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► To cite this version:

Nicolae-Bogdan Ianc, Camelia Turcu. So alike, yet so different: Comparing fiscal multipliers across EU members and candidates. *Economic Modelling*, 2020, 93, pp.278 - 298. 10.1016/j.econmod.2020.07.018 . hal-03533169

HAL Id: hal-03533169

<https://univ-orleans.hal.science/hal-03533169>

Submitted on 9 Sep 2022

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So alike, yet so different: comparing fiscal multipliers across EU members and candidates

Nicolae-Bogdan Ianc *

Camelia Turcu †‡

Abstract

We estimate, using a Panel Vector Autoregressive approach and data from 2001Q1 to 2017Q1, the fiscal multipliers of the European Union (EU) members and candidates. These countries are grouped according to their stages of integration: original members, new Eurozone members, and candidates for the Eurozone and the EU itself. For each group, we assess the impact of a positive spending shock (expansionary) or a positive tax shock (contractionary) on GDP. Our findings suggest that: (i) rising government spending increases GDP in both the EU and Eurozone candidates (Keynesian multipliers), but slightly decreases it in the Eurozone members (non-Keynesian multipliers); (ii) higher taxes are associated with mixed results in terms of GDP dynamics - both increases and decreases in terms of GDP are found - in the four country groups (suggesting the presence of Keynesian and non-Keynesian multipliers). Overall, these outcomes indicate that spending multipliers are, compared to tax multipliers, more sensitive to European Union or Eurozone membership.

Keywords: European Union candidates, Eurozone, fiscal multipliers, (Interacted) Panel VAR

JEL classification: E62, F62, O52.

*University of Orléans, CNRS, LEO, FRE 2014 and West University of Timisoara, East-European Center for Research in Economics and Business (ECREB), Email: nicolae-bogdan.ianc@univ-orleans.fr

†University of Orléans, CNRS, LEO, FRE 2014 and INFER, Email: camelia.turcu@univ-orleans.fr

‡We are indebted to Sushanta Mallick and Alexia Gaudeul, as well as to two anonymous referees, for their very constructive remarks. We thank the participants at the "Journées doctorales du Développement" (Orléans, December 2016), INFER Workshop on News and Fiscal Policy (Brussels, March 2017), 34th Symposium GdRE "Money, banking, finance" (Paris, July 2017) and 68th Annual Meeting of the French Economic Association (Orléans, June 2019) for their useful comments and suggestions. Special thanks to Scott Hegerty, Mihai Mutascu, Cosmin Enache, Alexandru Minea, and Petru Stefea for their very helpful suggestions and for all their support. We also acknowledge the financial aid of APR-IA Contract "MUTMOND, Les Mutations de la Mondialisation" and of the Faculty of Economics and Business Administration, West University of Timisoara.

1 Introduction

The 2008 Global Financial Crisis and the Eurozone crisis have called for new strategies in terms of monetary and fiscal policy. The monetary policy framework, established at the Eurozone level, is constrained by the interest-rate zero lower bound (ZLB). Moreover, the single monetary policy has to address the cross-country heterogeneity of the Eurozone member states. This has become an even harder task as the number of countries using the single currency in Europe has increased, with five Central and Eastern European (CEE) EU members joining the Eurozone. Fiscal policies have also been intensively used to react to the recent crises: European governments employed fiscal instruments ([Auerbach and Gorodnichenko 2013](#)) in order to counteract the large negative shocks and to boost demand ([Strauss-Kahn 2008](#)). Additionally, the European Commission set a recovery plan in November 2008 that was meant to spur economic growth both in the short run, through a huge injection of money and in the long run, through green investments. The plan has covered not only EU member states but also EU candidate countries, so as to accelerate their integration process. Moreover, the latter group of countries received loans of approximately €500 million from European financial institutions to get through the crisis ([Barroso 2008](#)).

Overall, large fiscal stimulus packages were launched in several European countries ([Buti and Székely 2009](#)), but their impact on economic activity depends on countries' characteristics, their phase in the business cycle and composition of the package (i.e., tax cuts, transfers, infrastructure spending or labor market incentives). For example, in recent years, Germany had a policy of tax-cutting, while France used different spending-related measures (such as infrastructure investment and youth employment services) to stimulate economic growth. In 2010, Poland implemented the highest (as a share of GDP) fiscal stimulus package among Central and Eastern European countries. This measure, along with the other reforms introduced by the Polish government, triggered a positive growth rate, which was a unique result at that time. Turkey, a candidate to EU integration, boosted its firms' activities by offering subsidies and adequate credit conditions. Smaller packages were adopted by Slovakia, which was less affected by the recent crisis. Other European countries followed fiscal consolidation programs ([ILO 2011](#)). For example, Estonia and Romania raised the VAT (Value-Added Tax), while Hungary was in favour of an income-tax increase. Both Hungary and Romania applied cuts in public sector wages (e.g. a 25% cut of public wages - the highest ratio in Europe - was applied in Romania).

The effectiveness of these fiscal stimuli remains an open question. The Global Financial Crisis and the Eurozone crisis, together with the perspective of the EU enlargement, have revived the debate on the size and effectiveness of fiscal multipliers in Europe. In this paper, we analyze, in particular, the fiscal multipliers in EU candidates (Albania, North Macedonia, Serbia, and Turkey) and in the EU members. The latter are grouped as follows, according to their European integration stages: historical EMU members (Belgium, France, Germany, Italy and Netherlands); new EMU members (Estonia, Latvia, Lithuania, Slovakia and Slovenia) and EMU candidates (i.e., EU members which are to join the EMU:

Croatia, the Czech Republic, Hungary, Poland, and Romania). We assign these country groups as we aim to consider the stages of European integration of the analyzed countries while comparing their fiscal multipliers. These integration levels also capture countries' particular features (i.e., their degree of openness). Each country group is confronted with specific challenges. The **historical EMU members** have been members of the Eurozone since its creation. They were deeply struck by the Global Financial Crisis and the European sovereign debt crisis. The **newest EMU members** complied with the Maastricht criteria before joining the Eurozone. These criteria¹ concern price stability (the inflation rate), sound and sustainable public finances (public debt and the deficit), exchange-rate stability through adherence European Exchange Rate Mechanism (ERM) II for at least two years, and long-term interest rates. The **EMU candidates** are the EU members that will have to fulfil the Maastricht criteria, at some point in the future, in order to be able to join the Eurozone. These countries have not been yet part of the ERM II. The **EU candidates** need to satisfy the Copenhagen criteria² (stability of institutions, functioning free-market economy, and the ability to take on the obligations of membership) in order to become EU members. We perform our analysis, on these four country-groups, using a Panel Vector Autoregressive (PVAR) approach. We draw on a quarterly dataset over the period 2001Q1-2017Q1. We compute fiscal multipliers as government spending multipliers (i.e., the response of GDP with respect to increasing government consumption, which is a positive spending shock) and tax multipliers (i.e., translating the change in GDP following an increase in taxes, which is a positive tax shock). Furthermore, we estimate these fiscal multipliers in the short- and long run: hence, in line with the literature, we calculate and discuss the impact, peak, and cumulative multipliers, both for spending and taxes. Our aim is to compare the fiscal multipliers of both EU candidates and EU members (the three groups as mentioned above), in order to identify which group is more or less sensitive during the integration process to public intervention.

The literature addresses, from several angles, the question of the effectiveness of fiscal multipliers. The theoretical mechanism behind these fiscal incentives is based on the Keynesian argument that demand drives economic activity and that a shortfall in demand could trigger a recession. Keynesian stimulus can be considered efficient in decreasing the cyclical budget deficit (during a recession). However, it can have side effects as it increases the structural budget deficit. The effectiveness of fiscal packages (i.e., the surplus injected into the economy after increasing spending or cutting taxes) can be assessed by estimating fiscal multipliers. A fiscal multiplier shows how output or GDP reacts if there is an exogenous one-unit change in government spending or taxes. An increase (a decrease) in output or GDP after larger government expenditure or a reduction in taxes is associated with a Keynesian

¹These criteria, also known as the nominal convergence criteria, were set through the Treaty on European Union ([Maastricht Treaty 1992](#)) signed by the European Economic Community. They are meant to define the EMU membership conditions for the potential new members.

²The EU enlargement criteria were laid down at the Copenhagen European Summit ([European Communities Presidency, Conclusions 1993](#)).

(non-Keynesian) effect. Non-Keynesian effects can arise in several circumstances: for example, in a fiscal consolidation period (defined as a situation when concrete policies aimed at reducing government deficits and debt accumulation (OCDE 2011) are undertaken), when cuts in public spending are accompanied by an increase in private consumption and investment (Bhattacharya 1999); or, in expansion periods when the additional income resulting from tax cuts might encourage economic agents to save more, thus limiting consumption: this is in line with the concept of the Ricardian equivalence³.

