries have rather high short-term (cumulative) multipliers. Compared to other developing countries, they can be classified into a high multiplier category (0.7–1.0) in normal times (Batini et al., 2014). We expect that the open-economy framework and the inclusion of the effects of public debt level will, to some extent, mitigate the effectiveness of fiscal spending and provide more realistic estimates for all observed countries.

3.4. Methodology and the identification method

The details of the research approach are discussed above, including an indication of data limitations and relatively short time series which present major limitations regarding econometric modelling[34]. For a selection of adequate control variables, we assume that the openness of the economy and public debt level are the most important characteristics for all countries when estimating the effectiveness of fiscal spending.

When taking openness into consideration, it is important to observe that an open-economy framework can be tested through three channels: trade channel, real exchange rate channel, and interest rate channel. The size of the fiscal multiplier depends on the interaction between these different channels. The total impact of foreign fiscal expansion on domestic output is expected to be positive if the trade and exchange rate effects outweigh the negative interest rate effect. When observing the

[34] After an estimation of all the models presented in this section, the authors conducted model stability (inverse AR) and adequacy tests (autocorrelation and heteroscedasticity) which show that all analysed models are stable, with no violations of non-autocorrelation and homoscedasticity assumptions. Also, all structural models are just-identified. However, due to the extensiveness of the results (a total of 48 tables), the results of these tests are available upon request.

"fixed" exchange rate regimes and rather underdeveloped capital markets[35], we believe that the trade channel prevails in most former Yugoslav countries when describing cross-border spill-overs. This justifies the use of adjusted BP methodology for small open economies, developed by Ravn and Spange (2012).

As for the level of public debt, it is hard to directly estimate the effects on the size of fiscal multipliers. However, higher debt levels imply lower fiscal multipliers. The main mechanisms could be explained through the effects of risk assessment and confidence. High levels of public debt (especially in a recessionary environment) usually imply a lower credit rating and higher risk spreads. This leads to a higher level of interest rates on government debt, which "spill" directly and indirectly to higher interest rates for the private sector, dissimulating, in turn, private consumption and investment. Another channel refers to the expectations, as consumers and the corporate sector expect that the increased spending or tax cuts on higher levels of public debt will eventually lead to higher taxes and/or spending cuts, so they refrain from spending/investing (the Ricardian equivalence).

Our analysis proceeds in three steps: (i) an estimation of the closed-economy model; (ii) an estimation of the closed-economy model with public debt as an additional variable; and (iii) an estimation of an open-economy model with different "openness" proxies. In this way, we can test our main thesis, which states that the openness and control of the public debt level will reduce fiscal multipliers when compared to the baseline closed-economy model. The following paragraphs present our methodological framework based on the aforementioned steps.

3.4.1. A closed-economy model

Our analysis starts with a three-variable VAR model:

$$X_t = \alpha + \sum_{i=1}^{p} A_i X_{t-i} + D_t + I_t + u_t \tag{3.1}$$

[35] In former Yugoslav countries, capital markets are generally shallow, illiquid, and underdeveloped. In such conditions assets are less liquid and prices more volatile. Behaviour of interest rates may be difficult to explain due to a large number of factors affecting the yield curve (Aljinović et al., 2008; Zoričić and Orsag, 2013). Furthermore, hard pegs and high euroisation influenced central banks' interest rates, which were and remain non-referent. For example, in Croatia, the central bank's money issuing function was reduced to an instrument of foreign exchange auctions, while open-market operations—as the main instrument of modern monetary policy—were and are of secondary importance (Ćorić et al., 2015).

Following Blanchard and Perotti (2002), vector $X_t = [T_t, G_t, DD_t]$' includes deflated and seasonally-adjusted log-values of the net indirect tax revenue (T_t), total general government spending (G_t), and domestic demand (DD_t). Exogenous variables included in the model are the constant (α), time trend ($\mathrm{I_t}$), and a 'crisis' dummy variable ($\mathrm{D_t}$), which takes the value of 1 from 1Q09–4Q09, representing the period in which all three countries were exposed to external systemic shocks after the impact of the spill-over effects of the Great Recession. Vector $\mathrm{I_t}$ includes long-term trends of corresponding variables, which are, according to Hur (2007), assumed to have no influence on the long-term trends of other variables. More precisely, this assumption reflects our view that fiscal policy has no long-run effects on the economy. Thus, the focus of our analysis is the effectiveness of public spending in steering short-term fluctuations. To capture the effects of this cyclical interdependence between fiscal shocks and economic activity, we use an HP filter to de-trend all variables and proceed with our analysis on cyclical components. Finally, the vector $\mathrm{u_t} = [\mathrm{t, g, dd}]'$ represents the vector of innovations of the reduced model (RF), $\mathrm{u_t} \sim (0, \sum \mathrm{u})$. Time lags are set based on the AIC and SIC criteria.

RF innovations are correlated and represent a linear combination of structural innovations. This prevents their precise economic interpretation. Linear combination of structural innovations (shocks) can be displayed as follows:

$$t_t = a_1 dd_t + \beta_2 e_t^G + \beta_1 e_t^t \qquad (3.2)$$

$$g_t = b_1 dd_t + \beta_4 e_t^T + \beta_3 e_t^g \qquad (3.3)$$

$$dd_t = c_1 t_t + c_2 g_t + \beta_5 e_t^{dd}, \qquad (3.4)$$

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

In matrix form:

$$\begin{pmatrix} 1 & 0 & a_1 \\ 0 & 1 & b_1 \\ c_1 & c_2 & 1 \end{pmatrix} \begin{pmatrix} t_t \\ g_t \\ dd_t \end{pmatrix} = \begin{pmatrix} \beta_1 & \beta_2 & 0 \\ \beta_4 & \beta_3 & 0 \\ 0 & 0 & \beta_5 \end{pmatrix} \begin{pmatrix} e_t^t \\ e_t^g \\ e_t^{dd} \end{pmatrix} \qquad (3.5)$$

To identify this system, $2K^2 - \frac{1}{2}K(K+1)$ restrictions are to be set (Lutkepohl, 2005), which must have a strong foundation in economic theory. Since the number of endogenous variables is K = 3 after the diagonal elements of matrix A are normalized,

9 additional restrictions need to be set. The baseline assumptions of the model (shown in the equations (3.2)–(3.4)) implicate 6 of them. Therefore, 3 more restrictions need to be imposed.

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 a short period, e.g., most of the statistical reports are published with a couple of months or quarters of delay; there are procedural barriers in parliaments 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 for restrictions to be set in the model based on the empirical estimation of exogenous elasticities of fiscal variables in relation to changes of certain macroeconomic aggregates. To be more precise, parameters a_1 and b_1 can be interpreted as (automatic) elasticities of tax revenue and expenditures, in accordance with aggregate demand changes.

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

To identify other parameters of the system, Blanchard and Perotti (2002) recommend the calculation of cyclically-adjusted residuals. These 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. To identify the system, it is necessary to assume that one of these parameters is equal to zero, 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 and Perotti (2002) demonstrated that the results of the model can hold this assumption (i.e., they are robust).

3.4.2. A closed-economy model with a public debt level

The second step is to analyze the effect of public debt on the size of fiscal multipliers in a closed-economy framework by including the fourth endogenous variable in model (3.6). As in previous cases, the identification scheme follows the BP approach and additional three restrictions come from the assumption that all variables can contemporaneously affect public debt while the debt figure cannot directly affect any of the variables within the same quarter, so $a_2 = 0, b_2 = 0, c_3 = 0$.

$$\begin{pmatrix} 1 & 0 & a_1 & 0 \\ 0 & 1 & b_1 & 0 \\ c_1 & c_2 & 1 & 0 \\ d_1 & d_2 & d_3 & 1 \end{pmatrix} \begin{pmatrix} t_t \\ g_t \\ d_t \\ pd_t \end{pmatrix} = \begin{pmatrix} \beta_1 & \beta_2 & 0 & 0 \\ \beta_4 & \beta_3 & 0 & 0 \\ 0 & 0 & \beta_5 & 0 \\ 0 & 0 & 0 & \beta_6 \end{pmatrix} \begin{pmatrix} e_t^t \\ e_t^g \\ e_t^{dd} \\ e_t^{pd} \end{pmatrix} \tag{3.6}$$

3.4.3. An open-economy model

An open-economy framework is analysed using two different proxies: foreign GDP and imports-to-GDP ratio.

Firstly, following Ravn and Spange (2012), we analyse the direct effects of foreign demand by incorporating the foreign GDP (F_t) variable in the baseline model (3.6). This gives us a system of linear equations of structural innovations in a matrix form (f_t and e_t^f represent a reduced form and structural shocks of foreign demand):

$$\begin{pmatrix} 1 & 0 & a_1 & a_2 \\ 0 & 1 & b_1 & b_2 \\ c_1 & c_2 & 1 & c_3 \\ d_1 & d_2 & d_3 & 1 \end{pmatrix} \begin{pmatrix} t_t \\ g_t \\ dd_t \\ f_t \end{pmatrix} = \begin{pmatrix} \beta_1 & \beta_2 & 0 & 0 \\ \beta_4 & \beta_3 & 0 & 0 \\ 0 & 0 & \beta_5 & 0 \\ 0 & 0 & 0 & \beta_6 \end{pmatrix} \begin{pmatrix} e_t^t \\ e_t^g \\ e_t^{dd} \\ e_t^f \end{pmatrix} \tag{3.7}$$

When compared to the closed-economy model, an open-economy framework includes an additional—fourth variable, which implies that we need a total of six restrictions to identify the system (for details, see Deskar-Škrbić et al., 2014). Three restrictions follow from the closed model, while the additional three restrictions are implied in the assumption that foreign demand affects all endogenous variables and that there is no effect the other way around, so $d_1 = d_2 = d_3 = 0$.

Secondly, if we use imports-to-GDP ratio as a proxy variable for openness, additional three restrictions come from the assumption that imports cannot contemporaneously react to fiscal shocks and shocks of the domestic demand (stronger domestic demand

stimulated by fiscal shocks or some other factors leads to higher imports with a lag). However, imports can affect taxes (VAT), government expenditure (import–content of expenditure) and GDP (as a component), so $d_1 = d_2 = d_3 = 0$. The system of linear equations for structural innovations—where im_t and e_t^{im} represent a reduced form and structural shocks of foreign demand—can be presented in a matrix form as:

$$\begin{pmatrix} 1 & 0 & a_1 & a_2 \\ 0 & 1 & b_1 & b_2 \\ c_1 & c_2 & 1 & c_3 \\ d_1 & d_2 & d_3 & 1 \end{pmatrix} \begin{pmatrix} t_t \\ g_t \\ dd_t \\ im_t \end{pmatrix} = \begin{pmatrix} \beta_1 & \beta_2 & 0 & 0 \\ \beta_4 & \beta_3 & 0 & 0 \\ 0 & 0 & \beta_5 & 0 \\ 0 & 0 & 0 & \beta_6 \end{pmatrix} \begin{pmatrix} e_t^t \\ e_t^g \\ e_t^{dd} \\ e_t^{im} \end{pmatrix} \quad (3.8)$$

Before presenting the results, it is important to emphasise some methodological issues of the applied approach. Firstly, the analysis was conducted on relatively short time series. This 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 and calculated for periods which are not in accordance with the analysed period in this paper. This is important because the choice of elasticities can significantly change the results and they remain one of the main determinants of differences in multipliers' sizes in different countries. Also, a very important assumption, which affects the multipliers' size, is the government spending elasticity's on the business cycle changes. In this, as in most of the papers using BP methodology, this elasticity is assumed to be zero, 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 a small number of observations, this test could not be applied in this paper.

Also, it is important to notice that there are several already entrenched criticisms of the BP methodology: (i) as already mentioned, Caldara and Kamps (2012) emphasize the sensitivity of results on the assumptions regarding the size of elasticities; (ii) in the current debate on the effects of fiscal consolidation, it is pointed out that 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 largely depends on the monetary policy stance; (iv) according to the results of the switching regime models (e.g., 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 the economic environment (e.g., Corsetti et al., 2012), so, for the robustness of the results, it is important to directly include structural characteristics of the economies such as the debt level, the exchange rate regime, the health of the financial system etc.

3.5. Data

In this section, we provide a brief overview and a graphical presentation of data used in the empirical part of the paper. Table 3.3 includes details regarding the definitions, sources, units and some explanations. It is important to notice that, due to data availability, data series apply to the 2001Q1–2014Q1 period for Croatia and Slovenia, and to the 2003Q1–2014Q1 period for Serbia.

Table 3.3 Definition of variables

Variable	Definition	Source	Unit	Note
Net indirect taxes	Taxes less subsidies on products (D.21 less D.31)	Eurostat; National accounts; ESA 2010	millions of euro; in 2005 prices	Data seasonally adjusted using ARIMA X12; expressed in logarithms
Government spending	Government final consumption expenditure (P.3 in S.13); Individual and collective expenditure	Eurostat; National accounts; ESA 2010	millions of euro; in 2005 prices	Data seasonally adjusted using ARIMA X12; expressed in logarithms
Domestic demand	Household final consumption expenditure (P.3 in S.15) + gross fixed capital formation (P.51)	Eurostat; National accounts; ESA 2010	millions of euro; in 2005 prices	Data seasonally adjusted using ARIMA X12; expressed in logarithms
Foreign demand	GDP based on the expenditure approach;	Eurostat; National accounts; ESA 2010	millions of euro; in 2005 prices	Data seasonally adjusted using ARIMA X12; expressed in logarithms

	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 for the selected economies			
Imports	Imports (P.7)	Eurostat; National accounts; ESA 2010	% of GDP	Data seasonally adjusted using ARIMA X12
Public debt	Total gross public debt of the general government	Eurostat; Government finance statistics; ESA 2010 Ministry of finance Serbia	% of GDP	Data seasonally adjusted using ARIMA X12: Data for Croatia and Slovenia based on ESA 2010 methodology and for Serbia on national methodology; in Serbia quarterly data was interpolated from annual data

Source: authors

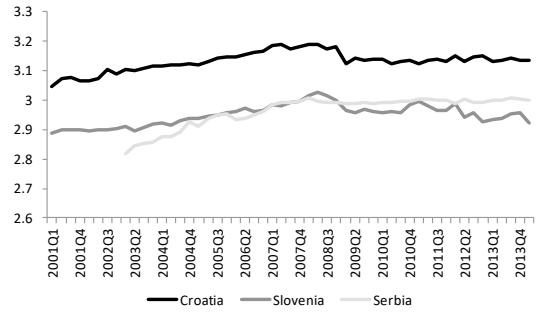
The aggregate demand of the private sector is calculated as a sum of personal consumption and investment, as in Giordano et al. (2005). This indicator provides information on the effect of fiscal variables on the private sector. This eliminates possible correlations between fiscal shocks and GDP components related to government spending, a high correlation between GDP and a component of GDP—government spending (G), and a 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 cannot directly be affected by domestic fiscal shocks. These components are affected by the changes in determinants of personal consumption. The mechanism of the instantaneous effect of fiscal shocks of consumption and indirect taxes on export has not been elaborated in economic literature.

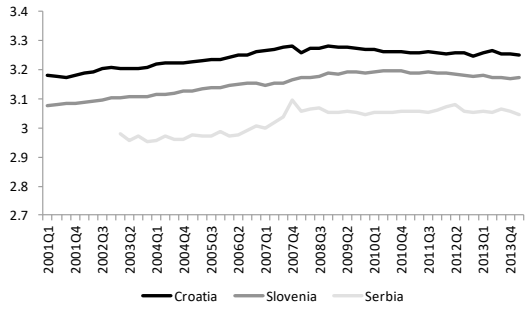
For our analysis, we use indirect taxes for three reasons: (i) as it has been mentioned in the introduction, the goal of the paper is to analyse the effects of fiscal policy on aggregate demand. In theory, personal income tax and profit tax mostly affect aggregate supply by modelling the behaviour of workers and companies; (ii) SVAR models are more suitable for the analysis of aggregate demand shocks (Ravn and Spange, 2012; Blanchard and Perotti, 2002). Due to the complexity of the mechanism by which direct taxes affect the aggregate supply, a broader methodological framework of a DSGE model is required to analyse their effects; (iii) tax systems in Croatia, Slovenia, and Serbia are mainly consumption-oriented, and most of the discretionary changes were related to indirect taxes since the beginning of the crisis. Before we proceed with the analysis, it is useful to graphically present the data used and provide commentary on the characteristics and developments of the time series (Figure 3.1).

Figure 3.1 Developments of key variables

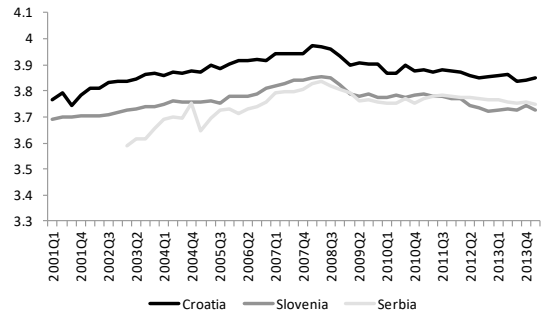
(a) Net indirect taxes (log)



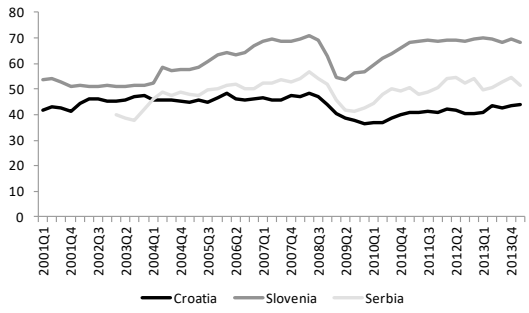
(b) Government expenditure (log)



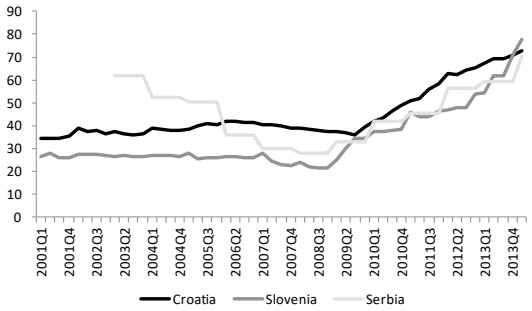
(c) Domestic demand of private sector (log)



(d) Imports-to-GDP ratio



(e) Debt-to-GDP ratio



Source: authors

Figure 3.1 (a) shows that Croatia collected the highest level of net indirect taxes in nominal terms during the overall analyzed period. Serbia started at the lowest point; however, it surpassed Slovenia after the beginning of the 2008/9 recession. Croatia and Slovenia recorded a relatively strong shock in 2009, while the indirect tax collection in Serbia has relatively stagnated since the beginning of 2007.