Blanchard and Perotti (2002) find that positive government spending shocks increase output, while positive tax shocks negatively affect the economy. In the same vein, Romer and Romer (2010) show that increasing taxes have negative effects on economic activity. In contrast, Giavazzi and Pagano (1990) underline that fiscal policy can have non-Keynesian effects. Blanchard (1990) and Sutherland (1997) note that similar results can be found following tax increases under high levels of debt. In a neoclassical model, Bertola and Drazen (1993) argue that when government consumption decreases, private consumption increases. Analysing both tax and government spending effects, Perotti (1999) puts forward the idea that fiscal policy is expected to be non-Keynesian when the public debt-to-GDP ratio is very high. Afonso (2001) points out that Keynesian effects can be found in the absence of fiscal adjustments, but they can change to non-Keynesian effects when fiscal adjustments occur. In a recent paper, Geiger et al. (2016) suggest that fiscal consolidation could increase private consumption if economic agents accumulate higher stock of savings before it happens. This is in line with the concept of Ricardian equivalence as it is expected that consumption will not increase after a tax cut as consumers are forward-looking and save the resulting additional revenue because they anticipate higher taxes in the future.

The use of fiscal stimuli is frequently put forward in (or immediately following) crisis periods. Nevertheless, recently it has become a topical issue also in calm periods since, especially in the European economies, there might be a lack of government investment spending (European Commission 2015) that could generate lower economic growth. This latter view is supported by Cochrane (2009), who argues that governments should rethink the fiscal stimulus measures not only during recessions but also in calm periods. Fiscal stimuli might have different effectiveness under calm and crisis times. Baum et al. (2012) highlight that multipliers are larger during a crisis era than in economic upturns. Riera-Crichton et al. (2015) also suggest that government spending multipliers might be different during expansions and recession, depending on whether government spending is acting procyclically or countercyclically. They show that, in extreme recession times, multipliers might be higher than expected. Barro (2009) suggests that in peacetime, fiscal multipliers are close to zero and they become equal to 0.8 in war periods. Batini et al. (2014) also underline that the state of the business cycle or political events could lead, along with structural factors, to higher fiscal multipliers. The relevance of these specific structural

³The Ricardian equivalence theorem of government finance states that substitution of debt for taxes does not affect private sector wealth and consumption (Barro 1974).

factors (e.g. exchange rate regime, the degree of openness, or public debt) in assessing the effectiveness of fiscal multipliers is to be considered. A key determinant of the size of multipliers is the exchange rate regime (ERR). [Corsetti et al. \(2012\)](#), [Born et al. \(2013\)](#) and [Ilzetzki et al. \(2013\)](#) argue, for example, that a fixed exchange rate regime has a significant impact on the size of fiscal multipliers⁴. Further, in economies that are open to trade⁵, fiscal multipliers seem to be smaller than in closed economies ([Ilzetzki et al. 2013](#)). Conventional wisdom suggests that, in order to have larger fiscal multipliers, small open economies could prefer to raise government spending rather than to cut taxes, since in the latter case, the resulting increase in consumption can be easily oriented towards imports. Hence, the effectiveness of fiscal stimuli based on tax cuts or government spending is a topic that has been put at the forefront of the current debate (see [Mountford and Uhlig \(2009\)](#); [Jha et al. \(2014\)](#); [Hur et al. \(2014\)](#); [Caldara and Kamps \(2017\)](#)). Public debt is another factor that could influence the size of multipliers. [Afonso \(2001\)](#) claims that in a period of high public debt, if government spending is financed by an increase in the deficit, the sustainability of the fiscal policy is doubtful. Hence, households might tend to save more. Specifically, high public debt can generate inefficiency in the fiscal stimuli: the government has to borrow the funds associated with these packages, and this raises interest rates for the private sector (i.e., generating a crowding-out effect).

Within this framework, the contribution of our paper to the literature is threefold. *First*, unlike the existing literature that is mainly concentrated on the U.S. (see [Barro \(2009\)](#), [Mountford and Uhlig \(2009\)](#); and [Caldara and Kamps \(2017\)](#)), the OECD countries (see [Alesina and Ardagna \(2010\)](#); [Auerbach and Gorodnichenko \(2012\)](#); [Corsetti et al. \(2012\)](#); [Born et al. \(2013\)](#), and [Ramey and Zubairy \(2018\)](#)) or the emerging markets (see [Jawadi et al. \(2014\)](#); and [Jawadi et al. \(2016\)](#)), we focus our analysis on Europe. In particular, we are able to tackle EU enlargement as we include in our study countries that do not belong to EU but are EU candidates. Very few papers analyze these countries' fiscal policies, and when they do, they consider each country individually. Ours is, to the best of our knowledge, the first work which explores overall the fiscal multipliers in this non-EU area.

Second, we employ a PVAR (Panel Vector AutoRegressive) methodology, á la [Blanchard and Perotti \(2002\)](#), in order to assess the fiscal multipliers in EU candidates, historical EMU

⁴In particular, [Corsetti et al. \(2012\)](#) show that under a flexible ERR, fiscal policy has a lower degree of effectiveness. [Born et al. \(2013\)](#) examine expected government expenses in the OECD countries and find that multipliers are higher than 1.2 in countries with fixed ERR, and equal to 0.75 under floating ERR. [Ilzetzki et al. \(2013\)](#) also obtain large multipliers under pegged exchange rate arrangements: however, they claim that fiscal multipliers are close to zero for flexible regimes.

⁵If an open economy increases its public spending or cuts taxes, this might stimulate its revenues and consumption that could, further on, trigger higher imports (if imported goods are preferred). Therefore, a budgetary policy implemented in only one open economy could finally end up as being profitable to the country's trade partners. Hence, the country might end up with a higher public deficit (due to the increase in public spending) and a higher trade deficit as well (due to increased imports, other things being equal). In order to avoid this, a coordination of countries' fiscal policies would be useful. In Europe, the Stability and Growth Pact (SGP) was set in this respect: it covers a set of rules designed to ensure that countries in the European Union pursue sound public finances and coordinate their fiscal policies.

members, newest EMU members and EMU candidates. The PVAR approach allows us to capture the interdependencies among different country groups while using a minimal set of restrictions (Canova and Ciccarelli 2013). Hence, we are able to overcome the limits of an analysis that examines the impact of fiscal policy on GDP using country-specific estimates (such as Mirdala (2009) and Stanova (2015)). The vast majority of studies that employ a PVAR methodology (Ilzetzki et al. (2013) or Hory (2016)) to analyze the effects of fiscal policy are, in general, concentrated, with very few exceptions, on advanced and emerging countries. Furthermore, in our work, in order to capture the crisis' effect, we also use an alternative econometric methodology, rarely used for EU countries' and EU candidates' fiscal policy analysis: the Interacted PVAR (Towbin and Weber 2013). We employ this methodology using the same country-grouping and time span as in the PVAR approach, and obtain similar results.

Third, we use quarterly data, unlike Beetsma et al. (2008). Using quarterly information allows us to take full advantage of the statistical data properties (Combes et al. 2014) and to better identify shocks (Ilzetzki et al. 2013).

The two papers the closest to ours, investigating the size of multipliers in Europe and using a PVAR methodology, are those of Beetsma et al. (2008) and Combes et al. (2014). Beetsma et al. (2008) estimate only the public spending multiplier for 14 EU countries, using annual data (1970-2004), in a PVAR approach and find an impact multiplier of 1.2 and a peak multiplier of 1.6. They underline that the effects of an increase in spending on GDP are expected to diminish with the degree of openness. Combes et al. (2014) analyse the fiscal multipliers in 14 EU countries as well, over the period from 1999 to 2012 using a PVAR approach: they distinguish between the EU founding members, the EU countries that are not expected to join the EMU, and a group of countries that joined the European Union in 2004 and are expected to adopt the euro. They show that, contrary to expenditure multipliers, tax multipliers are quite similar in the different groups of European countries.

With respect to the two latter articles, our approach is different and opens up new research avenues. In our research, we investigate a larger set of countries (19) over the recent period (2001-2017), and we pay particular attention to EU candidates. As mentioned, the four groups of countries on which our analysis is performed are: (I) historical EMU members, (II) newest EMU members, (III) EMU candidates and (IV) EU candidates. The historical EMU members considered in our analysis are included in Beetsma et al. (2008) as well: however, the other three groups of countries that we analyze were not part of the EU before 2004 and are not studied by Beetsma et al. (2008), whose analysis stops in 2004. Moreover, we perform our study on four groups of countries, other than the three country groups considered by Combes et al. (2014). We use quarterly data and compute both the spending and tax multipliers, unlike Beetsma et al. (2008). Further, our study covers 2001-2017, a period that also captures the recent economic and financial crisis. Differently from Beetsma et al. (2008) or Combes et al. (2014), we extend the analysis using an Interacted PVAR to capture the crisis effects and to strengthen the findings based on our country grouping.

Our findings suggest that increasing government spending will spur GDP growth in both the EU candidates and the EMU candidates, but will slightly reduce it in the historical and newest EMU members. Hence, GDP has a Keynesian response to spending shocks only in the EU candidates and the EMU candidates. We also find that high taxes are associated with rising GDP in the short run in all country-groups; however, in the long run, the tax multiplier remains positive only in historical EMU members and turns negative in the other country groups. Moreover, we show that the maximum reactions of GDP to taxes seem immediate in all country groups (almost all tax peak multipliers are registered, in general, in the first quarter). These outcomes indicate that European Union membership and monetary integration affect the spending multipliers more and the tax multipliers less. Surprisingly, we also find that, in all groups, the short-run tax multipliers are higher (in absolute value) compared to the spending multipliers. In the EU candidates, short run fiscal multipliers (both the spending and tax multiplier), are higher, in absolute value, than those for the EMU members, while the long-run cumulative multipliers are weaker. Several robustness checks are run, and the results hold.

This paper is organized as follows. Section 2 presents the research methodology, while Section 3 describes the data. Section 4 displays the results and their interpretation. Section 5 presents the robustness analysis, and Section 6 concludes.

2 Methodology

We aim to analyze fiscal multipliers across different groups of EU countries and EU candidates over the recent period. To do this, we follow [Blanchard and Perotti \(2002\)](#) and estimate a Panel Vector Autoregressive (PVAR) model. We choose to focus on a PVAR approach as it has the same structure as VAR models (meaning that all variables are considered to be endogenous and interdependent) and it also covers a cross-sectional dimension ([Canova and Ciccarelli 2013](#)).

$$Y_{i,t} = A_i + B(L)Y_{i,t} + \epsilon_{i,t} \quad (1)$$

As underlined by [Canova and Ciccarelli \(2013\)](#), the PVAR approach is used to identify idiosyncratic shocks in both time t ($t=1..T$) and units i ($i=1..N$).

Our model includes the following variables: $Y_{i,t}$ is the vector of endogenous variables; A_i denotes the vector of constants, translating fixed effects, which depends on unit i ; $B(L)$ is the polynomial matrix with L being the lag operator and $\epsilon_{i,t}$ is the error term or random disturbances. Our endogenous variables are government consumption, taxes and GDP.

We tackle the seasonability and non-stationarity of the data as follows. To deal with seasonality in the data, we compute the first difference of the logarithm of our series. In other words, we employ the growth rate of our variables: we define growth rates as a relative change in the variable in a quarter of a specific year with respect to the same quarter of the previous year. To check the stationary of our data, we use a panel unit root test, namely

the Im-Pesaran-Shin (IPS) test (Im et al. 2003). The null hypothesis of the IPS test is that a unit root is present after controlling for country fixed effects or both country fixed effects and a time trend. The stationarity results, computed for the four groups of countries, are presented in Appendix A. They allow us to reject the null hypothesis (i.e., the presence of a unit root).

Our work will be constructed further on three types of multipliers: an impact multiplier, a peak multiplier, and a cumulative multiplier. Hence, fiscal multipliers may differ depending on the time horizon they are built on. The impact and peak multipliers can translate a short-run perspective while the cumulative multiplier gives a long term perspective. The general definitions of these multipliers are presented below, in line with Combes et al. (2014), Spilimbergo et al. (2009) or Ilzetzi et al. (2013). We start with the **impact multiplier**, which accounts for the immediate effect of fiscal policy Z_t on GDP Y_t , in the very first analysed period, when the shock occurs (i.e., t):

$$\mathbf{k}_t = \frac{d\mathbf{Y}_t}{d\mathbf{Z}_t} \quad (2)$$

Moreover, in order to observe the maximum response of GDP to a fiscal policy shock occurred at time t , we compute the **peak multiplier**, which is reached at time M (where $M = t..T$):

$$\mathbf{k}_{t+M} = \max_M \frac{d\mathbf{Y}_{t+M}}{d\mathbf{Z}_t} \quad (3)$$

Given that the economic activity might respond with delay to fiscal stimuli, we also calculate the **cumulative multiplier**, which allows us to capture the impact of fiscal shocks in the long run T :

$$\mathbf{k}_T = \frac{\sum_{j=0}^T d\mathbf{Y}_{t+j}}{\sum_{j=0}^T d\mathbf{Z}_{t+j}} \quad (4)$$

On these grounds, we estimate the multipliers using the PVAR model, which allows us to go beyond the cross-section or time-series models and introduce both individual and time effects. This is particularly important in our analysis, as we aim at measuring GDP responses to fiscal policy in different groups of countries, on the European continent. The panel that we use is a balanced one. Within this framework, we further control for country heterogeneity by using fixed effects.

Our orthogonalized impulse response function (IRF) analysis (Canova and Ciccarelli 2013) is constructed as to identify exogenous fiscal shocks: orthogonalized IRF is the response of one variable to the shocks in another variable, considering that there are no other shocks in the system. To do this, we use a conventional Cholesky decomposition and transform the error term to get orthogonal innovations. Following Fatás et al. (2001), the order chosen for our variables is government consumption, taxes and GDP. This is in line with

the idea that the fiscal policy is predetermined as underlined by the standard IS-LM model (Hory 2016). In this context, we highlight that in our model, a fiscal shock is associated either with an increase in spending or with an increase in taxes. In other words, we use either a positive spending shock (which is expansionary) or a positive tax shock (which is contractionary).

3 Data

We use data for a sample of 19 countries in Europe (EU candidates and EU members) over the period 2001Q1-2017Q1. The variables considered in our analysis are the following: real GDP, real government spending (i.e., government consumption), and taxes⁶ (less subsidies) on products. The data are used at constant prices (base 2010), and they are collected on a quarterly basis for all the countries, over the analyzed time span. All the data are taken from Eurostat. Compared to annual data, quarterly data⁷ allow to better capture fiscal shocks and GDP reactivity (Ilzetzki et al. 2013). Moreover, quarterly data, with respect to annual data, bring in a considerable increase in the number of degrees of freedom (Combes et al. 2016): this becomes crucial if the time span under analysis is not very large, as in our case.

Table 1 below displays, for each country group, the summary statistics for real spending (as a percentage of GDP) and real taxation (as a percentage of GDP). These statistics include: the mean, maximum, and minimum. The mean is computed, for each variable, inside each country group, over the whole period. The highest mean value of the spending GDP ratio (21.99 %) is observed in the historical EMU members, while the highest mean taxation (13.17 %) is reported in the EU candidates. The minimum and the maximum are taken, for each variable, across the countries that compose each group over the analyzed time span (2001Q1-2017Q1). The maximum spending ranges from 27.62 % (for the Netherlands in 2009Q2, in the historical EMU members group) to 34.56 % (for North Macedonia in 2001Q3, in the EU candidates group), whereas the maximum taxation lines up from 11.75 (for Germany in 2000Q2, in the historical EMU members) to 20.47 % (for Estonia in 2004Q1, in the newest EMU members). The lowest minimum spending ratio is registered in the EMU candidates while the minimum taxation ratio is reached in the EU candidates.

Henceforth, we describe the country-grouping that we will further use in the analysis. As mentioned in the introduction, we divide our sample into four groups of countries (see Table 2 below) based on their European integration level. Group I gathers the EMU historical countries (Belgium, France, Germany, Italy and the Netherlands). These countries are the founders of the European Economic Community,⁸ have been part of the European Monetary

⁶Taxes on products are taxes that are payable per unit of goods or services produced or transacted. Subsidies on products are subsidies payable per unit of a good or service produced or imported.

⁷No interpolation adjustments are performed as all data are available at this frequency.

⁸These five countries, together with Luxembourg, signed the Treaty of Rome in 1957. Luxembourg is not included in our analysis, given its small size.