As for the government expenditure, Figure 3.1 (b) shows that the spending trajectory differed among the countries. Croatia recorded a stable upward trend in government spending until the end of 2007, when spending started to stagnate and gradually decline after 2009. Government spending in Slovenia kept the upward trend till the end of 2010, whereas in Serbia, the series show a higher degree of volatility prior to 2007, when the stagnation started, while the consolidation remains present only since 2012.

Domestic demand, presented in Figure 3.1(c), had a stable upward trend until the outburst of the Great Recession in 2008 when it started to decline. As Croatia and Slovenia were generally more strongly affected by the EU recession than Serbia, the decline of domestic demand in 2008/9 was more pronounced. Since the end of 2009 up to the beginning of 2014, domestic demand was relatively stagnant or gradually falling in Croatia and Slovenia, while it gained some momentum in Serbia in 2010, but stayed below the pre-crisis level.

Figure 3.1 (d) shows that Slovenia has the largest share of imports in GDP, followed by Serbia. While this share has steadily been rising in Slovenia and Serbia before the crisis, in Croatia this share was relatively flat. At the outburst of the 2008/9 recession, Slovenia and Serbia recorded a substantial fast decline in imports share, while for Croatia, the decline was more gradual. After the initial shock, the share of imports bounced back relatively fast in Slovenia and started to gradually rise in Serbia and

Croatia. This is probably due to a falling and stagnating GDP, which was stronger than the decline or stagnation of imports in nominal terms.

Public debt-to-GDP ratio, as presented in Figure 3.1(e), had a relatively similar trajectory in Slovenia and Croatia, with the figure stagnating or gradually falling until 2008/9, when it "exploded", especially in Slovenia. Strong increases in public debt in Slovenia reflect the consequences of the banking crisis. On the other hand, Serbia strongly reduced its public debt before 2008/9, when it also started to record strong growth, reflecting various effects of the global and local recession.

3.6. Results

We have derived impulse-response functions from a structural factorisation explained in (3.1)–(3.2) based on SVAR. Due to the extensiveness of graphical representations of IRF for all variables in this section we present only the IRFs of interest, namely cumulative IRFs, which represent the effects of a structural shock in public spending on the economic activity in all four models, with a 68-percent confidence interval. Following the presentation, we summarise the results in corresponding tables. Firstly, we present the results by country and then draw a comparison of the results between the analysed countries.

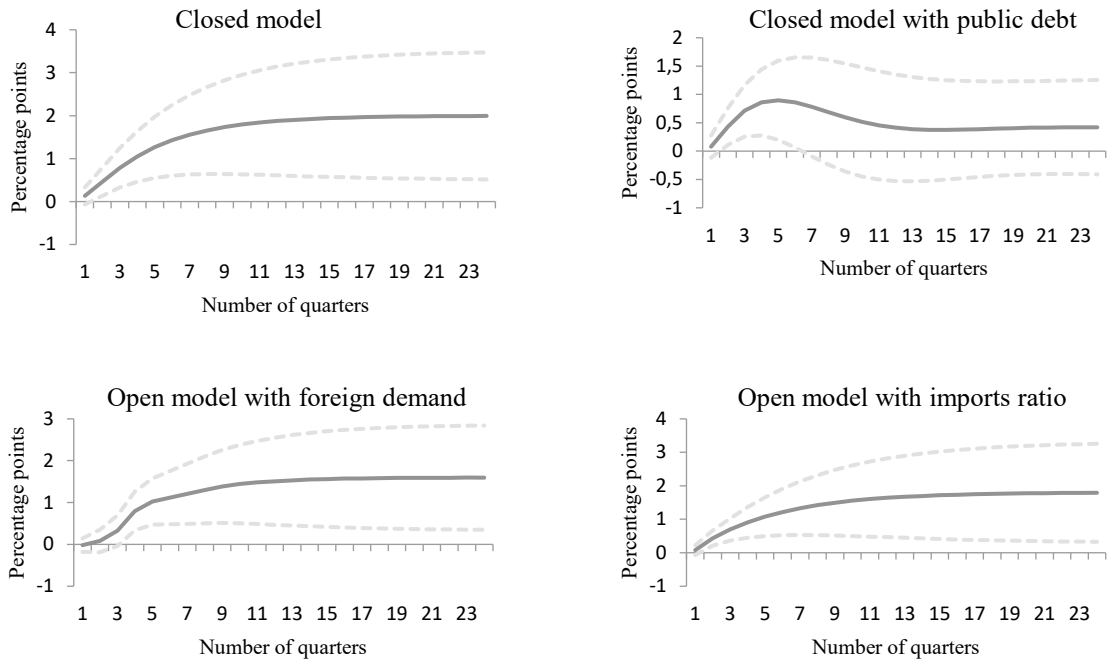
3.6.1. Croatia

Figure 3.2 shows that government spending has a positive and a mostly statistically significant effect on domestic demand in Croatia.

However, the size of the effect depends on the model, i.e., the included control variable. The results of all models are presented in Table 3.4. In a closed-economy model, one percentage point increase in government spending increases the domestic demand between 1.05 and 1.96 percentage points in the first four years. This indicates that government spending is effective in stimulating the economy[36].

[36] In literature regarding fiscal multipliers, government spending is seen as effective if a one unit increase of government spending increases GDP by more than one unit. The same logic can be applied here.

Figure 3.2 Effects of structural fiscal spending shock on domestic demand in Croatia



Source: authors

When controlling the closed model for the public debt level, we can see that the reactions of domestic demand to fiscal shock become weaker seeing how a one percentage point increase of fiscal spending leads to only 0.86 percentage points increase of domestic demand.

Open-economy models also reduce the effectiveness of fiscal spending, since a one percentage point increase in fiscal spending increases the domestic demand by 0.8–1.57 percentage points when simulating the effects of foreign demand, and by 0.9–1.73 percentage points if trade openness is accounted for.

Table 3.4 Effects of structural fiscal spending shock on domestic demand in Croatia

Quarter/Model	Closed model	Closed model with public debt	Open model with foreign demand	Open model with imports ratio
4	1.05	0.86	0.80	0.91
8	1.66	0.6849*	1.30	1.42
12	1.88	0.4131*	1.51	1.64
16	1.96	0.3808*	1.57	1.73

** implies that the impulse is not statistically significant*

Source: authors

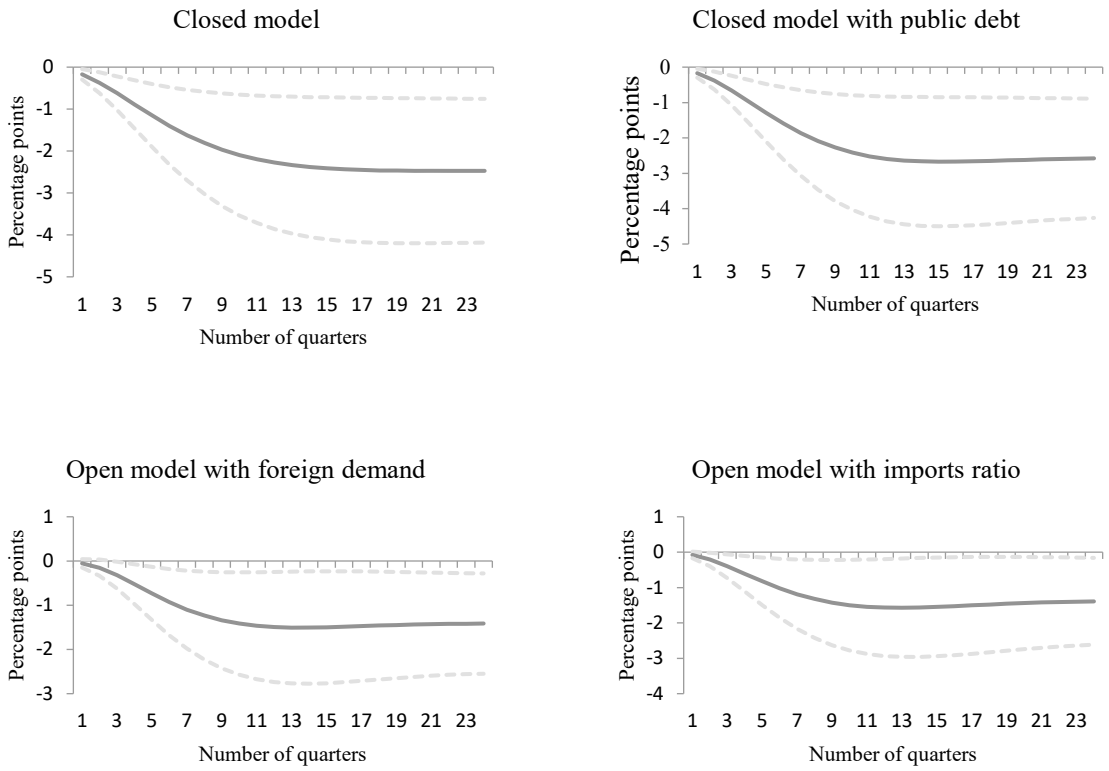
The bottom line is this: in the case of Croatia, we can see that our assumptions have been confirmed. The introduction of the public debt level in a closed-economy model reduces the effectiveness of government spending. The last two models also show that government spending is less effective in an open-economy framework, regardless of which control variable is used. However, as expected, direct effects of foreign demand are stronger than the effects of trade openness.

Using the fiscal multiplier logic, the approximate first-year fiscal multiplier in Croatia is greater than 1 only within a closed economy, while in all other cases it is below 1, with foreign demand having the strongest effect on the multiplier reduction. Finally, although the impulses are not statistically significant, it is interesting to notice that in the public debt model the effect of fiscal policy on the domestic demand starts to fade after the peak in the first year, while in other cases the effect stabilises only after more than four years.

3.6.2. Slovenia

The effects of fiscal spending on domestic demand in Slovenia are presented in Figure 3.3 and Table 3.5. The results indicate that government spending shocks have a negative and statistically significant effect on domestic demand throughout the analysed period.

Figure 3.3 Effects of structural fiscal spending shock on domestic demand in Slovenia



Source: authors

However, before we proceed with the interpretation of the results, it is important to note that these results are most probably reflecting the negative correlation ($r_{i,j} = -0.33$) between the cyclical components of government expenditure and domestic demand. Detailed observation of the data shows that this negative correlation comes from two episodes. Firstly, in the period from 4Q06 to 1Q08 government expenditure (inexplicably) recorded a slowdown and was moving below the long-run trend, while the domestic demand was accelerating to its peak. In the second case, during 2009, domestic demand recorded a strong externally-driven decline, while government expenditure continued to rise. Thus, the linear regression model (behind the VAR procedure) captures this negative correlation as a negative effect from government spending to domestic demand.

Table 3.5 Effects of structural fiscal spending shock on domestic demand in Slovenia

Quarter/Model	Closed model	Closed model with public debt	Open model with foreign demand	Open model with imports ratio
4	-0.89	-0.97	-0.53	-0.61
8	-1.81	-2.09	-1.24	-1.32
12	-2.28	-2.59	-1.49	-1.57
16	-2.44	-2.67	-1.49	-1.53

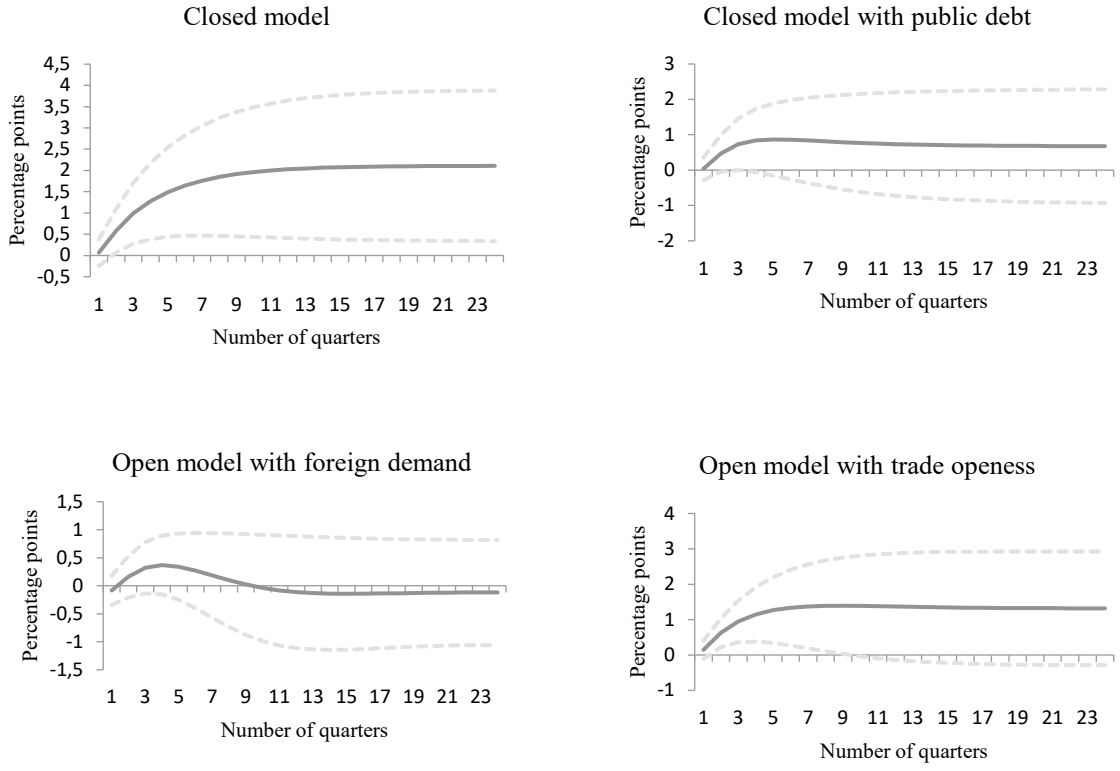
Source: authors

Despite these limitations, it is interesting to observe that in Slovenia there is also a difference in the size of fiscal effects between models. The inclusion of public debt in the closed- economy model leads to more pronounced negative effects of fiscal spending, while open- economy models mitigate some of the effects and lower the value of fiscal impulses, which is in line with the main assumptions.

3.6.3. Serbia

In Serbia, increased government spending has a positive and statistically significant effect on domestic demand, at least in the first two years after the fiscal shock. Impulse responses and a summary table are presented in Figure 3.4 and Table 3.6.

Figure 3.4 Effects of structural fiscal spending shock on domestic demand in Serbia



Source: authors

When observing the statistically significant results, we can see that our main assumptions are confirmed in Serbia's case. Table 6 shows that, in a closed-economy model, a one percentage point increase in government spending leads to a 1.28 percentage point increase in domestic demand. The effect of fiscal stimulus is weaker when public debt is incorporated in the closed-economy model, as the first-year impact effect falls to 0.84 percentage points. Thus, when controlling for the debt level, the effectiveness of fiscal policy weakens. As for the open-economy models, a foreign demand model provides no statistically significant results[37], while an alternative model shows that trade openness reduces the effect of fiscal stimulus, when compared to the closed-economy model, as approximate multipliers in the first two years stand at 1.15 and 1.39 versus 1.28 and 1.85, respectively.

Table 3.6 Effects of structural fiscal spending shock on domestic demand in Serbia

Quarter/Model	Closed model	Closed model with public debt	Open model with foreign demand	Open model with imports ratio
4	1.28	0.84	0.37*	1.15
8	1.85	0.81*	0.10*	1.39
12	2.03	0.74*	-0.11*	1.37*
16	2.08	0.70*	-0.14*	1.34*

** implies that the impulse is not statistically significant*

Source: authors

3.6.4. Comparison

Finally, Table 3.7 represents a summary of the effectiveness of fiscal policy in the first year after the shock (most statistically significant results) in all analysed countries. The effectiveness is measured by a percentage point change in domestic demand driven by a one percentage point increase of government spending.

[37] But, it indicates that the effectiveness would be substantially limited.

Table 3.7 Effects of structural fiscal spending shock on domestic demand – international comparison

Quarter/Model	Closed model	Closed model with public debt	Open model with foreign demand	Open model with imports ratio
Croatia	1.05	0.86	0.80	0.91
Serbia	1.28	0.84	0.37*	1.15
Slovenia	-0.89	-0.97	-0.53	-0.61

** implies that the impulse is not statistically significant*

Source: authors

From Table 3.7 we can conclude that the effectiveness of fiscal policy in a closed-economy framework is strongest in Serbia. This result can be partially explained by the size of domestic economy, since Serbia is the largest country in the sample. In all observed countries, the inclusion of public debt in a closed-economy model deteriorates the effectiveness of fiscal policy and the biggest deterioration is again recorded in Serbia. This probably reflects the fact that over the entire analysed period, Serbia had the largest a verage public debt-to-GDP ratio: in 2003 Serbia started to reduce public debt from around 60 percent of GDP (while Croatia and Slovenia's debt levels were around 30 percent and 40 percent). In 2014, the debt level was relatively similar in all countries. When taking into consideration the open-economy framework, foreign demand and imports ratio reduced the effectiveness of the fiscal policy in all observed countries, when compared to the closed-economy model. The biggest change in the (statistically significant) parameter was recorded in Slovenia, since Slovenia has the highest degree of trade openness and the strongest integration within the European trade channels. Although the result for Serbia is not statistically significant, we could state that foreign demand has a stronger effect on the effectiveness of fiscal spending than the degree of openness, which can be explained as follows: while imports ratio reflect the “outflow effect”, foreign demand includes many other trade and financial linkages.

3.7. Conclusion

In this paper, we analyzed the effects of fiscal spending on short-run cyclical fluctuations in Croatian, Serbian, and Slovenian economies while keeping in mind that

there are various structural characteristics determining the effectiveness of fiscal policy. As explained, the two main determinants in this analysis are the level of public debt and trade openness. Due to limitations in the time series length, we estimated four SVAR models based on the BP identification scheme: a closed economy, a closed economy with a public debt, an open economy with foreign demand, and an open economy with imports ratio models.

The empirical results confirmed our hypotheses that public debt level and openness of the economy significantly affect the effectiveness of fiscal policy, and that these control variables reduce the size of fiscal multipliers. Compared to the closed-economy model in the first year after the initial shock, in Croatia the fiscal parameter falls from 1.05 to 0.86 in the public debt model and from 0.8 to 0.9 in open-economy models; in Serbia, the parameter reduces from 1.28 to 0.84 and 1.15, respectively; while in Slovenia, it goes from -0.89 to -0.97 in the public debt model, and from -0.53 to -0.61 in open-economy models. Additionally, we discovered that the public debt level and openness of the economy also play an important role in international comparisons. The effectiveness of fiscal stimulus is mostly reduced in Serbia, which has the highest average public debt-to-GDP ratio and Slovenia, which has the highest degree of trade openness. Also, in terms of the openness of the economy, our results indicate that the effects of foreign demand on the effectiveness of fiscal policy are stronger than the effects of imports ratio.

Even though this research has several methodological limitations which have been elaborated in the paper, these results can be used as a benchmark for discussions about the differences in the effectiveness of fiscal policy in these countries.

4. DYNAMIC EFFECTS OF FISCAL POLICY IN CROATIA: CONFRONTING NEW-KEYNESIAN SOE THEORY WITH EMPIRICS[38]

4.1. Introduction

Croatia is a small open economy (SOE) with a managed floating exchange rate regime. More precisely, monetary authority in Croatia uses nominal exchange rate as a nominal monetary policy anchor due to a high degree of financial euroisation in the economy.

Such structural characteristics of Croatian economic and financial system make monetary policy instruments fairly ineffective in terms of business cycle management as central bank cannot use nor exchange rate nor key policy rate channels to steer the economy through the boom-bust cycles (for details on the limitations of monetary policy in Croatia see for example Vujčić, 2003; Lang and Krznar, 2004; Šimović, Ćorić and Deskar-Škrbić, 2015). Thus fiscal policy can be seen and understood as the key economic policy instrument in Croatia, especially when we focus on its stabilization function[39].

In addition, size of the government, measured through the share of general government expenditures in GDP (45.3% of GDP[40]) and share of public employment in total employment (around 30%[41]), makes the government an important economic agent in Croatian economy. The role and importance of fiscal policy in Croatia will become even more pronounced after the introduction of euro as monetary sovereignty of national central bank will be formally terminated. Already now, under the European semester framework, fiscal policy, its effectiveness and sustainability, are in the focus of both, local policy makers and European authorities. All these factors make the understanding of key fiscal policy instruments, mechanisms, limitations and possibilities in Croatia important for academics, researchers and policy makers.

The main goal of this paper is to determine whether the effects of government consumption, as one of the key fiscal policy instruments, on economic growth fit into a

[38] Published in *Proceedings of Rijeka Faculty of Economics: Journal of Economics and Business*, Vol. 36 (1), June 2018

[39] According to Musgrawe and Musgrawe (1989), from this point of view, the fiscal policy makers should make an effort to eliminate the macroeconomic fluctuations associated with a suboptimal allocation of resources and take an active role in the process of meeting basic economic policy targets. This approach to fiscal policy corresponds with a conception of business cycles as a manifestation of macroeconomic disequilibrium.

[40] Eurostat data for 2017 (Annual Government Finance Statistics); available at: Eurostat

[41] EBRD data for 2016 (Structural Change Indicators); available at: EBRD

New-Keynesian theoretical framework by comparing impulse response functions from calibrated DSGE model with empirical impulse response functions from VAR model. Adequate answer to this research questions has important implications for: (i) future research as modelling and simulations of fiscal policy have to have firm theoretical background and (ii) policy making process as fiscal policy measures can have different effects on economic growth under different theoretical assumptions.

The main hypotheses of this paper are:

H1: Fiscal policy has a significant effect on macroeconomic developments in Croatia

H1a: Government consumption has positive effect on GDP ($\uparrow G \rightarrow \uparrow Y$)

H1b: Government consumption has positive effect on employment ($\uparrow G \rightarrow \uparrow N$)

H1c: Government consumption has negative effect on trade balance ($\uparrow G \rightarrow \downarrow NX$)

H1d: Government consumption has positive effect on CPI ($\uparrow G \rightarrow \uparrow \pi$)

H2: New-Keynesian DSGE models can be used for simulations of the effects of government consumption on GDP, employment, trade balance and inflation in Croatia.

The main contribution of this paper stems from the fact that it represents the first publicly available attempt of fiscal modelling in New-Keynesian DSGE analytical framework in Croatia.

The rest of the paper is structured as follows. After the Introduction, in the second part of the paper we give a brief literature overview focused on literature related to economic modelling and macroeconomic effects of fiscal policy in Croatia. In the third part we present a theoretical, New-Keynesian open economy DSGE model, and analyze theoretical impulse response function, after calibration. In the fourth part of the paper we confront these impulse responses with empirical ones obtained from VAR model.

4.2. Literature review

Economic modelling in Croatia

Most of papers in this field of literature in Croatia are based on (static) computable general equilibrium (CGE) models[42].

[42] For detailed explanation of CGE models see Nadoveza and Penava (2016).

Pioneers of CGE modelling in Croatia are Adelman and Šohinger (2000) who developed a CEGCRO model suitable for the analysis of the effects of structural changes in taxes and tariffs on various sectors in Croatia (based on data from input-output tables for 1987). Šohinger, Galinec and Harrison (2001) analysed the possible welfare effects of Croatian accession to World Trade Organization. Thus, authors were mostly focused on tariffs and concluded that Croatian path towards WTO (and later CEFTA and EU) would not have notable negative impact on overall welfare. Škare and Stjepanović (2011) built a computable general equilibrium (CGE) model (based on Salter-Swan analytical framework) and analysed the effects of external shocks on various sectors of Croatian economy. Authors concluded that their model is suitable for the analysis. Škare and Stjepanović (2013) use so-called 1-2-3 model and analyse the effects of changes in nominal exchange rate and inflation on Croatian economy. Most recent CGE papers in Croatia are Nadoveza and Penava (2016) and Nadoveza, Sekur and Beg (2016). In the first paper authors described the structure of the computable general equilibrium for Croatia based on five sectors (including government) and showed that their CGE model resembles real data on Croatian economy in 2010. In the second paper authors used the aforementioned CGE model to analyse the effects of one of the fiscal policy instruments, namely income tax, on the economy. Results (among others) showed that reduction of labour tax burden increases production and disposable income in the economy while and that rise in tax revenues supported by stronger demand in the economy offsets the negative effects of lower income tax receipts in the budget.

Unlike CGE models, literature on dynamic stochastic general equilibrium (DSGE) in Croatia is relatively scarce, although we could see rising interest for this kind of economic modelling in recent years.

First publicly available paper in which authors conduct the analysis of Croatian economy through the lens of DSGE model is Bokan et al. (2010). This model was developed for the analysis of mechanisms by which the 2008 crisis propagated throughout the Croatian economy and for the analysis of monetary policy reaction. Model contains nine sectors whose behaviour is modelled in the New Keynesian framework of price stickiness and rigidities on the labour market. However, it is important to note that this model does not model fiscal authority behaviour. The authors showed that real data fitted well to the results of model which improved the

understanding of crisis propagation channels and possibilities of the stabilization role of monetary policy. Palić (2015) analysed the effects of various shocks in real business cycle (RBC) models and New Keynesian models and compared the theoretical impulse responses with impulse responses obtained from VAR analysis. Author concluded that the assumptions of New Keynesian models are more suitable for the analysis of Croatian economy than assumptions of RBC models. Arčabić et al. (2016a) used a small open economy DSGE model to analyze the effects of productivity shock on Croatian economy and showed that impulse responses from the empirical VAR model do not resemble those from the theoretical one for all the variables and that that the productivity shocks do not play a significant role in determining the variation of macroeconomic variables. Arčabić et al. (2016b) used the same DSGE model to analyze the effects of external shock on Croatian economy. Authors concluded that fits the data well as long as monetary policy is modelled as a fixed exchange rate regime. Palić, Dumičić and Barbić (2017) confronted DSGE impulse responses with SVAR impulse responses and confirmed the hypothesis that New-Keynesian models have stronger explanatory power for Croatian economy than RCB models. Palić (2018) tested the compliance of monetary policy shock in calibrated DSGE model which includes financial frictions with the empirical impact of monetary policy shock in Croatia estimated using VAR model. The results show that monetary policy shock has positive initial impact on interest rate and negative initial impact on house prices and output gap and they indicate that empirical impact of the monetary policy shock adequately reflects the impact of monetary shock in DSGE model with financial frictions.

Macroeconomic effects of fiscal policy in Croatia[43]

As we explained in the introduction, fiscal policy is the main economic policy instrument in Croatia and as such fiscal policy was in the focus of many published papers. For detailed literature overview on the effectiveness of fiscal policy see Šimović, Ćorić and Deskar-Škrbić (2015), while in this paper we will briefly present the results of papers based on (S)VAR methodology. Benazić (2006) used VAR/VEC methodology to analyse the effects of consolidated general government revenues and expenditures on GDP and concluded that expenditures have positive effect on GDP in the short run while in the long run is mostly neutral. Based on structural VEC model (SVEC) Rukelj

[43] For detailed review of presented papers see Šimović and Deskar-Škrbić (2013) and Šimović, Ćorić and Deskar-Škrbić (2015)

(2009) analysed the interaction of fiscal and monetary policy and stated that the effects of economic policy on economic activity has not proven to be clear enough to bring out strong conclusions. Ravnik and Žilić (2011) based their research on structural VAR model (SVAR), based on Blanchard-Perotti identification scheme. Authors analysed the effects of fiscal shocks on various short-term indicators and concluded that shocks in government expenditures have a short-term negative effect on the industrial production (approximation of GDP). Sever, Drezgić and Blažić (2011) analysed the effects of various components of government expenditures on GDP. Main conclusions are that capital expenditure, goods and services consumption and subsidies have positive effect on GDP, while wages, current expenditures and subsidies decrease economic growth rate in the long run. Šimović and Deskar-Škrbić (2013), Deskar-Škrbić, Šimović and Ćorić (2014) and Šimović, Ćorić and Deskar-Škrbić (2015) used SVAR methodology and showed that government consumption has positive effects on GDP and various components of GDP in both, closed economy and open economy model frameworks, although the size of fiscal multipliers is lower in open economy framework. Grdović Gnip (2013) used SVAR model and showed that government consumption has positive impact on GDP, consumption and investments and Grdović Gnip (2014) used STVAR model (regime switching model) and concluded that fiscal policy is more effective in the recessionary period.

4.3. Methodology

Based on the conclusions from the existing literature and discussion on the characteristics of Croatian economy in this paper we use a New-Keynesian open economy model.

Following Castanheira (2015), the model has four sectors: households, government, firms and external sector. Households and government operate in an open economy framework which means that they consume both domestic and foreign goods and their behaviour is determined by domestic and foreign prices of goods. It is important to point out that we assume that government consumption can directly affect consumer's utility, depending on the relations between the two, i.e. whether private and government consumptions are substitutes, complements or unrelated. In addition, consumer behaviour is also affected by a return on cross-currency security, due to international risk sharing assumption. Firms operate in a monopolistic competition

environment and adjust prices in a staggered manner. Aggregate demand in our model is determined by domestic effective consumption and external demand. This narrative can be analytically expressed as follows.[44]

Households

A typical small open economy is inhabited by a representative household who seeks to maximize utility function made of two components effective consumption $\widehat{C}_t$ and hours worked N_t:

$$E_0 \sum_{t=0}^{\infty} \beta^t U(\widehat{C}_t, N_t) = E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{\hat{C}_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi}}{1+\varphi}\right) \tag{4.1}$$

where σ^{-1} is the measure of relative risk aversion and the inverse of the intertemporal elasticity of substitution, φ is the inverse of the elasticity of labour supply and β is the subjective discount factor. Effective consumption is a composite index of private consumption (C_t) and government consumption (G_t) and it is given by:

$$\hat{C}_t \equiv \begin{cases} [(1-\vartheta)C_t^{1-v} + \vartheta G_t^{1-v}]^{\frac{1}{1-v}}, & if\ v \neq 1 \\ C_t^{(1-\vartheta)} G_t^{\vartheta}, & if\ v = 1 \end{cases} \tag{4.2}$$

ϑ is the share of government expenditures in effective consumption. The parameter v^{-1} defines intertemporal complementarity or substitutability between private and public consumption. If these two types of consumption are substitutes, government consumption would crowd out private consumption and reduce the effectiveness of fiscal policy. If $\sigma^{-1} > v^{-1}$private and public consumption are complements, if $\sigma^{-1} < v^{-1}$ then private and public consumption are substitutes and if $\sigma^{-1} = v^{-1}$ goods are not related.

Both private consumption and government consumption are based on the basket of products which contains both, domestically produced (H) and imported goods (F):

$$C_t = \left[(1-\alpha)^{\frac{1}{\eta}} (C_{H,t})^{\frac{\eta-1}{\eta}} + \alpha^{\frac{1}{\eta}} (C_{F,t})^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta-1}{\eta}} \tag{4.3}$$

[44] In this section we will present only fundamental equations which are important for our research question while fully developed model can be found in Castanheira (2015).

$$G_t = \left[(1-\chi)^{\frac{1}{\eta}}(G_{H,t})^{\frac{\eta-1}{\eta}} + \chi^{\frac{1}{\eta}}(G_{F,t})^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta-1}{\eta}} \quad (4.4)$$

The parameter η defines complementarity or substitutability of domestic and imported goods and α and χ are shares of products purchased abroad. If domestic and foreign goods are complements than the increase of consumption will increase imports. Opposite holds in case the goods are substitutes.

Household budget constraint is defined by:

$$P_t^C C_t + E_t\{Q_{t,t+1}D_{t+1}\} \leq D_t + W_t N_t + T_t \quad (4.5)$$

where $P_t^C \equiv \left[(1-\alpha)(P_{H,t})^{1-\eta} + \alpha(P_{F,t})^{1-\eta}\right]^{\frac{1}{1-\eta}}$ is CPI, α is the share of imported goods in consumer basket, $P_{H,t}$ represents domestic prices and $P_{F,t}$ prices of imported goods. D_{t+1} is the nominal payoff in the period *t+1* of the portfolio, Q_{t+1} is the subjective discount factor for this payoff, W_t are wages per every hour work and T_t are lump sum transfers which don't affect incentives to work.

Government

Government budget constraint is defined similarly to household budget constraint given the same structure of private and government consumption:

$$P_t^G G_t + E_t\{Q_{t,t+1}D_{t+1}\} \leq T_t + D_t \quad (4.6)$$

where $P_t^G \equiv \left[(1-\chi)(P_{H,t})^{1-\eta} + \chi(P_{F,t})^{1-\eta}\right]^{\frac{1}{1-\eta}}$ is government price index, χ is the share of imported goods in government consumption basket, while other variables are identical to those in the households constraint. For simplicity we assume that government runs a balanced budget policy which means that there is no bond-financing of public deficit so the constraint can be written as:

$$P_t^G G_t \leq T_t \quad (4.7)$$

In this paper we focus on the effects of increased government consumption, which is exogenous and defined as an autoregressive process:

$$g_t = \rho_g g_{t-1} + \varepsilon_t^g \tag{4.8}$$

where $\rho_g \in [0,1]$ is a autocorrelation parameter accounting for the persistence of shock. ε_t^g is assumed to be *IID* process.

Consumer prices

We have defined CPI and government consumption prices index above. Here we introduce the effective bilateral terms of trade which are defined as the ratio of foreign prices $P_{F,t}$ and domestic prices $P_{H,t}$:

$$S_t = \frac{P_{F,t}}{P_{H,t}} = \left(\int_0^1 S_{i,t}^{1-\gamma} \right)^{\frac{1}{1-\gamma}} \tag{4.9}$$

γ represents substitutability between goods produced in different foreign countries.

Log-linearization of CPI, government price index and effective terms of trade and some analytical adjustments give us expressions for consumer price and government price inflation:

$$\pi_t^C \equiv \pi_t^H + \alpha \Delta s_t \tag{4.10}$$

$$\pi_t^G \equiv \pi_t^H + \chi \Delta s_t \tag{4.11}$$

This model assumes a complete exchange rate pass-through to import prices in every time horizons or there are no trade frictions. Pass-through effect can be described through the (log log-linearized) expressions:

$$p_{F,t} = e_t + p_t^* \tag{4.12}$$

$$s_t = e_t + p_t^* - p_{H,t} \tag{4.13}$$

where e_t is the nominal exchange rate and p_t^* is the world price index. Thus, both consumer and government price inflation are affected by changes in world prices and changes in nominal exchange rate.