Table 1: Descriptive statistics of government spending and taxation (as a percentage of GDP)

	Historical EMU members		Newest EMU members		EMU candidates		EU candidates	
	Spending	Tax	Spending	Tax	Spending	Tax	Spending	Tax
Mean	21.99	10.22	19.32	12.03	19.67	12.52	17.76	13.17
Max	27.62	11.75	29.16	20.47	27.75	16.74	34.56	17.51
Min	17.09	8.75	14.12	7.64	8.79	8.35	11.79	5.20

Union since its launching, and are considered key economies in the Eurozone. Group II is composed of countries (Estonia, Latvia, Lithuania, Slovakia and Slovenia) that became members of the EU in 2004 and have recently joined the EMU (newest EMU members)⁹. These open economies have a lot of similarities, such as lower debt-to-GDP ratios, or higher per capita GDP growth. During the financial crisis, they did not use a discretionary fiscal policy intensively as their economies were less hit compared to the ones of the other Eurozone members, except for Latvia (Gyórfy 2015). Group III includes EMU candidates (Croatia, Czech Republic, Hungary, Poland and Romania): these countries are already EU members and are expected to join the Eurozone at some point in the future, once they join for at least two years the European ERM II and fulfil the Maastricht criteria¹⁰. Lastly, we add group IV, which covers EU candidates¹¹: Albania, North Macedonia, Serbia and Turkey. Due to data availability, in the baseline analysis, Albania is not included: it will be integrated into the robustness section when we work with a shorter time period. The EU candidates need to fulfil the Copenhagen criteria and boost their catching-up process in order to become EU members. Hence, these country groups have different objectives (e.g. either the EU integration, EMU integration, or the sustainability of their public finances as members of the monetary union) and specific tools they can use in order to achieve them.

4 Empirical results

In this section, we will present the empirical results obtained using the modelling framework described above. As our econometric study is built within a dynamic panel approach, which uses lagged variables, we have to choose the optimal lag length before estimating the model and implementing an impulse response analysis. We minimize the Akaike Information Criteria (AIC), as Fatás et al. (2001), in order to decide the optimal lag (up to the four

⁹Cyprus and Malta are not included in the study due to their small size.

¹⁰Bulgaria is excluded from the analysis as it has been in a currency board setting throughout the analyzed time span.

¹¹There are five EU candidates: Albania, Montenegro, North Macedonia, Serbia and Turkey. We had to eliminate Montenegro from the analysis as the country has unilaterally adopted the euro since 2002. The four EU candidates that we analyze are considered by United Nations (2014) as economies in transition (Albania, Serbia and North Macedonia) or emerging markets (Turkey).

Table 2: European country groups

Historic EMU members	Newest EMU members	EMU candidates	EU candidates
Belgium	Estonia	Croatia	Albania
France	Latvia	Czech Republic	North Macedonia
Germany	Lithuania	Hungary	Serbia
Italy	Slovakia	Poland	Turkey
Netherlands	Slovenia	Romania	

lags). Based on these criteria, reported in Table 3 below, we choose one lag for the historical and newest EMU members as well as for the EU candidates and we proceed with two lags for the EMU candidates.

Further on, this section is divided into two subsections. First, we present the fiscal multipliers for each country group, and then we compare and interpret the results.

Table 3: Lag selection using the AIC

Lag	Historical EMU	Newest EMU members	EMU candidates	EU candidates
1	-93.21671	-56.71496	-84.99286	-52.79980
2	-75.36341	-46.79744	-87.98398	-44.92091
3	-66.63524	-37.38472	-78.80211	-38.82956
4	-69.38169	-31.55515	-73.20890	-37.14601

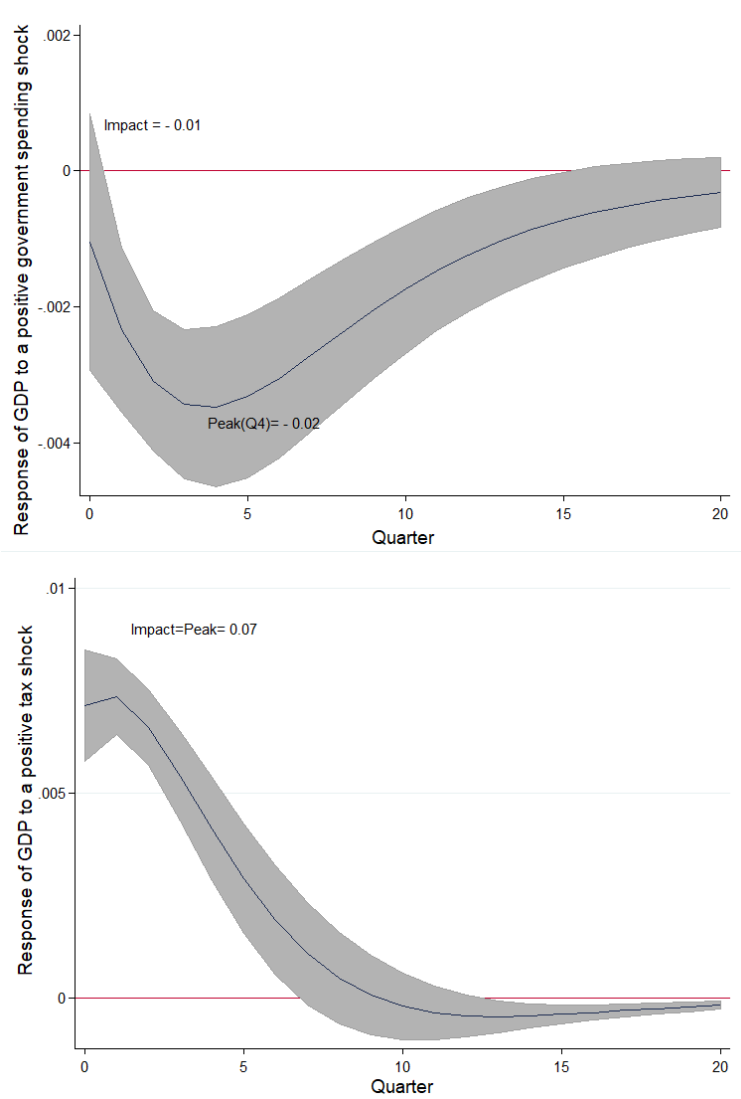
***Note:** Bold values translate the lag selected in line with the AIC. The numbers in columns 2-5 are the AIC values.*

4.1 Fiscal multipliers by country-group

We start our analysis by focusing on **historical EMU countries**. These countries launched the European construction in 1957 and were at the heart of the region's monetary integration. The reaction of their GDP to spending and tax shocks is summarized in Figure 1. As underlined in the upper chart below (Figure 1), this country group displays very weak spending multipliers in the short run. The values of the impact and peak spending multipliers are close to zero, being equal to -0.01 and -0.02, respectively. The cumulative multiplier, obtained after 20 quarters, is higher, in magnitude, but still negative: it equals -2.40 (see Appendix B, Table 9). Figure 1 (lower chart) presents the tax multipliers: it shows that an increase in taxes generates a significant positive response by GDP. We obtain a value of 0.07 for both the impact and the peak multiplier and a significant 1.88 value for the long-run multiplier.¹²

¹²The values of the long-run (cumulative) multipliers for all country groups are available in Appendix B, Table 9.

Figure 1: Impulse response functions to fiscal shocks in historical EMU countries



Note: The results are based on a Monte Carlo simulation with 1000 replications using a 90% confidence interval (shaded area). Each figure gives the impulse responses to a one-standard-error positive government expenditure shock (top figure) or positive tax shock (bottom figure). The former represents an expansionary fiscal policy while the latter captures a contractionary fiscal policy.

We continue the analysis by exploring the case of the **newest EMU members**. As indicated in the upper chart of Figure 2, we obtain, for this country-group, negative values

for the spending multipliers both in the short run and the long run. The impact multiplier (-0.05) is close in magnitude to the peak one (-0.08, obtained in the fifth quarter). These effects, while small, are statistically significant. The value of the cumulative multiplier, reached after 20 quarters, is large and negative (-3.84, as Appendix B, Table 9 depicts). These overall results show that increasing government spending has a very small (close to zero) negative impact on economic activity.