International risk sharing

In SOE models it is commonly assumed that financial markets are complete which means that the return on a cross-border security affects the intertemporal allocation of

households' budget The ratio current vs. future consumption depends on the expected return of the security:

$$\beta\left(\frac{C_{t+1}^{i}}{C_{t}^{i}}\right)^{-v}\left(\frac{\hat{C}_{t+1}^{i}}{\hat{C}_{t}^{i}}\right)^{v-\sigma}\left(\frac{\varepsilon_{i,t}}{\varepsilon_{i,t+1}}\right)\left(\frac{P_{t}^{C,i}}{P_{t+1}^{C,i}}\right)=Q_{t} \tag{4.14}$$

Firms

Production function of firms which produce products j in this model is determined by labour N_t and technology A_t:

$$Y_t(j)=A_t(j)N_t(j) \tag{4.15}$$

Technology is defined as an AR(1) process $a_t = logA_t = \rho_a a_{t-1} + \varepsilon_t$.

Linearised production function takes the form $\mathrm{y_t} = \mathrm{a_t} + \mathrm{n_t}$. Profit maximizing firms have real marginal costs defined as:

$$mc_t = -\delta + w_t - p_{H,t} - a_t \tag{4.16}$$

where δ is an employment subsidy $log(1-\tau)$.

Firms set prices in a staggered manner (Calvo, 1983) which means that part of firms are selected to re-optimize profits changing prices with regard to new contingencies. Thus the domestic price index can be defined as:

$$\bar{p}_{H,t} = \mu + (1-\beta\theta)\sum_{k=0}^{\infty}(\beta\theta)^{k}E\{mc_{t+k} + p_{H,t+k}\} \tag{4.17}$$

where $\theta \in [0,1]$ is the share of firms which keep their prices fixed. $\mu = \left(\frac{\varepsilon}{\varepsilon-1}\right)$ is a mark-up. Domestic price inflation is given by:

$$\pi_{H,t} = \beta E_t\{\pi_{H,t+1}\} + \lambda\widehat{mc}_t \tag{4.18}$$

where $= \frac{(1-\beta\theta)(1-\theta)}{\theta}$) is a coefficient that relates the probability of resetting prices with the time discount rate. If $\lambda = 0$ prices are fully flexible and $\pi_{H,t} = \beta E_t\{\pi_{H,t-1}\}$.

Equilibrium

Domestic demand side of the economy is determined by private and government consumption which includes domestically produced products and foreign production which is consumed domestically and it is defined by:

$$Y_t(j) = (1-\vartheta)\left(\frac{P_{H,t}(j)}{P_{H,t}}\right)^{-\varepsilon}\left[(1-\alpha)\left(\frac{P_{H,t}}{P_t^C}\right)^{-\eta} C_t + \right.$$
$$\left.\alpha\int_0^1\left(\frac{P_{H,t}}{\varepsilon_{i,t}P_{F,t}^i}\right)^{-\gamma}\left(\frac{P_{F,t}^i}{P_t^{C,i}}\right)^{-\eta} C_t^i\, di\right] + \vartheta\left(\frac{P_{H,t}(j)}{P_{H,t}}\right)^{-\varepsilon}\left[(1-\chi)\left(\frac{P_{H,t}}{P_t^G}\right)^{-\eta} G_t \; + \right. \quad (4.19)$$
$$\left.\chi\int_0^1\left(\frac{P_{H,t}}{\varepsilon_{i,t}P_{F,t}^i}\right)^{-\gamma}\left(\frac{P_{F,t}^i}{P_t^{G,i}}\right)^{-\eta} G_t^i\, di\right]$$

Net exports are defined as:

$$nx_t = \frac{NX_t}{Y} \approx \frac{1}{Y}\left[Y_t - \frac{P_{H,t}}{P_t^C}C_t - \frac{P_{H,t}}{P_t^G}G_t\right] \quad (4.20)$$

As for the supply side, natural level of output is affected by domestic and foreign variables and represented by (* represents foreign):

$$y_t^n = \Gamma_0 + \Gamma_{y^*}y_t^* + \Gamma_{c^*}c_t^* + \Gamma_{\hat{c}^*}\hat{c}_t^* + +\Gamma_{\hat{c}}\hat{c}_t + \Gamma_g g_t + \Gamma_{g^*}g_t{}^* + \Gamma_a a_t \quad (4.21)$$

If output gap is defined as $\hat{y}_t = y_t - y_t^n$ dynamic IS equation for the open economy in terms of the output gap can be expressed as:

$$y_t^n = E_t[y_t^n + 1] - \Upsilon\left(i_t - E_t\left[\pi_{H,t+1}\right] - r_t^n\right)$$
$$-\left[\Upsilon + \Lambda + \left(\frac{1-\vartheta}{v}\right)\left(\frac{\alpha\Upsilon_{\varphi+1}}{\Upsilon_{\varphi+1}}\right)\right](\sigma - v)E_t\{\Delta\hat{c}_{t+1}\} \quad (4.22)$$

where r_t^n is the natural rate of interest of the domestic economy.

In the empirical part of the analysis, where we calculate empirical impulse response responses we use VAR model, based on real data. Reduced form VAR model is defined as:

$$X_t = \alpha + \sum_{i=1}^{p} A_i X_{t-i} + u_t \quad (4.23)$$

X_t is a vector of five endogenous variables, government consumption, number of employed, GDP, CPI and net exports. Based on economic theory we assume Cholesky

ordering of variables in a form[45] $X_t = [G_t, L_t, Y_t, CPI_t, NX_t]$. α is a constant, A_i are (KxK) parameter matrices, u_t is a noise process characterized by the assumption $u_t \sim (o, \sum_e)$ and p is number of lags.

The number of time lags in our model is set at two, according to AIC information criteria. The analysis is carried out on quarterly data from the first quarter of 2000 to the last quarter of 2016. VAR adequacy tests show that specified VAR model is stable and that null hypotheses of no autocorrelation and no heteroscedasticity of error terms are confirmed. Detailed data description is provided in the Appendix.

4.4. Empirical data and analysis

4.4.1. Calibration of the model

In our simulation we will assume a fixed exchange rate regime, taking into account the fact that fluctuations of exchange rate in Croatia are small, with standard deviation of monthly EUR/HRK in 2000-2016 period standing at 0.14. Thus, monetary policy framework is described under the assumption of $e_t = 0$. This assumption can also be found in Palić (2015), Arčabić et al. (2016a) and Arčabić et al. (2016b).

So-called deep parameters of our model are presented in Table 4.1.

Table 4.1 Calibrated parameters

Parameter	Description	Value	Source
α	share of private imports (average 2000-2016)	0.21	authors calculations
χ	share of public imports	0.14	Mikulić (2018)
ϑ	share of government expenditures in effective consumption (average 2000-2016)	0.25	authors calculations
φ^{-1}	elasticity of labour supply	0.33	Bokan et al. (2010)
v^{-1}	intratemporal elasticity of sub. btw private and public consumption	0.33	Bouakez and Rebei (2007)
σ^{-1}	intertemporal elasticity of substitution of effective consumption	0.50	Havranek et al. (2013)
γ	substitutability between goods produced in different foreign countries (perfect complements)	1.00	assumption
η	substitutability between domestic and foreign goods (perfect complements)	1.00	assumption

[45] Results are not sensitive to other specifications of ordering; available upon request

ε	elasticity of substitution between varieties produced within countries	4.00	Bokan et al. (2010)
β	time discount factor	0.99	Bokan et al. (2010)
θ	share of firms unable to reset prices	0.72	Pufnik and Kunovac (2013)
ρ_g	AR(1) government consumption (2000-2016)	0.80	authors calculations

Source: author

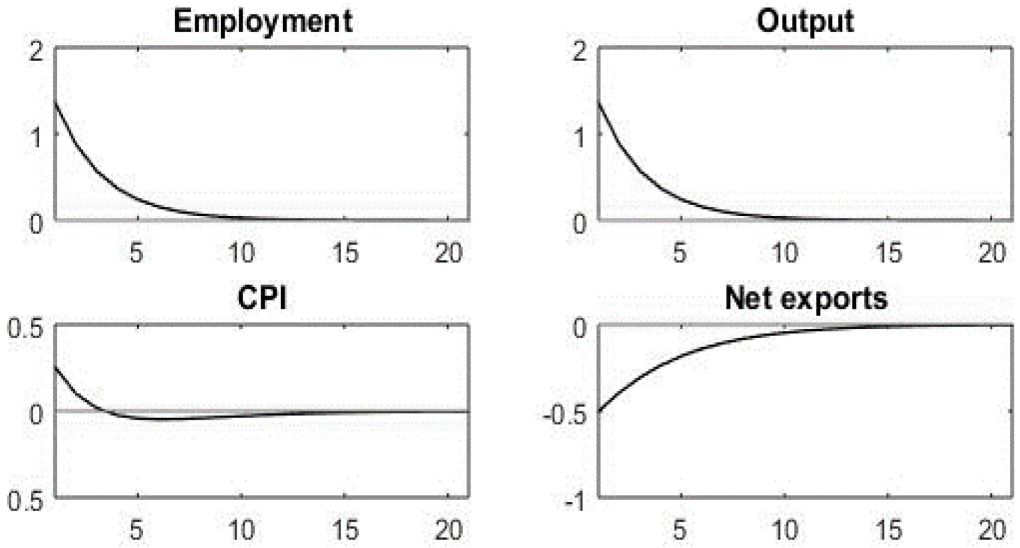
Share of private imports α is obtained from Mikulić (2018) who estimates import dependency of government consumption at 14%, based on input-output analysis. Share of government consumption in effective demand is calculated from CBS National accounts data as a ratio of final government consumption and the sum of total final household and government consumption. For elasticity of labour supply we follow Bokan et al. (2010) who modelled Croatian economy. Intratemporal elasticity of substitution between private and government consumption is obtained from Bouakez and Rebei (2007) there is no similar research for Croatia. Assumption on the complementarity of private and government consumption in Croatia seems plausible as correlation between real growth rates of private consumption and government consumption from 2000-2016 is 0.37. Intertemporal elasticity of substitution of effective consumption is obtained from Havranek et al. (2013). Assumptions on the substitutability of foreign and domestic goods indicate that we treat these products as perfect complements, which is a common approach in the literature. Elasticity of substitution between varieties produced within countries and time discount factor are obtained from Bokan et al. (2010). As a share of firms unable to reset prices we take results of a survey on Croatian firms conducted by Pufnik and Kunovac (2013) which indicate that 72% of firms change their prices only once a year or less. AR(1) model of government consumption is estimated using data on total final consumption of government from CBS National accounts data.

4.4.2. Effects of government consumption in calibrated DSGE model

In this section we present the effects of government consumption on selected variables, based on the calibrated DGSE model explained in the previous section. As noted above, our focus is on the effect of government consumption shock on employment, output, prices and net exports. Those variables are chosen as they reflect most common goals of economic policy, internal stability (full employment and price

stability) and external stability. On Figure 4. 1 we present the response of these macroeconomic variables to a one standard deviation increase in the steady state level of government expenditure. The responses are expressed in terms of impulse response functions (IRF). The vertical axis of impulse response functions measures the percentage deviations of the variables from the respective steady state values while the horizontal axis measures quarters.

Figure 4.1 Effects of government consumption in calibrated DSGE model



Source: author's calculations; Dynare 4.4.3 and MATLAB R2015a

Results of simulation show that employment and output react positively to increase of government consumption, which is in line with Keynesian theory. Higher government consumption in our model increases inflation through the mechanism of New-Keynesian Phillips curve. Finally, net exports deteriorate as increased consumption leads to stronger imports.

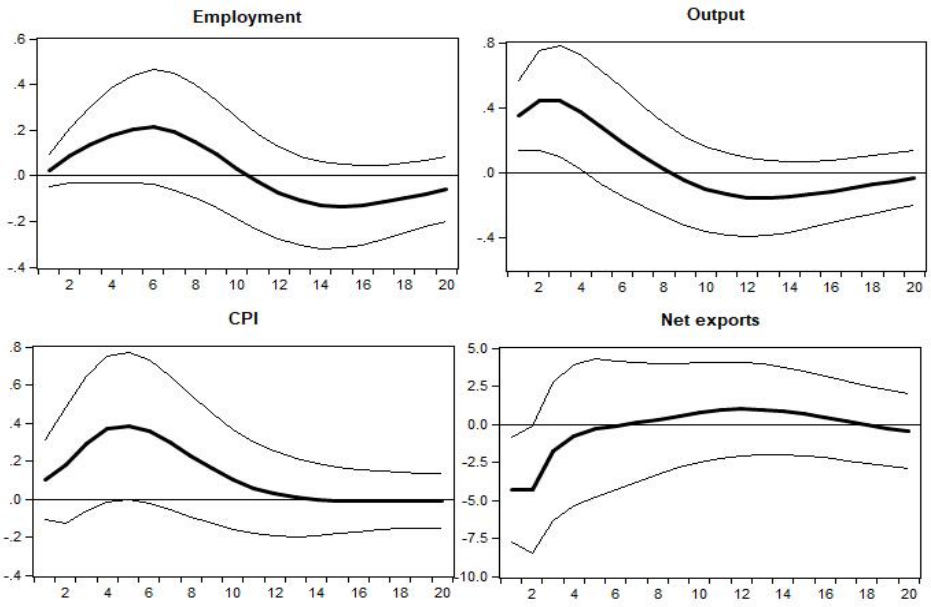
4.4.3. Effects of government consumption in estimated VAR model

In this section we present the results from estimated VAR model (23). All data is obtained from the Croatian Bureau of Statistics, seasonally-adjusted and expressed as deviations from steady states[46] to capture the nature of DSGE model where, as noted above, fundamental equations are also defined as deviations of variables from steady state. Variables used in VAR model are presented in the Appendix.

[46] Steady states are calculated using HP filter; only trend for net exports was calculated as a polynomial.

Figure 4.2 shows the effects of a one standard deviation shock in government consumption on other variables in the system. Bold lines represent the impulse response and thicker lines 95% confidence interval.

Figure 4.2 Effects of government consumption in estimated VAR model



Source: author's calculations; EViews

4.5. Results and discussion

As Figure 4.2 suggests, increase in government consumption has positive effect on employment, in line with the results of simulation but this effect is not statistically significant. Output reacts positively to increase of government consumption, in line with the results of simulation and this effect is statistically significant for four quarters after the shock. Developments of CPI are also in line with the simulation as CPI reacts positively to government consumption shock, although the effect is statistically significant between fourth and sixth quarter after the shock. Finally, net exports deteriorate in both, simulation and VAR model, but this effect is statistically significant only in first two quarters.

Presented results indicate that fiscal policy can have a significant impact on economic developments in Croatia. Its effects are Keynesian in nature as increased government consumption results in increased employment, output and inflation. These results are also in line with the conclusions of the existing literature on the effects of fiscal policy in Croatia, such as Sever, Drezgić and Blažić (2011), Šimović and Deskar-Škrbić

(2013), Grdović Gnip (2013), Grdović Gnip (2014), Deskar-Škrbić, Šimović and Ćorić (2014) and Šimović, Ćorić and Deskar-Škrbić (2015).

These results have important contribution to the existing literature as they show that fiscal policy in Croatia can be modelled through the lens of New-Keynesian small open economy theory. Models are a useful policy toolkit for academics, researchers and policy makers which provide framework for policy simulations and better understanding of fundamental factors that determine effectiveness of fiscal policy. As fiscal policy in Croatia is mostly based on discretionary *ad hoc* measures fiscal policy modelling could bring more analytical rigor and stability in planning and implementation of fiscal policy measures.

4.6. Conclusions

Based on the previous discussion we can conclude that results of simulation and empirical analysis mostly confirm our main hypotheses. Firstly, results of estimated VAR model show that government consumption has positive and statistically significant impact on output and prices and negative impact on trade balance. Effect on employment is positive but it is not statistically significant. Secondly, such reactions of macroeconomic variables on shocks in government consumption correspond to the results of calibrated New Keynesian DSGE model. Thus we can conclude that this model can be used in fiscal policy simulations in Croatia. The main contribution of this paper stems from the fact that it represents the first attempt of fiscal policy modelling in New Keynesian DSGE framework and the first paper in which author compares simulations of the effects of fiscal policy with estimated empirical results in Croatia. So far DSGE models in Croatia were used in the analysis of external shocks and/or reactions of monetary policy. In future research this model can be expanded with additional sectors (such as financial intermediaries), fiscal instruments (e.g. taxes) and variables (e.g. investments and capital formation). Presented results have important policy implications as they indicate that fiscal policy, as the key economic policy instrument in Croatia, has an important role in business cycle management and the responsibility of fiscal policy makers is to prudently use and adjust fiscal instruments in such a way that fiscal policy can always have a counter-cyclical, stabilizing effect on Croatian economy.