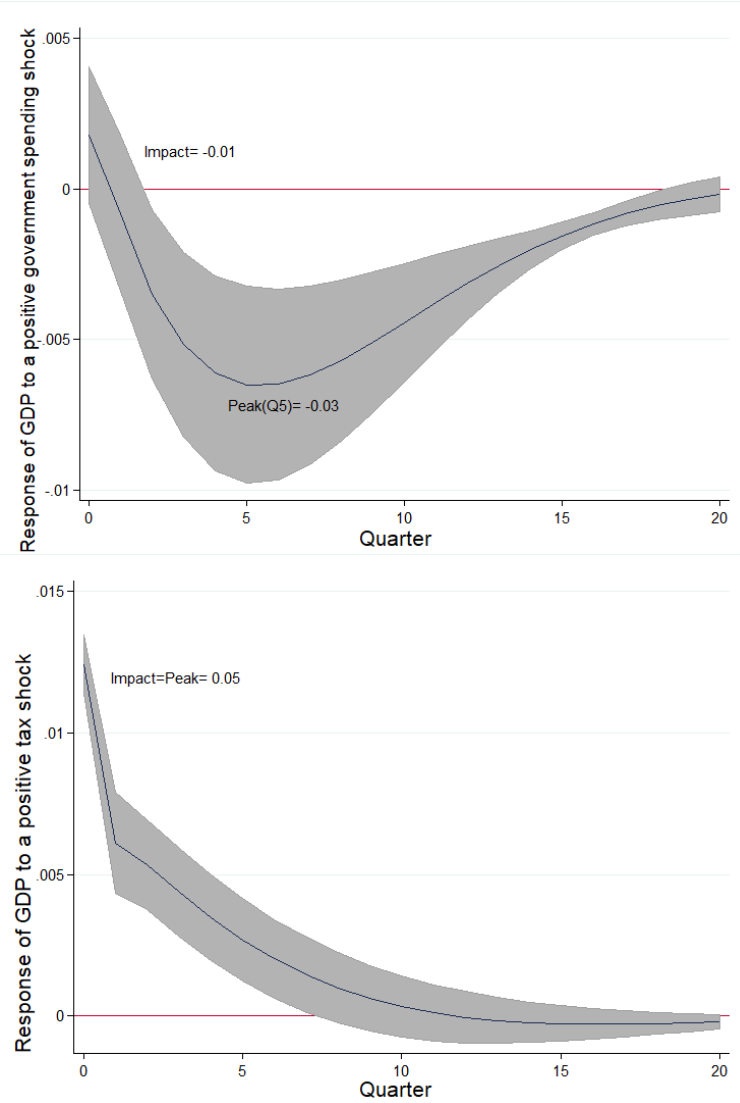
The lower chart (Figure 2) below illustrates the response of GDP to a tax shock (i.e., an increase in taxes). We find positive and similar values for both the impact multiplier and the peak multiplier (equal to 0.11: this value is obtained in the first quarter). In contrast, in the long run, we get a negative value (-0.37) for the cumulative multiplier. This suggests that increasing taxes, in the long term, can depress economic activity.

There are a lot of similarities between the results that we obtain for the historical EMU members and newest EMU members, both for the spending and tax multipliers. Our findings seem to indicate that the GDP response to fiscal policy is similar in all EMU countries, both the historical and newest EMU members. A large negative cumulative (spending) multiplier characterizes both groups. However, the cumulative tax multiplier is positive in the first group and negative in the second one. This might be explained by the fact that the historical EMU countries, as other advanced economies, launched a fiscal contraction ([Corsetti et al. 2012](#)), as a reaction to the crisis, while the most of the newest EMU members, not very much affected by the crisis, had, in the long run, a Keynesian tax policy.

As previously argued, the literature is not very abundant when analysing fiscal multipliers in the EMU. Moreover, with regard to the magnitude of fiscal multipliers in the historical EMU members, if some studies underline that multipliers are relatively high in these countries, others show the contrary. In the European framework, [Combes et al. \(2014\)](#) highlight that spending multipliers, while relatively weak, tend to be Keynesian for the historical EMU members. They also find positive tax multipliers, peaking a value of 0.39 (after 2 quarters) for these historical EMU countries. Moreover, at the very early stages of European monetary integration, [HM Treasury \(2003\)](#) finds spending multipliers of 0.5 in France and of 0.4 in Germany. [Kirchner et al. \(2010\)](#) show, using a VAR model, that the short-run effectiveness of government spending in stabilizing GDP in Europe was high in the 1980s but decreased afterwards, 2008. They also emphasize that long-run government spending multipliers have declined significantly over the period from 1980 to 2008. The [OECD \(2009\)](#) assesses the effectiveness of the fiscal packages and estimates the following maximum values for the spending multiplier across the EMU countries: 1.0 for France, 0.8 for Germany and 0.7 for Belgium, in 2008, for example. The case of historical EMU members is also analyzed by [Amendola et al. \(2019\)](#) who underline that fiscal multipliers are larger in periods of economic slack. Analyzing the Eurozone countries as a whole (including the newest EMU members), [Cugnasca and Rother \(2015\)](#) confirm that, over 2004-2013, fiscal adjustments had strong effects (23% of fiscal adjustments had a multiplier larger than one). Nevertheless, focusing on some of the EMU recent members, in particular, [Combes](#)

et al. (2016) find, using a panel vector error correction model, that the spending multiplier is positive, but low, on average, over the time span 1999-2013, varying across countries. Baum et al. (2012) and Batini et al. (2014) note that short-term tax multipliers are weak in the Eurozone. This is also in line with Spilimbergo et al. (2009), who show that small open economy, as for example, the recent entrants in our case, exhibit low fiscal multipliers.

Figure 2: Impulse response functions to fiscal shocks in newest EMU countries



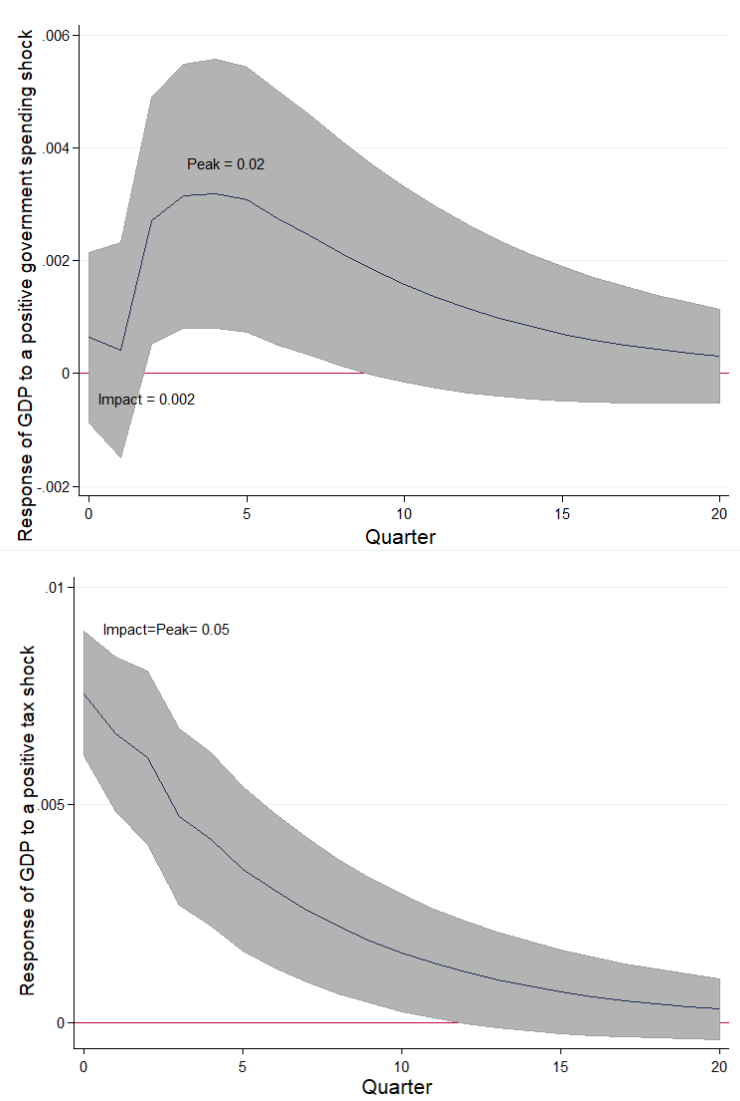
Note: The results are based on a Monte Carlo simulation with 1000 replications using a 90% confidence interval (shaded area). Each figure gives the impulse responses to a one-standard-error positive government expenditure shock (top figure) or positive tax shock

(bottom figure). The former represents an expansionary fiscal policy while the latter captures a contractionary fiscal policy.

The third set of estimations focuses on **EMU candidates**. In this country group, fiscal multipliers have higher values only in the long run: this implies that there might be a delay between the implementation of fiscal policy and the moment when its effects on the economy become visible. In the EMU candidates, boosting government spending or increasing taxes leads to positive multipliers up to the 20th quarter.

As shown in the upper chart below (Figure 3), we obtain a low value for the spending multiplier in the short run, namely 0.002 in the first quarter - but this is not statistically significant (it changes to significant starting with the second quarter). Regarding the peak multiplier, the most substantial response of GDP to a spending shock occurs after 4 quarters and equals 0.02.