5. CONCLUDING REMARKS

Fiscal policy makers in small open economies are faced with much greater challenges than their peers in large and (more) closed economies. The effectiveness of fiscal policy in small open economies is limited by various factors. Firstly, part of fiscal stimulus in small open economies "leaks out" of the economic system through increased demand for imported goods. Secondly, the effectiveness of fiscal policy in stimulating economic growth is determined by the choice of the exchange rate regime that determines the behavior of monetary policy makers, faced with changes in fiscal policy, and the sole nature of monetary-fiscal policy mix. Theory and empirical evidence suggest that fiscal policy is more effective in countries with fixed exchange rates. In these countries fiscal policy is usually the only active counter-cyclical instrument of economic policy, while monetary policy has a more accommodative role. Thirdly, fiscal policy measures can affect nominal and real exchange rate and thus affect the competitiveness of the economy. Finally, besides the effects of fiscal policy on internal macroeconomic balances, growth and inflation, fiscal policy makers in small open economies have to evaluate and take into account the effects of fiscal policy measures on external balances, primarily trade balance. Concretely, fiscal policy measures aimed at promotion of economic growth in small open economies can lead to a deterioration of trade balance.

Understanding these complex relations requires adequate analytical framework. Thus, this dissertation provides a theoretical and empirical framework for the analysis of macroeconomic effects of fiscal policy in a small open economy, using the empirical evidence from Croatia. Through three central chapters this dissertation deals with various aspects of the effectiveness of fiscal policy in an open economy framework.

The focus of Chapter 2 is on the estimation of the size of fiscal multipliers in Croatia in an open economy framework. Results are based on SVAR models, identified by the extended version of Blanchard-Perotti procedure presented in Ravn and Spange (2014). The results of estimated models indicate that government consumption multiplier and net indirect tax multiplier, which measure the effects of a unit increase in these fiscal variables on private consumption and private aggregate demand, are lower compared to estimates in a closed economy framework (see, for example, Šimović and Deskar-Škrbić, 2013 and Grdović Gnip, 2014). More precisely, government consumption multiplier moves in a range between 0.83 and 1.03 for private

consumption and 0.71 and 1.17 for private aggregate demand. A larger multiplier for private aggregate demand can be partially explained by the multiplier-accelerator dynamics in private investments. As for the net indirect taxes, the multiplier is negative (in line with theoretical assumptions) and its size moves in a range between -0.7 and -1 for private consumption and for private aggregate demand it stands at 0.32. A lower size of the indirect tax multiplier in the second case can be explained by the fact that private consumption is more sensitive to changes in indirect taxes compared to investments. These results indicate that reactions of private consumption and aggregate demand to fiscal shocks in Croatia can be described as Keynesian. Also, a positive reaction of private consumption to government consumption shock indicates that these variables can be seen as complements and suggests that the Ricardain equivalence theorem in Croatia is not valid.

This analytical framework is also applied in Chapter 3. However, in this part of the analysis the focus is: (i) on direct comparison of the closed and open economy multipliers of government consumption and (ii) the comparison of multipliers in Croatia (managed peg exchange rate system), Slovenia (member of the euro area) and Serbia (small open economy with floating exchange rate regime and inflation targeting). In addition, the closed economy model is extended by inclusion of public debt as an important determinant of the size of fiscal multipliers and by two alternative measures of economic openness , foreign demand and imports ration. The main results (other results are available in the attached paper) point that the closed model multiplier of government consumption in all countries is notably higher compared to the multiplier estimated in an open economy framework. Also, the inclusion of public debt in the closed economy model reduces the size of the multiplier, which is in line with economic theory. Next, the definition of the openness of the economy notably affects the size of the multiplier as the multipliers estimated in models with foreign demand as an indicator of openness is significantly lower compared to models with imports ratio. This can be explained by the fact that imports ratio reflects the ‘leakage effect’ while foreign demand includes many other trade and financial linkages. Finally, the comparison across countries cannot provide clear conclusions but shows that economic openness and public debt reduce the size of multipliers in all countries, regardless of their size and monetary and exchange rate regime.

In Chapter 4 the empirical approach is determined by the use of calibrated small open economy New-Keynesian DSGE model. In this model government consumption can directly affect GDP, employment, trade balance and prices. Model simulations show that employment and output react positively to the increase of government consumption, which is in line with the Keynesian theory. Higher government consumption in the model increases inflation through the mechanism of the New-Keynesian Phillips curve. Finally, net exports deteriorate as increased consumption leads to stronger imports. Results from the model simulation are then assessed through the VAR model. Impulse responses from the empirical model mostly match the results from the calibrated model. The increase in government consumption has a positive effect on employment (not statistically significant), output and prices react positively while trade balance deteriorates. These results indicate that the presented DSGE model can be a useful starting point and a toolkit for the analysis of macroeconomic effects of fiscal policy in Croatia. However, the presented model is a calibrated small scale model. Future research should be based on larger models with alternative estimation methods.

To conclude, the empirical results in this dissertation suggest that the effects of fiscal policy in Croatia could be attributed as Keynesian. The rise of government consumption has positive effects on GDP, private aggregate demand, private consumption, employment and prices. Results also indicate that government and private consumption in Croatia can be seen as complements and that the Ricardian equivalence hypothesis is not valid in Croatia. On the other hand, a rise in net indirect taxes has negative effect on private aggregate demand and private consumption. However, results also suggest that the effectiveness of fiscal policy in Croatia is constrained by the openness of the economy and the level of public debt as both factors reduce the size of the fiscal multiplier. Also, increased public consumption deepens the trade deficit, which exerts pressure on external imbalances. Thus, the participants of the academic and public debate on the role and possibilities of fiscal policy in Croatia should always keep in mind that Croatia is a small open and relatively highly indebted economy. Such characteristics of the economy put notable challenges for fiscal policy makers in Croatia.

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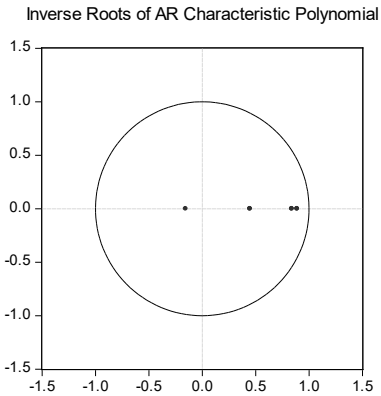
7. LIST OF FIGURES AND TABLES

8. APPENDICES

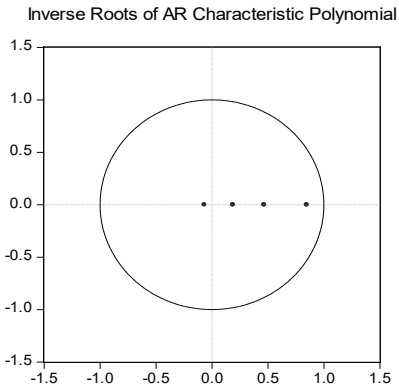
Appendix to Chapter 2

Stability tests

Model 1: Consumption



Model 2: Private AD



Serial correlation, normality and heteroskedasticity tests

Model 1 – Consumption

Residual serial correlation test		
Lags	LM-Stat	Prob
1	18.67130	0.2861
2	20.45608	0.2004
3	14.25282	0.5799
4	29.63618	0.0200
5	10.63893	0.8312
6	14.80011	0.5393

Residual normality test			
Component	Jarque-Bera	df	Prob.
1	3.671000	2	0.1595
2	3.251655	2	0.1967
3	2.110366	2	0.3481
4	4.272280	2	0.1181
Joint	13.30530	8	0.1018

Residual heteroskedasticity test		
Joint test:		
Chi-sq	df	Prob.
445.015	410	0.1126

Model 2 – Private AD

Residual serial correlation test		
Lags	LM-Stat	Prob
1	31.98907	0.1101
2	18.65219	0.2871
3	17.86708	0.3317
4	28.68041	0.0262
5	25.79784	0.0569
6	11.01960	0.8083

Residual normality test			
Component	Jarque-Bera	df	Prob.
1	3.732140	2	0.1547
2	1.683926	2	0.4309
3	1.569457	2	0.4562
4	3.380067	2	0.1845
Joint	10.36559	8	0.2403

Residual heteroskedasticity test		
Joint test:		
Chi-sq	df	Prob.
450.5530	410	0.0815

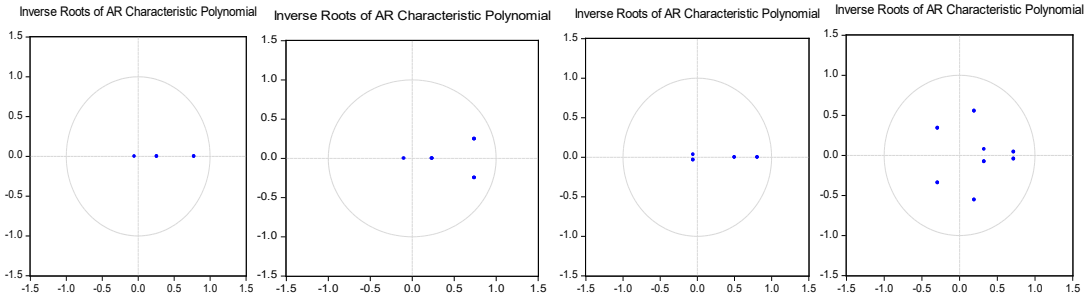
Source; authors calculations; Eviews

Appendix to Chapter 3

Croatia

Stability tests

Closed economy | Closed economy PD | Open economy - IM | Open economy - FD



Serial correlation tests (LM test)

Closed economy | Closed economy PD | Open economy - IM | Open economy - FD

Lags	LM-Stat	Prob	Lags	LM-Stat	Prob	Lags	LM-Stat	Prob	Lags	LM-Stat	Prob
1	17.53149	0.0410	1	28.45850	0.0279	1	28.02397	0.0314	1	25.51761	0.0612
2	17.92585	0.0360	2	27.61583	0.0351	2	33.58960	0.0662	2	29.54307	0.0705
3	12.38734	0.1923	3	23.06625	0.1120	3	22.28788	0.1341	3	23.29494	0.1061
4	4.720090	0.8580	4	7.626328	0.9592	4	9.307272	0.9002	4	8.035565	0.9478
5	9.488504	0.3935	5	13.05325	0.6689	5	19.02265	0.2675	5	14.96958	0.5269
6	5.523488	0.7865	6	12.83128	0.6851	6	8.908626	0.9171	6	14.37943	0.5705
7	6.676064	0.6708	7	9.684171	0.8826	7	6.705734	0.9785	7	15.62526	0.4794
8	12.65938	0.1786	8	13.38661	0.6443	8	21.86600	0.1476	8	20.27956	0.2079
9	9.555548	0.3876	9	11.28263	0.7917	9	10.86231	0.8179	9	13.15571	0.6613
10	15.15113	0.0869	10	20.99855	0.1786	10	16.27172	0.4342	10	12.54642	0.7056
11	7.259697	0.6101	11	15.25268	0.5062	11	25.85394	0.0561	11	14.39651	0.5692
12	9.398311	0.4013	12	15.68474	0.4752	12	22.78980	0.1195	12	9.134389	0.9078

Hetroskedasticity tests (White with cross terms)

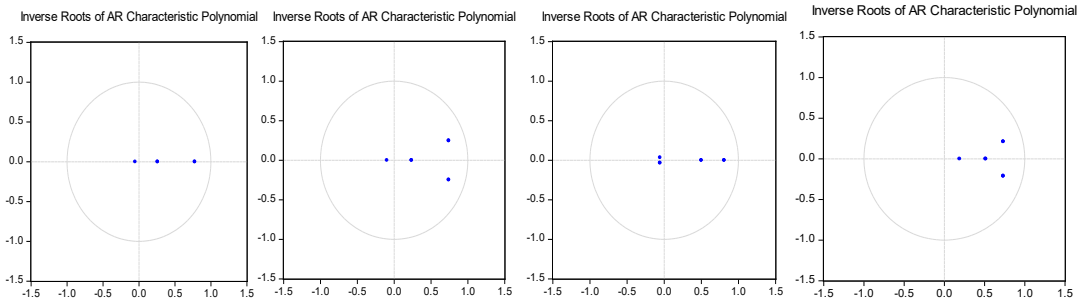
Model	Joint test probability
Closed economy	0.1029
Closed economy with public debt	0.1240
Open economy with imports ratio	0.0844
Open economy with foreign demand	0.4405

Source; authors calculations; Eviews

Serbia

Stability tests

Closed economy | Closed economy PD | Open economy - IM | Open economy - FD



Serial correlation tests (LM test)

Closed economy

Lags	LM-Stat	Prob
1	11.24367	0.2594
2	10.23880	0.3315
3	3.297493	0.9513
4	19.55337	0.0209
5	11.27335	0.2574
6	11.29936	0.2557
7	8.371931	0.4971
8	6.478227	0.6913
9	15.19566	0.0857
10	5.957377	0.7442
11	9.430323	0.3985
12	10.08510	0.3436

Closed economy PD

Lags	LM-Stat	Prob
1	19.48232	0.2444
2	20.80283	0.1862
3	10.92082	0.8143
4	22.58878	0.1252
5	21.17300	0.1720
6	27.86382	0.0328
7	10.67301	0.8292
8	10.18468	0.8568
9	21.53692	0.1588
10	13.71270	0.6201
11	19.55570	0.2409
12	9.268674	0.9019

Open economy - IM

Lags	LM-Stat	Prob
1	17.87702	0.3311
2	15.79522	0.4673
3	9.452673	0.8936
4	20.36782	0.2041
5	12.00437	0.7437
6	11.68975	0.7650
7	13.73002	0.6188
8	20.35987	0.2044
9	16.12159	0.4445
10	13.90909	0.6055
11	15.60077	0.4812
12	33.72212	0.0059

Open economy - FD

Lags	LM-Stat	Prob
1	16.65807	0.4080
2	15.34471	0.4996
3	13.49823	0.6360
4	19.52491	0.2424
5	18.25141	0.3094
6	8.387782	0.9365
7	14.18606	0.5849
8	14.55374	0.5575
9	13.93740	0.6034
10	18.52119	0.2943
11	15.72053	0.4726
12	24.35105	0.0821

Hetroskedasticity tests (White with cross terms)

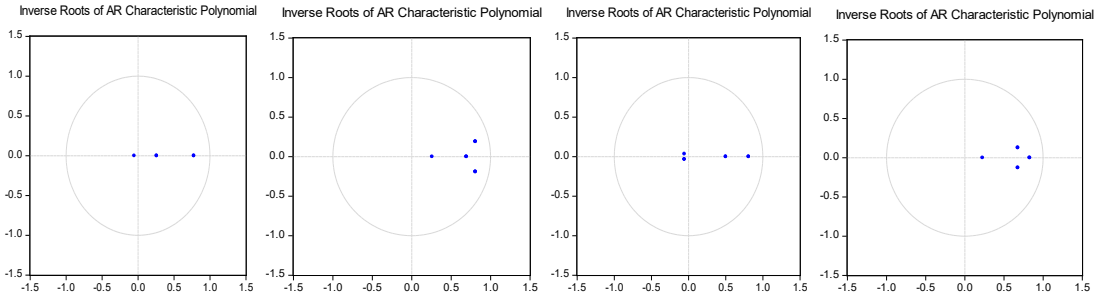
Model	Joint test probability
Closed economy	0.1789
Closed economy with public debt	0.0987
Open economy with imports ratio	0.2145
Open economy with foreign demand	0.3978

Source; authors calculations; Eviews

Slovenia

Stability tests

Closed economy Closed economy PD Open economy - IM Open economy - FD



Serial correlation tests (LM test)

Closed economy Closed economy PD Open economy - IM Open economy - FD

Lags	LM-Stat	Prob	Lags	LM-Stat	Prob	Lags	LM-Stat	Prob	Lags	LM-Stat	Prob
1	9.353437	0.4053	1	18.56893	0.2916	1	27.55536	0.0357	1	26.23973	0.0507
2	7.158081	0.6207	2	12.17031	0.7322	2	22.39637	0.1308	2	21.28071	0.1680
3	17.32710	0.0438	3	26.13897	0.0521	3	29.34173	0.0217	3	24.59215	0.0773
4	8.695508	0.4658	4	14.69762	0.5469	4	13.41732	0.6420	4	20.51843	0.1978
5	14.20833	0.1151	5	30.16136	0.0172	5	21.95481	0.1447	5	22.51817	0.1272
6	6.554481	0.6834	6	12.80885	0.6867	6	27.63813	0.0349	6	26.73194	0.0446
7	6.389936	0.7003	7	14.79616	0.5396	7	13.19142	0.6587	7	8.480992	0.9332
8	40.68077	0.0000	8	50.32185	0.0000	8	43.46125	0.0002	8	39.74493	0.0008
9	7.267288	0.6093	9	19.30241	0.2533	9	16.55095	0.4152	9	12.99814	0.6729
10	6.206989	0.7190	10	18.43641	0.2990	10	19.64698	0.2365	10	22.17093	0.1378
11	12.11970	0.2066	11	14.74686	0.5433	11	22.33693	0.1326	11	21.24477	0.1693
12	5.119682	0.8238	12	15.93208	0.4577	12	13.02803	0.6707	12	17.70329	0.3416

Hetroskedasticity tests (White with cross terms)

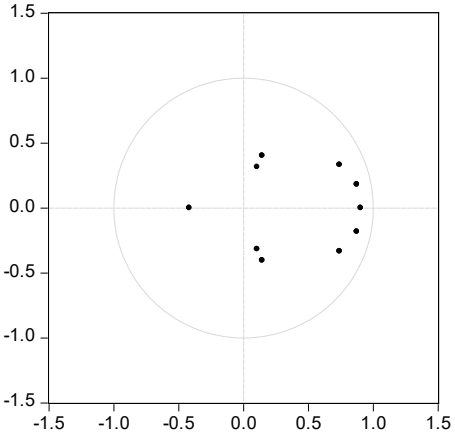
Model	Joint test probability
Closed economy	0.1120
Closed economy with public debt	0.0678
Open economy with imports ratio	0.1389
Open economy with foreign demand	0.4286

Source; authors calculations; Eviews

Appendix to Chapter 4

VAR adequacy tests

Inverse Roots of AR Characteristic Polynomial



VAR Residual Heteroskedasticity Tests: With Cross Terms
Date: 02/04/18 Time: 19:23
Sample: 2000Q1 2016Q4
Included observations: 66

Joint test:

Chi-sq	df	Prob.
350.6897	300	0.0833

VAR Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h
Date: 02/04/18 Time: 19:22
Sample: 2000Q1 2016Q4
Included observations: 66

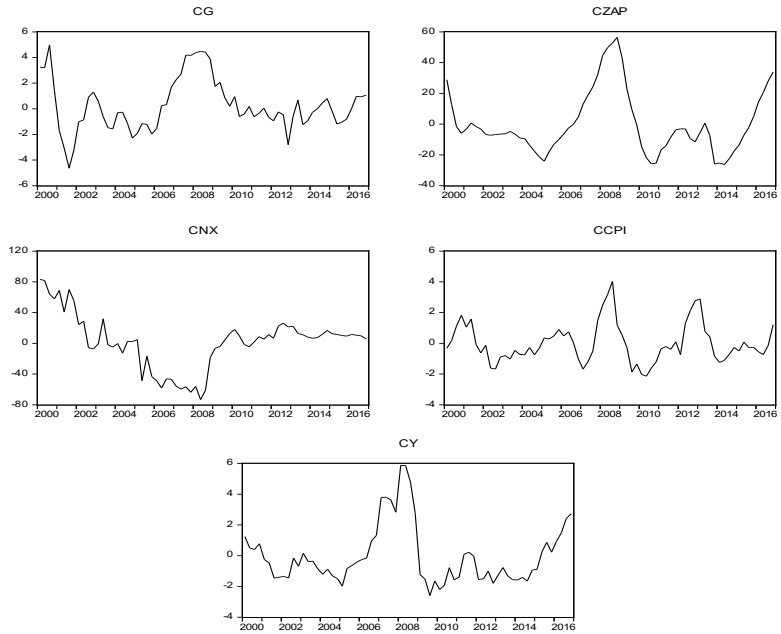
Lags	LM-Stat	Prob
1	29.40625	0.2473
2	44.73911	0.0690
3	33.75198	0.1133
4	34.23607	0.1030
5	15.97813	0.9155
6	25.66633	0.4256
7	9.053659	0.9985
8	38.50351	0.0413
9	30.32563	0.2123
10	24.31936	0.5010

Probs from chi-square with 25 df.

Source; authors calculations; Eviews

Variable	Definition	Source
Government consumption G	Government final consumption expenditure (ESA 2010) includes two categories of expenditures: the value of goods and services produced by general government itself other than own-account capital formation, and purchases by general government of goods and services produced by market producers that are supplied to households - without any transformation - as social transfers in kind (% of GDP)	Croatian Bureau of Statistics
Gross Domestic Product Y	The sum of the final uses of goods and services (all uses except intermediate consumption) measured in purchasers' prices, minus the value of imports of goods and services;	Croatian Bureau of Statistics
Employment ZAP	Employment is defined as the number of people engaged in productive activities in an economy. The concept includes both employees and the self-employed (million)	Croatian Bureau of Statistics
Net exports (NX)	Difference between exports and imports from National Accounts (% of GDP)	Croatian Bureau of Statistics
Inflation (CPI)	The consumer price index, abbreviated as CPI, measures the change over time in the prices of consumer goods and services acquired, used or paid for by households (%)	Croatian Bureau of Statistics

Source: author

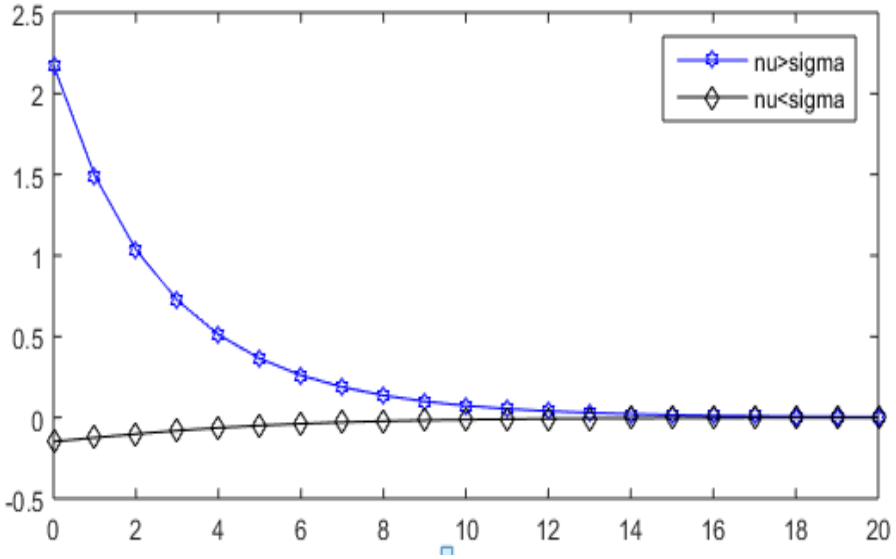


CG - cyclical component of government consumption; CZAP - cyclical component of employment; CNX - cyclical component of net exports; CCPI - cyclical component of CPI, CY - cyclical component of GDP

Source: author

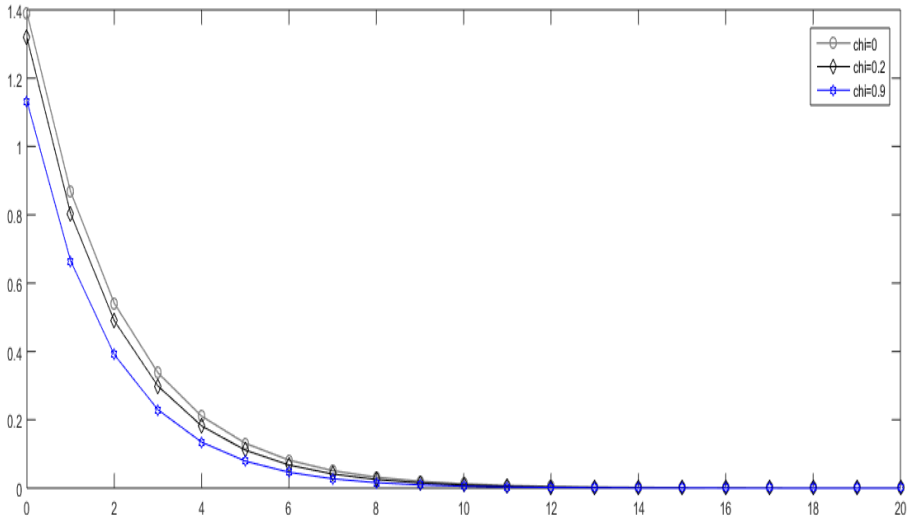
Sensitivity analysis

Effects of G shock on consumption when C and G are complements (nu>sigma) and substitutes (nu<sigma)



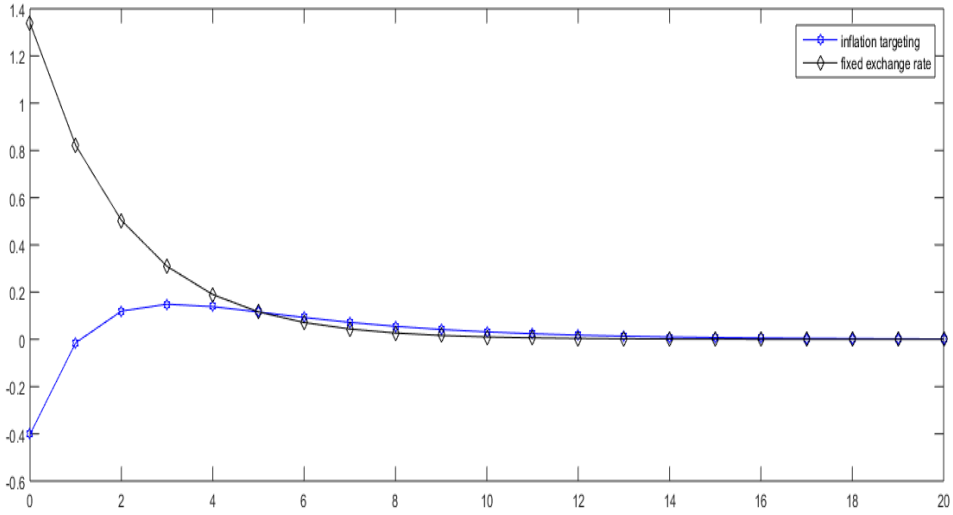
Source: author

Effects of G shock on output for various shares of import sin government consumptuon (chi)



Source: author

Effects of G shock on output depending on the monetary policy regime



Source: author

9. CURRICULUM VITAE

PERSONAL INFORMATION

Deskar-Škrbić Milan

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WORK EXPERIENCE

17/12/2018–Present

Senior Economic Researcher - Advisor

Croatian National Bank, Zagreb (Croatia)

Applied Macroeconometric Analysis

01/02/2018–15/12/2018

Senior Macroeconomic Analyst

Erste and Steiermarkische bank, Zagreb (Croatia)

Macroeconomic analysis and forecasting for SEE countries (Serbia, Montenegro, Macedonia, Bosina and Herzegovina)

01/03/2014–31/01/2018

Macroeconomic Analyst

Erste and Steiermarkische bank, Zagreb (Croatia)

Macroeconomic analysis and forecasting for SEE countries (Serbia, Montenegro, Macedonia, Bosina and Herzegovina)

01/11/2012–01/03/2014

Analyst

Arhivanalitika Business Advisory, Zagreb (Croatia)

Projects for Croatian Banking Association and Croatian Employers Association

01/09/2018–Present

Lecturer

Zagreb School of Economics and Management, Zagreb (Croatia)

Courses: International Economics, Public finance, Principles of Economics

2018

Lecturer

Faculty of Economics and Business Rijeka, Rijeka (Croatia)

Course: Fiscal Policy

2014–2015

Lecturer

Faculty of Economics and Business Zagreb, Zagreb (Croatia)

Course: Public Finance

2013–2014

Lecturer

Faculty of Economics and Business Zagreb, Zagreb (Croatia)

Course: Public Finance

EDUCATION AND TRAINING

2017–Present
PhD Economics
Faculty of Economics and Business Rijeka, Rijeka (Croatia)

2011–2012
MA Economics
Faculty of Economics and Business Zagreb, Zagreb (Croatia)

2007–2011
BA Economics
Faculty of Economics and Business Zagreb, Zagreb (Croatia)

2018
AmCham Talents Program
American Chamber of Commerce Croatia, Zagreb (Croatia)

12/2017
DCF Valuation Seminar
Grubišić i partneri d.o.o., Zagreb (Croatia)

06/2017
MS Excel - advanced degree
Algebra, Zagreb (Croatia)

06/2015
Applied Econometrics: time series
Faculty of Economics and Business Zagreb, Zagreb (Croatia)

06/2013
Applied Econometrics: panel data analysis
Faculty of Economics and Business Zagreb, Zagreb (Croatia)

07/2010
Summer School of Economics
Institute of Economics Belgrade, World Bank, Beograd (Serbia)

PERSONAL SKILLS

Mother tongue(s): Croatian

Foreign language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C2	C2	C2	C2	C2
	Vodnikova Language School, Zagreb, Croatia				

Levels: A1 and A2: Basic user - B1 and B2: Independent user - C1 and C2: Proficient user
Common European Framework of Reference for Languages

Digital skills
EViews
Statistica
Matlab/Dynare

ADDITIONAL INFORMATION

Books

Bićanić, I.; Deskar-Škrbić, M. (2018): *Makroekonomika I za ekonomiste i neekonomiste: s hrvatskim primjerima*, Ekonomski lab, Zagreb

Publications

Deskar-Škrbić, M. (2018): Dynamic Effects of Fiscal Policy in Croatia: Confronting New-Keynesian SOE Theory With Empitics; Zbornik radova Ekonomskog fakulteta u Rijeci : časopis za ekonomsku teoriju i praksu; Vol. 36, No.1, 81-100

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Deskar-Škrbić, M.; Drezgić, S.; Šimović, H. (2018): Tax Policy and Labour Market in Croatia: Effects of Tax Wedge on Employment; *Ekonomska istraživanja-Economic Research* (forthcoming)

Deskar-Škrbić, M.; Šimović, H.; Buljan, A. (2017): Fiscal multiplier determinants in the CESEE region; *Journal of Management and Financial Sciences;* Vol. 29; 11-26

Ćorić, T.; Deskar-Škrbić, M. (2017): Croatian path to the monetary union: why, when and what can we learn from our peers? , *Ekonomski pregled*, Vol. 68, No.6, 611-637

Deskar-Škrbić, M.; Šimović, H. (2017): Effectiveness of fiscal spending in Croatia, Slovenia and Serbia: the role of trade openness and public debt level; *Post-Communist Economies,* Vol. 29, No . 1

Šimović, H.; Deskar-Škrbić, M. (2016): Učinak promjena poreznih stopa na porezno opterećenje rada u Hrvatskoj. U: A. Stojanović i H. Šimović (ed.), *Aktualni problemi i izazovi razvoja financijskog sustava*. Zagreb: Ekonomski fakultet, 83-102.

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Šimović, H.; Deskar-Škrbić, M. (2016): Efikasnost poreza na dodanu vrijednost u Hrvatskoj; *Ekonomija/Economicx*, Vol. 22, No.2, 409-426.

Bićanić, I.; Deskar-Škrbić, M.; Zrnc, J. (2016): A Narrative Explanation of Breakpoints and Convergence Patterns in Yugoslavia and its Successor States 1952-2015; *WIIW Balkan Observatory Working Paper*, No. 122, 1-55

Šimović, H. and Deskar-Škrbić, M. (2015), Efficency of value added tax in Croatia, *Proceedings of the 9th International Conference European Entrepreneurship Forum 2015: Efficiency in the Private and the Public Sector*, Newton College, Prague, 144-151.

Deskar-Škrbić, M-; Šimović, H. (2015): The Size and Determinants of Fiscal Multipliers in Western Balkans: Comparing Croatia, Slovenia and Serbia: *Proceedings of the 1st International Conference*

European Fiscal Dialog 2015: Current Issues of Fiscal Policy, Newton College, Prague, 7-27.

Ćorić, T.; Šimović, H.; Deskar-Škrbić, M. (2015): Monetary and Fiscal Policy Mix in a Small Open Economy: the case of Croatia; *Economic Research*, Vol. 28, No 1., 407-421.

Bogdan, Ž., Deskar-Škrbić, M., Šonje, V. (2014): International Capital Flows and Economic Growth in CESEE: Structural Break in the Great Recession; *EFZG Working Paper Series,* No. 4/2014

Deskar-Škrbić, M.; Šimović, H. (2014): Porezna politika u Hrvatskoj u razdoblju od 2012.-2014. godine; *Političke analize*, Vol. 20, No. 1, 22-32.

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Šimović, H; Ćorić, T.; Deskar-Škrbić, M. (2014): Mogućnosti i ograničenja fiskalne politike u Hrvatskoj; *Ekonomski pregled*; Vol. 65, No. 6, 541-575.

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Deskar-Škrbić, M. (2011), Relationship and the role of government and markets in developmental state, *Ekonomska misao i praksa*, *2*, 569-578.

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Projects

2016 –2019 - "*Public finance sustainability on the road to monetary union"*, Croatian Science Foundation, IP-2016-06-4609, project leader: izv.prof.dr.sc. Hrvoje Šimović, Faculty of Economics and Business Zagreb

2014 – 2018 - *„Tax policy and fiscal consoilidation in Croatia"*, HCroatian Science Foundation, IP-2013-11-8174,, project leader: prof.dr.sc. Helena Blažić, Faculty of Economics Rijeka

2016 – *"Fiscal sustainability and debt dynamics in Croatia"*, University of Zagreb, DP- 079-2016, project leader: izv.prof.dr.sc. Hrvoje Šimović, Faculty of Economics and Business Zagreb

2015 – *"Sustainability of public finance and effectiveness of fiscal policy in Croatia",* SUniversity of Zagreb, DP- 079-2015, project leader: izv.prof.dr.sc. Hrvoje Šimović, Faculty of Economics and Business Zagreb

2014-2016 - "*Falling Behind and Catching Up in Southeast Europe"*, WIIW GDN projekt, project

leader: dr.sc. Robert Stehrer, The Vienna Institute for International Economic Studies

2014-2015 - "*Possibilities and Limitations of Fiscal Policy in Croatia"*, Hrvatska udruga banaka, project leader: prof.dr.sc. Hrvoje Šimović, Faculty of Economics and Business Zagreb

2011-2012 - „*Growth Diagnostics for Croatia"*, Hrvatska udruga poslodavaca, project leader: prof.dr.sc. Ivo Bićanić, Faculty of Economics and Business Zagreb

Conferences

Ahec Šonje, A.; Deskar-Škrbić, M.; Šonje, V. (2018): *Efficiency of Public Expenditure on Education: comparing Croatia with other NMS*; 12th annual International Technology, Education and Development Conference; Valencia, March 5-7, 2018

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Bićanić I., Deskar-Škrbić , M. and Zrnc; J. (2014): *An empirical study of structural flexibility, break points and convergence in Yugoslavia 1950-1990 at the national and regional level*;: WEastworkshop': Understanding the economic development of Eastern Europe, Belgrade, September 22-24 2014

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10. PROŠIRENI SAŽETAK

Republika Hrvatska je malo, otvoreno i visoko euroizirano gospodarstvo. Okvir monetarne politike u Hrvatskoj temelji se na održavanju stabilnosti nominalnog tečaja, koji predstavlja nominalno sidro monetarne politike. Tečajni režim se definira kao upravljano plivajući režim, a glavni instrument monetarne politike predstavljaju devizne intervencije. Takav monetarni i tečajni režim ograničavaju prostor protu-cikličkog djelovanja monetarne politike pa fiskalna politika predstavlja glavni instrument ekonomske politike, u smislu njezine stabilizacijske funkcije (Musgrave, 1959). Uloga i važnost fiskalne politike postat će još više naglašena nakon što Hrvatska postane članica euro područja i usvoji zajedničku monetarnu politiku Europske središnje banke (ECB). Zato je razumijevanje ograničenja i mogućnosti fiskalne politike u Hrvatskoj od izrazite važnosti i za istraživače i za nositelje ekonomske politike. Kako bi se ova ograničenja i mogućnosti mogle razumjeti potreban je adekvatan analitički okvir koji omogućuje empirijsku procjenu makroekonomskih učinaka fiskalne politike, ali i okvir koji daje temelj za izradu simulacija djelovanja fiskalne politike u Hrvatskoj.