Figure 3: Impulse response functions to fiscal shocks in EMU candidates



Note: The results are based on a Monte Carlo simulation with 1000 replications using a 90% confidence interval (shaded area). Each figure gives the impulse responses to a one-standard-error positive government expenditure shock (top figure) or positive tax shock (bottom figure). The former represents an expansionary fiscal policy while the latter captures a contractionary fiscal policy.

In the long run, we obtain a cumulative multiplier whose value rises to 0.41, as emphasized by Appendix B, Table 9. This result indicates that after several quarters, the effects of

government spending become visible in terms of GDP variation. This result is statistically significant only after the second quarter.

The lower chart (Figure 3) describes the orthogonalized IRF related to taxes. The impact and the peak multipliers (0.05) are higher than the spending multipliers. The tax multiplier, however, becomes negative in the long run: this result is nevertheless not statistically significant.

Our results related to the EMU candidates are in line with the existing literature. Stanova (2015) highlights that government spending has small effects on output, and Crespo Cuaresma et al. (2011) show that both the spending and tax multipliers are smaller in countries from Central and Eastern Europe (such as Hungary and Poland) that we include in this group (countries that joined the European Union in 2004). Boiciuc et al. (2014) find small but positive values for the fiscal multipliers in another EMU candidate, Romania. Mirdala (2009) shows, in a pre-crisis sample, that, following a government expenditure shock, output increases strongly in the Czech Republic and increases slightly in countries as Hungary, Poland and Romania. In Croatia, Grdović Gnip (2014) documents that during recessions, government spending multipliers tend to be larger and in line with the Keynesian assumptions, while Ravnik and Žilić (2011) indicate that tax shocks have a positive (and non-Keynesian) effect on industrial production. Combes et al. (2014) obtain a positive fiscal multiplier for the EMU candidates, as a whole, result which is similar to ours but higher in magnitude.

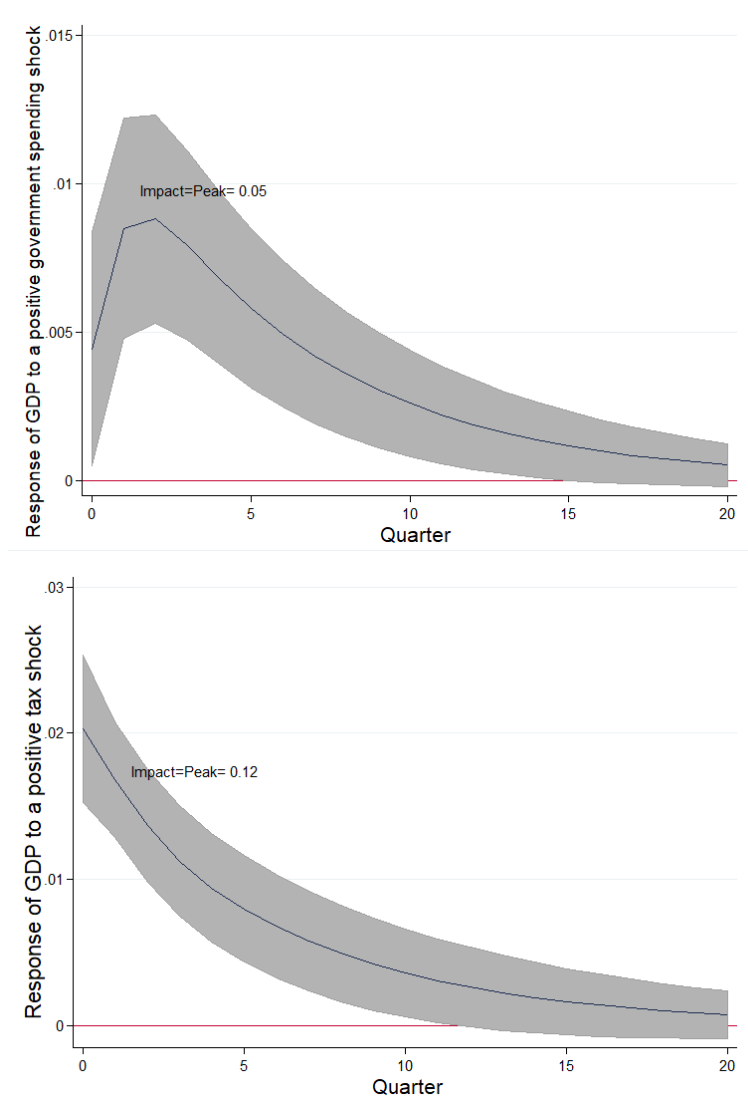
Lastly, we analyze the case of **EU candidates**. To do this, we rely upon the orthogonalized IRF displayed in the upper graph in Figure 4. This figure shows the following: the EU candidates exhibit high values for their spending multipliers in the short run. Regarding the peak multiplier, the largest response of GDP occurs after two quarters and it equals 0.05 (see Appendix B, Table 9). The impact multiplier is equal to 0.05 as well. The persistence of these multipliers is going up to 10 quarters, suggesting that an expansion of fiscal policy might have lasting effects in these upper-middle-income countries. In the long run, after 20 quarters, the cumulative multiplier rises to its long-run value of 0.88 (see Appendix B, table 9). These results are opposite to the ones of Ilzetzki et al. (2013), who underline that multipliers' persistence is transient in emerging countries. Nevertheless, our findings are obtained based on a small country sample and on a time span in which the recent crises are included, a period which is not covered by Ilzetzki et al. (2013).

The lower-hand graph in Figure 4 presents the orthogonalized IRF for the tax multiplier: we obtain the same value (0.12), for both the impact and peak multipliers. In the long run, the cumulative multiplier becomes negative, but it is not significant statistically.

To the best of our knowledge, the impact of fiscal policy on output (i.e., the fiscal multipliers) for all the EU candidate countries, taken together, has not been yet investigated in the literature. There are only few studies analyzing fiscal multipliers in this area, based on individual country estimates. Our results confirm their findings in general, with some exceptions. OECD (2009) analyzes Turkey's case and obtains a maximum spending multiplier of 1.0 and a tax multiplier of 0.4; after cuts in indirect taxation. Çebi (2017) also finds, in

Turkey, a high spending multiplier (reaching a maximum value of 1.5): this can be linked to the large fiscal stimulus packages adopted in 2008 (equal to 6% of Turkey's 2008 GDP, according to [ILO \(2011\)](#)). [Korkmaz et al. \(2019\)](#) document, based on an ARDL model estimations from 2006Q1 to 2018Q3, that increasing indirect taxes spurs economic growth in Turkey. In Serbia, the government launched a set of measures in 2009 to strengthen private sector activity and put forward several incentives for infrastructure projects ([Aran-darenko 2011](#)). The effectiveness of this type of fiscal stimulus is proved to be high in this country (as underlined by [Hinić and Miletić \(2013\)](#) or [Deskari-Škrbić and Šimović \(2017\)](#)). For North Macedonia, the analysis of fiscal multipliers is extremely scarce. To the best of our knowledge, the only study available in the literature is by [Filipovski et al. \(2016\)](#), who find negative values for the public expenditure multiplier and positive ones for the tax multiplier.

Figure 4: Impulse response functions to fiscal shocks in EU candidates



Note: The results are based on a Monte Carlo simulation with 1000 replications using a 90% confidence interval (shaded area). Each figure gives the impulse responses to a one-standard-error positive government expenditure shock (top figure) or positive tax shock (bottom figure). The former represents an expansionary fiscal policy while the latter captures a contractionary fiscal policy.

4.2 Comparing fiscal multipliers across EU candidates and EU members

Building on the results presented in the previous subsection, we aim here to extend the analysis in order to compare and discuss the fiscal multipliers across the four country groups. Particular attention will be given to the behaviour of the fiscal policy in the **EU candidates**.

EU candidates, as well as the **EMU candidates**, exhibit positive spending multipliers, both in the short run and in the long run: this suggests that the incentives launched by the government in these countries seem efficient. Hence, the public spending policy is characterized by Keynesian effects. The effects are more significant and larger in the **EU candidates**. This can be associated with the fact that in these countries, there might be credit constraints during downturns (i.e., during the recent crisis, banks rarely lent funds to the private sector and households, due, mainly, to an uncertainty of repayment). Consequently, governments have to activate fiscal policy in order to stimulate economic activity. These incentives are key elements for the private sector and households, and, thus, they can be absorbed very fast (Suzuki 2015). Therefore, applying a countercyclical policy helped these countries to stabilize the economy during slumps.

The **historical** and **newest EMU members** exhibit extremely small and non-Keynesian short-run spending multipliers. In the long run, the spending multipliers become larger but stay non-Keynesian. We can interpret these findings as follows: increasing government expenditure can indicate that future fiscal consolidation might be needed, and this might have an ambiguous effect on the economy. Furthermore, this might depress private investment and output. Overall, these factors can thus offset the government spending effect. At longer horizons, increasing government spending can be associated with accumulating debt, which in the EMU, might raise concerns about the sustainability of public finances (Kirchner et al. 2010). In this situation, fiscal stimuli might be counter-productive (Ilzetzi et al. 2013). Our results suggest, overall, that, as the EMU countries need to respect fiscal discipline, through the Stability and Growth Pact, increasing government spending can challenge the sustainability of public finances and might finally make the fiscal stimuli inefficient. This implies, in the spirit of Kirchner et al. (2010), that components of aggregate demand can be expected to be progressively crowded out by spending based on fiscal expansion.

Tax multipliers are positive for the **EU candidates** and the **EMU candidates** in the short run. In the long run, the cumulative tax multipliers become negative in the two country groups, but they are not statistically significant. As underlined by Causevic (2012), the **EU candidates** project fiscal discipline in order to maintain their deficits in line with the Maastricht limits and to prepare for integration both in the EU and the EMU in the future. But, if this fiscal correction exerts an expansion of GDP in the short run, it might not be the case in the long run (as a cumulative increase in taxes might not be expected to increase GDP over a longer time horizon). This is in line with Jawadi et al. (2014), who claim that no expansionary fiscal consolidation effects are found for emerging and transition countries. The **EMU candidates** need to prepare their future monetary

integration and also need to maintain sound public finances, in order to make the fulfilment of the Maastricht criteria possible at some point in the future. Nevertheless, aiming to have higher fiscal revenues through raising taxes might generate a GDP increase only in the short run (Combes et al. 2016).

Overall, the four country groups that we analyze exhibit positive and significant short-run tax multipliers. In the literature, Gechert (2013) or Blot et al. (2014) confirm that both negative and positive tax multipliers have been identified empirically. The puzzling positive response of GDP to an increase in taxes can be explained using several arguments. First, this is in agreement with Guajardo et al. (2014), who highlights empirically that a fiscal contraction can act as a stimulus for private demand in the short run. It is also in line with a large body of the literature supporting the idea that if fiscal restraint is enacted during a downturn, then, it is better to have it constructed on tax increases rather than public spending cuts, as underlined by Blot et al. (2014). Empirical studies found evidence of such a result, as stated by Perotti (2002) or Afonso (2001). Theoretically, as underlined by Combes et al. (2014), the positive effect of taxes on GDP can be related to the increasing side of a Laffer Curve (Minea and Villieu (2009) or to non-Keynesian effects during expansion periods in which more liquidity can be compatible with a Ricardian behavior or during recession periods with deteriorated fiscal stance in which changes in the private sector's expectations might appear (Alesina and Ardagna 2010).

We turn now in particular to the **EMU countries (original and newest)** which are characterized by small and positive (non-Keynesian) short-run tax multipliers, and we analyze their situation in detail. In the long run, cumulative multipliers are larger in these two country groups: they remain positive for the **historical EMU members** and turn negative for the **newest EMU members**. Several arguments can be put forward to justify this result. In the **historical EMU countries**, the private sector has been concerned, over the last decades, with the situation of public finances characterized by higher deficit and debt levels. Within this framework, increasing taxes generates fiscal revenues and could be considered as a fiscal consolidation measure. Hence, if it is considered credible in the eyes of investors (this is usually the case in advanced countries such as the EMU members), it can be seen as an attempt to diminish public sector borrowing requirements (Afonso 2001). Thus, it can be expected to boost private sector confidence, leading to a rise in private consumption which can, ultimately, increase output (Mauro et al. 2015). In earlier work on the OECD countries, Corsetti et al. (2012) outline the presence of a government credibility effect after announcing a fiscal consolidation: this leads to lower interest rates (i.e., a lower risk-premium rate), and thus to positive effects on output. All together, these elements can represent a reasonable explanation of our results for this country group. For the **newest EMU members**, we find negative (and thus Keynesian) long-run tax multipliers. These countries were not severely hit by the global financial crisis or the Eurozone sovereign debt crisis: hence their GDP reacts, in the long run, in a Keynesian way to tax increases. This country evidence unveils long-run heterogeneities within the EMU members: the dynamics of their GDP following tax shocks might be quite different over a twenty-quarter time

horizon.

We nevertheless note several similarities across the results obtained in the four groups of countries. We find that: the peak tax multipliers arise rather rapidly, in general, in the first quarter after the shock; short-run tax multipliers are higher in magnitude (in absolute value) compared to the spending multipliers, irrespective of the country group that is analyzed (this is not in line with the theoretical predictions of the Keynesian literature) and cumulative spending multipliers are higher (in absolute value) than cumulative tax multipliers (which seems more in agreement with the Keynesian theory).

A crucial difference in terms of results across the country groups is the following: in the **EU candidates**, short-run tax and spending multipliers, are stronger in absolute value compared to the ones of the **EMU members (historical and newest)**; while long-run tax and spending cumulative multipliers are, in general, bigger in absolute value in the **historical and newest EMU members** than in the **EU candidates**.

In the following, we will link our results concerning the fiscal multipliers, to different characteristics of the country groups: exchange-rate regimes, financial development, public debt and trade openness. Summary statistics of the three latter variables are briefly presented in Table 4. Trade openness is measured as exports plus imports divided by GDP. Public debt is taken as a share of GDP as well. Financial development is computed as credit to domestic sector as a percentage of GDP. In Table 4, we present for each variable the average obtained over the period from 2001 to 2017 for the countries included in each group. Hence, we observe that, on average, the newest EMU members have the highest trade openness and the lowest public debt, among the four groups of countries. The level of financial development in the historical EMU countries is, on average, two times higher than that one of the EU candidates or EMU candidates. When it comes to the exchange rate regimes in the country groups under analysis, they are as follows: the EMU historical and newest members are in a monetary union, while among the EMU candidates and EU candidates, both flexible and fixed exchange rate regimes can be found (more details will be provided in the following paragraphs). This data is presented in order to put forward some key features of these groups in general. We highlight however that we do not aim to identify the fiscal multipliers determinants in these country-groups: this is above the scope of this paper. We simply suggest some possible further interpretations for our results, which can be put forward, in the light of the existing literature.

Exchange rate regimes are usually considered in the literature as a key factor that can be related to the size of fiscal multipliers. Many studies, such as [Ilzetzkı et al. \(2013\)](#), suggest that fiscal multipliers tend to be smaller, *in the long run*, under flexible exchange rates (and are higher under predetermined fixed exchange rates). This is done in line with the Mundell-Fleming model (i.e., fiscal expansion becomes ineffective under flexible exchange rates as it triggers an exchange rate appreciation which crowds out net exports; in contrast, fiscal policy is considered effective under fixed exchange rates as monetary expansion keeps the exchange rate unchanged ([Corsetti et al. 2012](#), [Born et al. 2013](#), [Ilzetzkı et al. 2013](#))). Considering the exchange rate regimes in our country grouping, we could expect, in line

with this literature, stronger long-run multipliers in the EMU countries. Our results suggest indeed that within the European Union members, fiscal multipliers are higher in absolute value in **EMU countries (both historical and newest members)** than in the **EMU candidates**¹³ or in the **EU candidates**¹⁴ that experience pegged or floating exchange rate regimes (IMF 2016).

Several studies argue that stronger financial development induces larger fiscal multipliers (Spilimbergo et al. 2009, Corsetti et al. 2012, Hory 2016), while others claim the contrary, namely that a lower financial development could be associated with higher values of multipliers (Kirchner et al. 2010, Eggertsson and Krugman 2012, Batini et al. 2014). The **EU candidates'** situation, *in the short-run*, can be interpreted in the light of the latter approach, which is based on the idea that consumption relies rather on current revenue than on future revenue and that can trigger larger fiscal multipliers. This country group exhibits the lowest level of financial development among the analyzed countries (as shown in Table 4). The arguments based on credit constraints, provided at the beginning of this section, can be related to the financial development dimension and can further explain the fiscal multipliers in the **EU candidates**. The situation of the **EMU candidates** is rather different: after their EU accession, they were able to develop other sources (such the capital market or the access to higher post-EU-adhesion financing) to finance their economic activities. The European Structural and Cohesion Funds used in the region were up to €138.76 billion: the **newest EMU members** benefited from approximately €30.46 billion (KPMG 2007). Hence, *in the long run*, these countries report higher multipliers, a fact that can confirm the former assumption related to financial development's impact on multipliers (i.e., the stronger the financial development, the bigger the multiplier).