Empirijska literatura o stabilizacijskom djelovanju fiskalne politike, kroz istraživanje utjecaja državne potrošnje i poreza na agregatnu potražnju i njezine osnovne sastavnice, počela se snažnije razvijati tijekom sedamdesetih i osamdesetih godina dvadesetog stoljeća. Do sredine sedamdesetih godina prevladavao je kejnezijanski pogled na fiskalnu politiku i ona se smatrala važnim i adekvatnim alatom za stabilizaciju gospodarstva. Vjerovalo se da se instrumentima fiskalne politike u fazi ekspanzije može spriječiti tzv. „pregrijavanje“ gospodarstva, dok se u fazi recesije različitim instrumentima može potaknuti gospodarska aktivnost (Blinder i Solow, 1976; Stein, 1990). Međutim, ovaj pogled na fiskalnu politiku počeo se mijenjati nakon što je Rober Barro (Barro, 1974) ponovno istaknuo važnost stare hipoteze Davda Ricarda, tzv. Rikardijansku ekvivalenciju. Rikardijanska ekvivalencija ističe da povećanje državne potrošnje, bez obzira je li financirano sadašnjim povećanjem poreza ili zaduživanjem, koje podrazumijeva povećanje poreznog opterećenja u budućnosti, ne može pozitivno djelovati na agregatnu potražnju jer će dovesti do

smanjenja osobne potrošnje. Ova teorijska hipoteza je dobila uporište i u značajnim emprijskih istraživanjima iz tog vremena, koja su provedena na podacima za Sjedinjene Američke Države (SAD). Primjerice, Tanner (1979) i Kormendi (1983) pokazali su da fiskalna ekspanzija dovodi smanjena privatne potrošnje. Do sličnih zaključaka su došli Aschauer (1985) i Hall (1986). S druge strane, Feldstein (1982) je zaključio kako hipoteza Rikardijanske ekvivalencije nije u skladu s empirijskim istraživanjima, dok je Barro (1981) pokazao kako se makroekonomski učinci fiskalne politike mogu razlikovati u slučaju privremene promjene fiskalne politike i trajne promjene fiskalne politike. Barro je također istaknuo kako ni ekonomska teorija ni empirijska istraživanja ne pružaju uvjerljive dokaze o učinkovitosti fiskalne politike. Kontradiktorni rezultati empirijskih istraživanja i nedostatak konsenzusa o učinkovitosti monetarne politike doveli su do pada značajnosti i uloge fiskalne politike, a uloga upravljanja agregatnom potražnjom u tom je razdoblju pripala monetarnoj politici. Ta promjena se odrazila i na akademsku literaturu. Solow (2002) je istaknuo kako je „ozbiljna diskusija o fiskalnoj politici gotovo nestala“, a Krugman (2009) kako je u razdoblju od osamdesetih godina do početka dvije tisućitih „cijela diskusija o fiskalnoj politici nestala iz makroekonomike“.

Međutim, krajem devedesetih godina i početkom dvije tisućitih empirijska literatura o učincima fiskalne politike počela je ponovno rasti i razvijati se, a nakon Velike recesije, izazvane financijskom krizom 2008. godine, nositelji ekonomske politike i akademski ekonomisti počeli su ponovno cijeniti ulogu fiskalne politike i vjerovati u njezine mogućnosti makroekonomske stabilizacije. Ova promjena je velikim dijelom bila i posljedica činjenice da je u mnogim zemljama na svijetu monetarna politika dotaknula donju granicu kamatnih stopa i suočila se tzv. zamkom likvidnosti. Dok su se diskusije i empirijska istraživanja u sedamdesetim i osamdesetim godinama uglavnom fokusirale na odnos između državne potrošnje i privatne potrošnje, i djelomično na tzv. učinak istiskivanja, gdje rast državne potrošnje dovodi do „istiskivanja“ osobne potrošnje (i/ili privatnih investicija), novija literatura se fokusirala na koncept ukupnog fiskalnog multiplikatora. Fiskalni multiplikator se definira kao analitički izraz koji pokazuje za koliko se jedinica mijenja realni BDP uslijed jedinične promjene državne

potrošnje (multiplikator državne potrošnje) ili jedinične promjene poreza (multiplikator poreza). Pouzdana procjena fiskalnog multiplikatora zahtijeva adekvatnu identifikaciju egzogenih fiskalnih šokova, tj. šokova koji su ortogonalni (nisu korelirani) s poslovnim ciklusom. U literaturi postoji nekoliko temeljnih pristupa identifikaciji egzogenih fiskalnih šokova. Prvi je tzv. narativni pristup (Ramey i Shapiro, 1998; Romer i Romer, 2010) koji koristi povijesne informacije o promjenama različitih legislativa koje su rezultirale promjenama u fiskalnoj politici, a koje omogućavaju da se razlikuje dio fiskalnih aktivnosti koje su rezultat reakcije na kretanje i stadije poslovnog ciklusa od onih koje su određene i koje su rezultat nekih egzogenih faktora. Drugi pristup se temelji na modelima vektorske autoregresije (eng. vector autoregression models, VAR), koji se identificiraju rekurzivnim pristupom i tzv. nultim restrukcijama (Choleski dekompozicija i poredak varijabli prema smjeru uzročnosti), koji je prvi put predložen u radu Fatasa i Mihova (2001). Treći, vjerojatno najpopularniji i najkorišteniji pristup, predložili su Blanchard i Perotti (2002), ovaj pristup se naziva Blanchard-Perotti pristup. U ovom pristupu se na odnos između fiskalnih varijabli i makroekonomskih varijabli, prvenstveno BDP-a, postavljaju nulte restrikcije i restrikcije temeljene na elastičnosti fiskalnih varijabli u odnosu na BDP, čime se iz odnosa apstrahira utjecaj djelovanja automatskih stabilizatora. Konačno, Mountford i Uhlig (2009) su predložili postavljanje restrikcija na predznak (eng. sign restriction) međusobnog utjecaja i veze između fiskalnih i makroekonomskih varijabli. Konačno, kako bi izbjegli problem identifikacije egzogenih šokova, neki autori predlažu korištenje ciklički prilagođenog primarnog salda (CAPB) kao mjere fiskalne politike, koja adekvatno pokazuje karakter fiskalne politike nakon eliminacije učinka poslovnog ciklusa na prihode i rashode proračuna (e.g. Alesina and Ardagna 2010). Svi navedeni pristupi su detaljnije objašnjeni u središnjem dijelu disertacije.

Tema makroekonomskih učinaka fiskalne politike u domaćoj literaturi je prilično zastupljena. Počevši od ranijih istraživanja, Pivac i Jurun (2002) koristili su vektorski model korekcije pogreške (eng. vector error correction model, VECM) i pronašli pozitivnu vezu između veličine proračuna u BDP-u i BDP-a u Hrvatskoj. Benazić (2006) pokazao je kako rast državnih rashoda dovodi do rasta BDP-a i

do rasta državnih prihoda. Rukelj (2009) koristio je strukturni VEC model kako bi analizirao interakciju fiskalne i monetarne politike u Hrvatskoj i zaključio je kako su učinci fiskalne politike na ekonomsku aktivnost većinom pozitivni, ali da ovise o identifikaciji modela. Vizke i Tkalec (2010) koristile su višestruku linearnu regresiju i pokazale kako državna potrošnja dovodi do učinka istiskivanja u prerađivačkom sektoru, tj. da porast državne potrošnje dovodi do smanjenja proizvodnje u prerađivačkom sektoru. Ravnik i Žilić (2011) prvi su koristili strukturni VAR model i primijenili Blanchard-Perotti metodu identifikacije te su pokazali kako šok rasta državnih rashoda smanjuje industrijsku proizvodnju, a šok rasta državnih prihoda povećava industrijsku proizvodnju. Sever, Drezgić i Blažić (2011) koristili su VAR model i procijenili učinke različitih kategorija državnih rashoda na BDP te pokazali kako neke kategorije rashoda (kapitalni izdaci i potrošnja dobara i usluga) povećavaju BDP, dok neke kategorije imaju negativan učinak na BDP (plaće i subvencije). Šimović i Deskar-Škrbić (2013) također su koristili Blanchard-Perotti pristup u SVAR modelu s tri varijable te procijenili pozitivni multiplikator državne potrošnje i negativni multiplikator poreza (iako učinak poreza nije bio statistički signifikantan). Grdović Gnip (2014) koristila je sličan pristup, ali je proširila SVAR model uključivanjem dodatne varijable i analizom utjecaja promjene ekonomskog režima (recesija ili ekspanzija) na veličinu multiplikatora. Autorica je procijenila pozitivan multiplikator državne potrošnje i negativan multiplikator poreza te je pokazala kako je multiplikator državne potrošnje veći u recesiji. Grdović Gnip (2015) je koristila SVAR model s pet varijabli i Blanchard-Perotti metodom identifikacije te je također pokazala kako je multiplikator državne potrošnje pozitivan, a poreza negativan. Šimović (2017) je pokazao kako visoka razina javnog duga smanjuje učinkovitost fiskalne politike budući da smanjuje veličinu multiplikatora državne potrošnje.

Navedena istraživanja u domaćoj ekonomskoj literaturi predstavljaju vrlo važan, ažuran i informativan analitički okvir i mogu služiti kao važna analitička podloga za diskusiju o makroekonomskim učincima fiskalne politike u Hrvatskoj. Međutim, sva navedena istraživanja previdjela su ulogu i važnost vanjskih šokova za makroekonomska kretanja u Hrvatskoj iako su vanjski šokovi vrlo važne, ponekad i dominantne, odrednice kretanja BDP-a i inflacije (Jovičić i Kunovac,

2015; Dumičić, Palić i Šprajček, 2015). Stoga modeli koji su procijenjeni bez uključivanja vanjskih varijabli (šokova) u analizu vrlo vjerojatno pate od problema pristranosti zbog izbačene značajne varijable iz analize (eng. omitted variable bias). Konkretnije, procjena učinaka fiskalne politike na makroekonomske varijable u Hrvatskoj, koja zanemaruje učinak vanjskih šokova na makroekonomska kretanja, može dovesti do precijenjenih učinaka fiskalne politike i precijenjene veličine fiskalnih multiplikatora. Zato kredibilniji rezultati djelovanja fiskalne politike na makroekonomske varijable u Hrvatskoj zahtijevaju analitički pristup koji uzima u obzir činjenicu da je Hrvatska mala otvorena ekonomija, snažno izložena kretanjima u međunarodnom okruženju. Također, nijedno postojeće istraživanje u domaćoj literaturi ne koristi alate ekonomskih modela, poput dinamičkih stohastičkih modela opće ravnoteže (eng. dynamic stochhstic general equlibrium models, DSGE), za simulaciju ili procjenu makroekonomskih učinaka fiskalne politike u Hrvatskoj. Dosadašnja istraživanja u kojima se koriste DSGE modeli ne uključuju učinke fiskalne politike već analiziraju ili mehanizme širenja recesije kroz gospodarski sustav (Bokan i dr., 2010) ili učinak realnih šokova na gospodarstvo (Palić, 2015; Arčabić i dr., 2016a i 2016b; Palić, Dumićić i Barbić, 2017) ili učinke monetarne politike (Palić, 2018).

Empirijska literatura o učincima fiskalne politike u otvorenim ekonomijama ukazuje na različite aspekte djelovanja fiskalne politike koji se ne uzimaju u obzir kada se koriste modeli zatvorene ekonomije. Primjerice, autori pokazuju da fiskalna politika može imati značajan utjecaj na trgovinsku bilancu (Lane i Perotti, 2003; Beetsma i Giuliodori, 2011, Ilzetzki i dr., 2013). Istraživanja potvrđuju i teorijsku pretpostvku da postoje značajne razlike u veličini fiskalnih multiplikatora u ekonomijama s fiksnim tečajem i fluktirajućim tečajem (Corsetti i dr., 2012; Ilzetzki i dr. 2013). Također, neki autori ukazuju na značajan učinak fiskalne politike na realni tečaj (Monacelli i Perotti, 2006; Benetrix i Lane, 2010). Konačno, istraživanja pokazuju kako stupanj otvorenosti ekonomije ima značajan učinak na veličinu fiskalnih multiplikatora (Ilzetzki i dr., 2013, Riguzzi i Wegmueller, 2016). Ova istraživanja većinom daju potporu nekim temeljnim teorijskim pretpostavkama. Prvo, istraživanja pokazuju kako je fiskalna politika učinkovitija u zemljama s fiksnim tečajem. Zatim pokazuju kako fiskalna ekspanzija dovodi

do pogoršanja trgovinske bilance i aprecijacije realnog tečaja. Konačno, snažna otvorenost ekonomije smanjuje veličinu fiskalnih multiplikatora preko tzv. učinka izlijevanja (eng. leakage effect) budući da snažnija domaća potražnja, potaknuta fiskalnom ekspanzijom, dovodi do rasta uvoza. Većina istraživanja u ovom području se temelji na modelima panel analize, a broj istraživanja koja se temelje na pristupu vremenskih serija ili, konkretnije, na modelima vektorske autoregresije (VAR) je prilično skroman. Prema autorovim saznanjima, jedina istraživanja koja direktno uključuju učinak otvorenosti ekonomije u SVAR modele su Ravn i Spange (2014) i Teodovski, Petrevski, Bogoev (2016).

Na temelju navedenog mogu se definirati temeljni ciljevi i doprinosi ove doktorske disertacije.

Osnovni ciljevi ove doktorske disertacije su analizirati učinke državne potrošnje i neto indirektnih poreza na makroekonomske varijable u Hrvatskoj koristeći analitički okvir male otvorene ekonomije te ocijeniti adekvatnost jednostavnog, kalibriranog, DSGE modela male otvorene ekonomije za simulaciju učinaka promjene državne potrošnje u Hrvatskoj.

Navedeni ciljevi ujedno predstavljaju i temeljne doprinose ove doktorske disertacije budući da radovi u ovoj disertaciji donose prvu analizu makroekonomskih učinaka fiskalne politike i procjenu veličine fiskalnih multiplikatora u Hrvatskoj u okviru modela koji uključuju učinke vanjskih šokova na domaća makroekonomska kretanja. Također, u ovoj disertaciji je predstavljen prvi rad u domaćoj literaturi u kojem se promatraju učinci promjene državne potrošnje na različite makroekonomske varijable kroz prizmu kalibriranog novo-kejnezijanskog DSGE modela male otvorene ekonomije.

U uvodnom poglavlju ove doktorske disertacije je predstavljen teorijski i konceptualni okvir istraživanja. Teorijsko uporište disertacije predstavljaju različiti kejenizijanski modeli i koncepti. Prvo, na temelju modela tzv. Kenyesovog križa definiran je koncept fiskalnog multiplikatora te su objašnjene njegove temeljne odrednice. U zatvorenoj ekonomiji je veličina multiplikatora određena graničnom sklonošću potrošnji i poreznom stopom, dok u modelu otvorene ekonomije važnu ulogu igra i granična sklonost uvozu. Zbog toga je po definiciji fiskalni multiplikator

manji o otvorenim ekonomijama budući da se dio fiskalnog stimulansa „izlijeva“ kroz povećani uvoz u inozemstvo (eng. leakage effect). Osim utjecaja granične sklonosti uvozu na veličinu multiplikatora, učinkovitost fiskalne politike u malim otvorenim ekonomijama je određena i tečajnim režimom, na što upućuje Mundell-Flemingov model, koji predstavlja proširenje klasičnog kejnezijanskog IS-LM modela. Mundell-Flemingovom modelu učinkovitost fiskalne politike, u smislu utjecaja na ukupnu agregatnu potražnju, tj. dohodak, ovisi o interakciji monetarne i fiskalne politike. Primjerice, u režimu fleksibilnog tečaja, rast potražnje potaknut fiskalnim stimulansom dovodi do rasta domaće kamatne stope, što potiče priljev kapitala, koji stvara aprecijacijske pritiske na domaću valutu. Budući da središnja banka u režimu fleksibilnog tečaja ne „brani“ tečaj aprecijacija domaće valute dovodi do smanjenja neto izvoza, što može u potpunosti anulirati utjecaj fiskalne ekspanzije na ukupni dohodak. S druge strane, u režimu fiksnog tečaja bi središnja banka na aprecijacijske pritiske reagirala otkupom deviza na devinom tržištu i plasmanom likvidnosti u domaćoj valuti, što bi smanjilo kamatu te aprecijacijske pritiske i omogućilo potpuni prijenos fiskalnog stimulansa na gospodarstvu, u iznosu veličine fiskalnog multiplikatora. Uloga tečajnog režima je važna za razumijevanje mogućnosti i ograničenja fiskalne politike u Hrvatskoj te za pristup ekonomskom modeliranju njezinih makroekonomskih učinaka, što će biti detaljnije objašnjeno u nastavku. Osim u navedenim modelima, teorijska podloga ove disertacije se može pronaći i u relativno novoj ekonomskoj literaturi nove otvorene makroekonomike (eng. New Open Economy Macroeconomics), koja proširuje i nadopunjuje Mundell-Flemingov model uvođenjem tzv. mikro osnova. U ovoj disertaciji se prati metodološki pristup najzastupljenijeg tipa modela u ovoj literaturi, novo-kejnezijanskog dinamičkog stohastičkog modela opće ravnoteže za male otvorene ekonomije (eng. New-Keynesian open eocnomy DSGE model) (Clarida i dr., 2002; Galí i Monacelli, 2005; Galí i Monacelli, 2008). Kalibracija (i procjena) ovih modela ovisi o nekim važnim pretpostavkama. Prvo, učinkovitost fiskalne politike značajno je određena pretpostavkom o odnosu između državne potrošnje i privatne potrošnje. Ukoliko su privatna potrošnja i državna potrošnja supstituti, rast državne potrošnje dovest će do istiskivanja privatne potrošnje pa fiskalna ekspanzija može dovesti do

smanjenja BDP-a, a ne njegovog povećanja, što bi bilo u skladu sa stabilizacijskim djelovanjem fiskalne politike i kejnezijanskim pogledom na njezine učinke. Ovaj odnos državne i privatne potrošnje je vezan uz ranije objašnjenu hipotezu Rikardijanske ekvivalenije. Osim toga, na učinkovitost fiskalne politike ovisi i pretpostavka o obliku funkcije korisnosti potrošača. U ovoj disertaciji se slijede radovi (npr. Kormendi 1983, Aschauer 1985; Gali i Monacelli, 2008; Coenen i dr., 2013) koji pretpostavljaju da je državna potrošnja sastavni dio funkcije korisnosti potrošača, tj. da preferencije potrošača o državnoj i privatnoj potrošnji nisu odvojene (eng. non-seperable preferences). Osim pretpostavki o vezi između privatne i državne potrošnje, učinkovitost fiskalne politike u otvorenim ekonomijama i modelima nove otvorene makroekonomike ovisi i o uvoznoj orijentiranosti gospodarstva, pri čemu je posebno važno istaknuti da, osim osobne potrošnje i investicija, i državna potrošnja može sadržavati visoku uvoznu komponentu, što znači da državna potrošnja na trgovinsku bilancu otvorene ekonomije može djelovati direktno (kroz uvoznu komponentu) i indirektno (povećanjem osobne potrošnje i ukupnog dohotka, što u uvozno orijentiranim ekonomijama stvara pritiske na uvoz). Konačno, u ovim modelima je važna pretpostavka o vrsti tečajnog režima, pri čemu se za gospodarstva koja imaju i režim fiksnog tečaja pretpostavlja da nemaju jasno definiranu funkciju reakcije središnje banke te se pretpostavlja nulta varijabilnost nominalnog tečaja.

Kako bi se u ove teorijske pretpostavke stavile u kontekst analize učinaka fiskalne politike u Hrvatskoj, uvodno poglavlje sadrži i neke stilizirane činjenice o hrvatskom gospodarstvu. Prvo, u disertaciji je pokazano kako se Hrvatska može smatrati otvorenom ekonomijom budući da ukupna trgovinska razmjena s inozemstvom (zbroj uvoza i izvoza roba i usluga) čini preko 100% BDP-a. Po ovom indikatoru Hrvatska pripada skupini zemalja s otvorenošću gospodarstva iznad prosjeka Europske unije. Za učinkovitost fiskalne politike posebno je važna uvozna zavisnost gospodarstva. U tom kontekstu je u disertaciji prikazano da je hrvatsko gospodarstvo relativno visoko uvozno zavisno budući da uvozna komponenta čini oko 30% ukupne osobne potrošnje, 40% investicija i izvoza te oko 15% državne potrošnje, a da se udio uvoza u BDP-u kreće oko 50%, s tendencijom rasta. Također, u disertaciji je pokazano kako su poslovni ciklusi u

Hrvatskoj visoko korelirani s ciklusima euro područja te da vanjski šokovi predstavljaju vrlo važnu odrednicu ekonomskih kretanja u Hrvatskoj, što je u skladu s nalazima u različitim istraživanjima domaćih autora (npr. Arčabić, 2011; Kotarac, Kunovac i Ravnik, 2017; Dumičić, Palić i Šprajček, 2015; Jovičić i Kunovac, 2017). Ovakvi odnosi naglašavaju važnost modeliranja učinaka fiskalne politike u Hrvatskoj u analitičkom okviru male otvorene ekonomije. Slijedeće, u radu je pokazano da je varijabilnost nominalnog tečaja u Hrvatskoj vrlo mala (standardna devijacija kvartalne promjene tečaja od 2000. do 2018. iznosi 0,13) te je objašnjeno da se u tom kontekstu hrvatsko gospodarstvo u ekonomskim modelima može modelirati kao gospodarstvo s fiksnim tečajem. Ovaj stav dodatno potvrđuje i nova klasifikacija tečajnog režima od strane MMF-a, koji tečajni režim u Hrvatskoj sada klasificira kao stabilizirani režim, što je najrigidniji oblik upravljano plivajućeg tečaja. Konačno, u uvodu su prikazane i važne stilizirane činjenice o fiskalnim kretanjima u Hrvatskoj. Pokazano je kako Hrvatska prema udjelu državne potrošnje (prema definiciji nacionalnih računa) u BDP-u pripada skupini novih zemalja članica s najvišim udjelom. Također je pokazano kako Hrvatska pripada skupini zemalja s najvišim udjelom indirektnih poreza u BDP-u u cijeloj Europskoj uniji. Ovako važna uloga državne potrošnje i indirektnih poreza Hrvatskoj opravdava njihovu ulogu glavnih fiskalnih instrumenata u analizi u ovoj disertaciji. Konačno, u uvodnom dijelu disertacije je pokazano i kako je fiskalna politika u Hrvatskoj od 2000. godine u najvećem dijelu promatranog razdoblja bila pro-ciklička (za detaljnu diskusiju vidjeti, primjerice, Grdović Gnip, 2011; Deskar-Škrbić i Raos, 2018), što sugerira kako fiskalna politika nije ispunjavala svoju važnu stabilizacijsku funkciju.

Središnja poglavlja ove disertacije otvaraju i daju odgovore na različita važna istraživačka pitanja o vezi između fiskalnih i makroekonomskih varijabli te makroekonomskim učincima fiskalne politike u Hrvatskoj.

U Poglavlju 2 se analizira učinak državne potrošnje i neto indirektnih poreza na osobnu potrošnju i privatnu agregatnu potražnju (zbroj privatnih investicija i osobne potrošnje) u Hrvatskoj. U ovom poglavlju se koristi strukturni model vektorske autoregresije (SVAR) koji je identificiran Blanchard-Perotti metodom. Međutim, za razliku od originalnog Blanchard-Perotti (2002) modela u ovom radu

se koristi prošireni model prvi put predstavljan u radu Ravn i Spange (2014), koji osim makroekonomske varijable, poreza i državne potrošnje uključuje i varijablu inozemne potražnje, koja se definira kao ponderirani zbroj BDP-a glavnih trgovinskih partnera. Temeljna istraživačka pitanja u ovom poglavlju su:

1. Je li reakcija privatne agregatne potražnje i privatne potrošnje na šokove državne potrošnje i neto indirektnih poreza u Hrvatskoj kejnezijanske prirode?

2. Upućuje li reakcija osobne potrošnje na šok državne potrošnje na valjanost hipoteze Rikardijanske ekvivalencije u Hrvatskoj?

3. Mogu li se privatna potrošnja i državna potrošnja u Hrvatskoj smatrati supstitutima ili komplementima, tj. postoje li dokazi učinka istiskivanja privatne potrošnje u Hrvatskoj?

Rezultati istraživanja u ovom poglavlju pokazuju kako su multiplikatori državne potrošnje i neto indirektnih poreza procijenjeni u okviru otvorene ekonomije manji u odnosu na multiplikatore u prijašnjim istraživanjima procijenjene u modelu zatvorene ekonomije (npr. Šimović i Deskar-Škrbić, 2013; Grdović Gnip, 2014). Konkretno, multiplikator državne potrošnje kreće se između 0,83 i 1,03 za osobnu potrošnju i između 0,71 i 1,17 za privatnu agregatnu potražnju. Nešto viši multiplikator u slučaju privatne agregatne potražnje može se djelomično objasniti djelovanjem multiplikatora-akceleratora koji značajno određuje dinamiku privatnih investicija. U slučaju neto indirektnih poreza, procijenjeni multiplikator se kreće između -0,7 i -1 za privatnu potrošnju te -0,32 u slučaju privatne agregatne potražnje. Veći multiplikator u slučaju privatne potrošnje može se djelomično objasniti činjenicom da indirektni porezi imaju značajniji utjecaj na privatnu potrošnju nego na investicije. Ovi rezultati upućuju da se reakcija privatne potrošnje i privatne agregatne potražnje na šokove državne potrošnje i neto indirektnih poreza u Hrvatskoj može opisati kao kejnezijanska. Također, rast privatne potrošnje potaknut rastom državne potrošnje, tj. pozitivan učinak privatne potrošnje na povećanje državne potrošnje, sugerira kako se ove varijable mogu smatrati komplementima, a ne supstitutima, te da hipoteza Rikardijanske ekvivalencije u Hrvatskoj ne vrijedi. Ovi zaključci se koriste i kao

važan input za kalibraciju novo-kejnezijanskog DSGE modela male otvorene ekonomije u četvrtom poglavlju disertacije, o čemu će više riječi biti kasnije.

Treće poglavlje koristi sličan analitički okvir, ali je u fokusu ovog poglavlja direktna usporedba veličine multiplikatora državne potrošnje procijenjenog u modelima zatvorene ekonomije (originalni Blanchard-Perotti (2002) model) i modelima otvorene ekonomije (prošireni Blanhard-Perotti model s učincima šoka inozemne potražnje) te usporedba veličine multiplikatora državne potrošnje u Hrvatskoj i druge dvije usporedive male otvorene ekonomije, s različitim monetarnim i tečajnim režimima - Srbiji (ciljanje inflacije, uz fluktuirajući tečaj) i Sloveniji (članica euro područja). Također, u ovom poglavlju se promatraju i učinci javnog duga na veličinu multiplikatora državne potrošnje na način da je model zatvorene ekonomije proširen uključivanjem varijable javnog duga i identifikacijom njegovog učinka na ostale varijable u sustavu. Dodatno, učinci vanjskih šokova se promatraju na dva alternativna načina. Prvo, kao u Poglavlju 2, koristi se varijabla inozemna potražnja, dok se u drugom pristupu kao inozemni pokazatelj koristi omjer uvoza i izvoza. Istraživačka pitanja koja otvara ovo poglavlje su:

1. Jesu li multiplikatori državne potrošnje procijenjeni u modelu otvorene ekonomije manji od multiplikatora državne potrošnje procijenjenih u modelu zatvorene ekonomije?

2. Kakav je učinak javnog duga na učinkovitost fiskalne politike u smislu utjecaja na veličinu multiplikatora državne potrošnje?

3. Kakva je razlika u utjecaju inozemne potražnje i omjera uvoza i izvoza na multiplikator državne potrošnje?

4. Postoji li razlika u veličini multiplikatora državne potrošnje u promatranim zemljama u ovisnosti o tečajnom režimu?

Temeljni rezultati ovog dijela istraživanja upućuju da su multiplikatori državne potrošnje procijenjeni u modelu zatvorene ekonomije u svim analiziranim zemljama veći od multiplikatora državne potrošnje procijenjenih u modelu otvorene ekonomije, što je u skladu s ranije objašnjenim teorijskim pretpostavkama. Također, uključivanje javnog duga u modele zatvorene ekonomije dovodi do smanjenja multiplikatora državne potrošnje, što je u skladu

s empirijskim radovima koji upućuju da rast državne potrošnje u uvjetima visokog javnog duga može dovesti do pada povjerenja i negativno utjecati na očekivanja potrošača i investitora, te smanjiti njihovu potrošnju i investicije, što smanjuje multiplikativni učinak državne potrošnje na agregatnu potražnju. Sljedeće, rezultati pokazuju kako definicija otvorenosti ekonomije značajno utječe na veličinu procijenjenih multiplikatora u svim zemljama. Razlike u veličini multiplikatora se mogu objasniti na način da omjer uvoza i izvoza ističe samo ulogu učinka izlijevanja (eng. leakage effect), dok inozemna potražnja uključuje kompleksniji odnos trgovinske i financijske integracije s inozemstvom. Konačno, usporedba među zemljama nije dala jasne zaključke o utjecaju karakteristika njihovih ekonomija na učinkovitost fiskalne politike, ali je pokazala da otvorenost i javni dug značajno smanjuju multiplikator državne potrošnje u svime zemljama, neovisno o njihovoj veličini te monetarnom i tečajnom režimu.

Analitički okvir u četvrtom poglavlju temelji se na kalibraciji novo-kejnezijanskog dinamičkog stohastičkog modela opće ravnoteže (DSGE) za malu otvorenu ekonomiju, korištenjem pretpostavki koje odgovaraju hrvatskom gospodarstvu, te usporedbi funkcija impulsnog odziva (eng. impulse response function) tog modela s procijenjenim VAR modelom, koji uključuje podatke o državnoj potrošnji, BDP-u, zaposlenosti, cijenama i neto izvozu za Hrvatsku. Dakle, u fokusu ovog dijela istraživanja je procjena adekvatnosti novo-kejnezijasnkih DSGE modela male otvorene ekonomije za simulaciju učinaka promjene državne potrošnje na makroekonomske varijable u Hrvatskoj. Korištenje takvih modela pomaže razumijevanju vrlo kompleksnih odnosa između fiskalnih šokova i makroekonomskih varijabli u otvorenim ekonomijama. Temeljna istraživačka pitanja koja otvara ovo poglavlje su:

1. Ima li ekspanzivna fiskalna politika, temeljena na porastu državne potrošnje, ekspanzivan učinak na BDP i zaposlenost u Hrvatskoj?
2. Može li rast državne potrošnje stvoriti inflatorne pritiske u Hrvatskoj?
3. Postoje li empirijski dokazi da rast državne potrošnje dovodi do pogoršanja trgovinske bilance u Hrvatskoj?

4. Odgovaraju li funkcije impulsnog odziva iz empirijskog VAR modela funkcijama impulsnog odziva iz kalibriranog DSGE modela?

Funkcije impulsnog odziva iz kalibriranog DSGE modela pokazuju da državna potrošnja ima pozitivan utjecaj na BDP i zaposlenost, što je u skladu s kejnezijanskom teorijom. Rast BDP-a je potaknut pozitivnim djelovanjem državne potrošnje na privatnu potrošnju, što je u skladu s empirijskim nalazima iz drugog poglavlja disertacije, a djelovanjem Okunovog zakona veći BDP dovodi do porasta zaposlenosti. S duge strane, rast državne potrošnje, preko mehanizma novo-kejnezijanske Phillipsove krivulje (koja uključuje inflacijska očekivanja te jaz BDP-), dovodi do rasta cijena. Konačno, funkcije impulsnog odziva kalibriranog modela upućuju da, zbog uvozne ovisnosti državne potrošnje i gospodarstva u cjelini, rast državne potrošnje dovodi do pogoršanja trgovinske bilance. Usporedba ovih rezultata s funkcijama impulsnog odziva procijenjenog VAR modela pokazuje kako su oni vrlo slični. Pozitivan šok državne potrošnje u VAR modelu dovodi do povećanja državne potrošnje, zaposlenosti (iako učinak nije statistički signifikantan) i cijena te povećanja trgovinskog deficita u Hrvatskoj. Navedeni rezultati sugeriraju kako predstavljeni DSGE model može poslužiti kako koristan okvir i alat za razumijevanje i analizu makroekonomskih učinaka fiskalne politike u Hrvatskoj.

Zaključno, rezultati empirijskog istraživanja provedenog u ovoj disertaciji pokazali su kako se makroekonomski učinci fiskalne politike u Hrvatskoj mogu opisati kao kejnezijanski. Porast državne potrošnje ima pozitivan učinak na BDP, osobnu potrošnju, privatnu agregatnu potražnju (zbroj osobne potrošnje i investicija), zaposlenost i cijene. Rezultati također ukazuju da se osobna potrošnja i državna potrošnja u Hrvatskoj mogu smatrati komplementima te da hipoteza Rikardijanske ekvivalensije u Hrvatskoj nije valjana. S druge strane, rast neto indirektnih poreza ima negativan učinak na privatnu agregatnu potražnju i osobnu potrošnju. U tom kontekstu se može zaključiti kako fiskalna politika u Hrvatskoj može biti učinkovita u upravljanju agregatnom potražnjom i djelovati stabilizacijski na gospodarstvo. Međutim, rezultati su također pokazali kako je učinkovitost fiskalne politike u Hrvatskoj ograničena otvorenošću i uvoznom ovisnošću gospodarstva te razinom javnog duga, budući da svi navedeni faktori smanjuju

veličinu fiskalnog multiplikatora. Također, povećana državna potrošnja u Hrvatskoj povećava trgovinski deficit, što stvara pritiske na vanjsku ravnotežu gospodarstva. Zbog svega navedenog se u diskusijama o fiskalnoj politici u Hrvatskoj uvijek mora voditi računa o činjenici da je Hrvatska malo i otvoreno gospodarstvo, s relativno visokim javnim dugom. Takve osobine hrvatskog gospodarstva pred nositelje fiskalne politika stavljaju značajne izazove.