Table 4: Country groups characteristics

Variable	EMU historical	Newest EMU members	EMU candidates	EU candidates
Trade openness	94.10	132.24	102.74	75.26
Public debt	84.68	30.37	46.99	42.34
Financial development	87.65	57.44	42.56	35.11

Source: World Bank, average computed over the period 2001-2017. **Note:** Public debt and trade openness are expressed as shares of GDP. Financial development is measured by domestic credit to the private sector as a share of GDP.

The debt-to-GDP ratio can also explain the size and sign of multipliers. Several empirical studies confirm that long-run fiscal multipliers are larger in a low public-debt environment (Chian Koh 2017, Kirchner et al. 2010). **EU candidates** experience a relative low debt-to-GDP ratio (cf. Table 4). However, the infrastructure projects and structural

¹³According to the IMF (2016), the EMU candidates have pegged (Croatia) and floating (Poland, Czech Republic, Hungary, Romania) exchange rate regimes.

¹⁴In the EU candidate countries, the exchange rate regimes are either floating (Turkey, Albania) or related to currency pegs (Serbia, North Macedonia) (IMF 2016).

policies implemented in the last decade in this country group, but also in the **EMU candidates**, have generated rising debt-to-GDP ratio. The level of the latter is nevertheless lower than the one of the **EMU historical countries**, but higher compared to the **newest EMU members** (see Table 4). Hence, this might explain why the **historical EMU countries** experience a negative long run spending multiplier (i.e., fiscal stimuli might become inefficient under high public debt, inducing a crowding-out effect) while the **EU candidates** have a positive multiplier.

Several papers, such as [Spilimbergo et al. \(2009\)](#) or [Ilzetzki et al. \(2013\)](#), highlight that open economies have small fiscal multipliers. [Spilimbergo et al. \(2009\)](#) show that fiscal multipliers are big only if fiscal stimuli are not spent on imports. In other words, only countries with a low propensity to import could benefit from large fiscal multipliers. The level of trade openness is high within the EU countries. In contrast, **EU candidates** face more costs (e.g. tariffs) when they trade with EU members: hence, their degree of openness with respect to the EU might be lower (the EU is, however, their most important trade partner). This can explain, if the degree of openness is used as a factor that can justify the size of the fiscal multiplier (other things being equal), the fact that spending multipliers are higher in the **EU candidates** compared to the **EU countries**.

Our analysis covers recent years (the pre-crisis, crisis and post-crisis periods) during which countries employed different measures and mechanisms in order to fight the crisis, to get more stable public finances and higher growth, or to strengthen the integration process with respect to the EU or the EMU. In this context, analyzing the effectiveness of fiscal stimuli across countries is extremely interesting. We put a particular focus of our analysis on the experience of the EU candidates: they used their fiscal policy and achieved results in terms of GDP growth. The magnitude of the fiscal multipliers in this group seems stronger, especially, in the short run. Moreover, since the effects of fiscal policy are found to be significant in this group of countries, drawing upon a sound fiscal policy might improve their convergence process towards the EU membership criteria.

5 Robustness check

In order to test the robustness of our specification and results, we follow different approaches. Specifically, our robustness checks are run at six levels.

First, to confirm our results, we employ an alternative methodology: the Interacted Panel Vector Auto-regressive (IPVAR) approach. The IPVAR model allows to have a relation between the endogenous variables that varies according to an interaction term value ([Hory 2016](#)). As an interaction variable, we use a dummy that takes the value 1 for the EU candidates and the EMU candidates, and 0 for all the other countries. Hence, this allows to group the countries of our sample differently: we distinguish, between the EU candidates and the EMU candidates (as one group, assimilated to non-Eurozone countries), on the one hand, and the historical and newest EMU members (as another group covering

the euro area members), on the other hand. The IPVAR has the following form:

$$Y_{i,t} = A_i + B(L)Y_{i,t} + A_i X_{(i,t)} + C(L)X_{i,t}Y_{i,t} + \epsilon_{i,t} \quad (5)$$

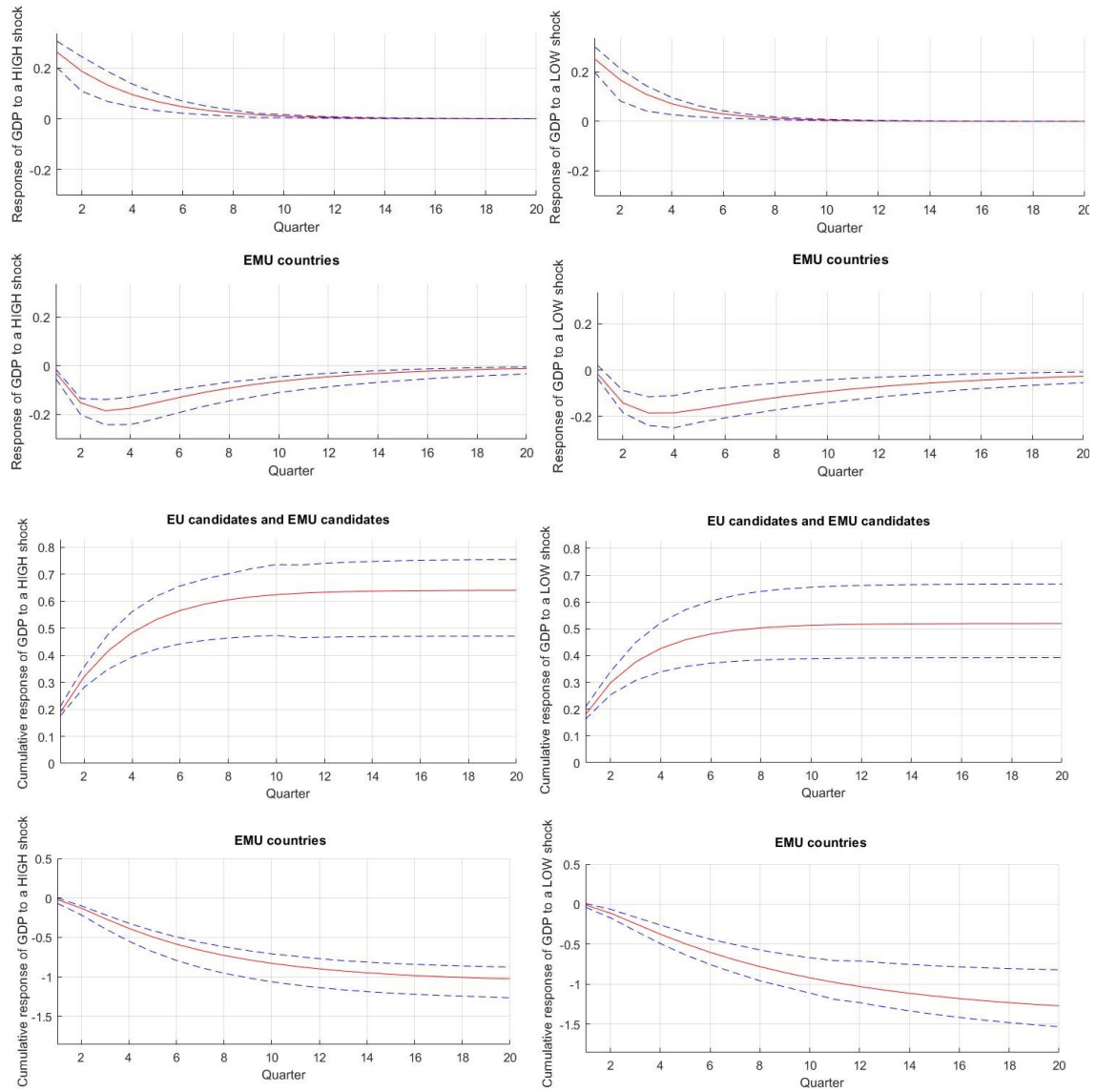
The model is built on the initial PVAR model and includes additional variables: $X_{i,t}$ is the vector of interaction terms and $C(L)$ is the polynomial matrix with L being the lag operator for the coefficients with limits.

Using a IPVAR approach does not trigger huge differences in terms of results for the fiscal multipliers. Findings do not change significantly with respect to the initial ones. We use shocks at lower (25th) and higher (75th) percentiles. We get positive results for spending multipliers in candidate countries and negative ones in EMU members. Positive values are obtained for all tax multipliers in both the short- and the long run. Hence, our results hold when an alternative methodology is employed (Figures 5 and 6).

Second, we test the sensitivity of our initial results to a change in the order of the variables included in the analysis. We recall that in Section 2, the ordering of the variables was: government consumption, taxes (less subsidies) on products, and GDP. Now, when computing the impulse response functions, we invert the order of the first two variables: we introduce first taxes (less subsidies) on products and then government consumption.

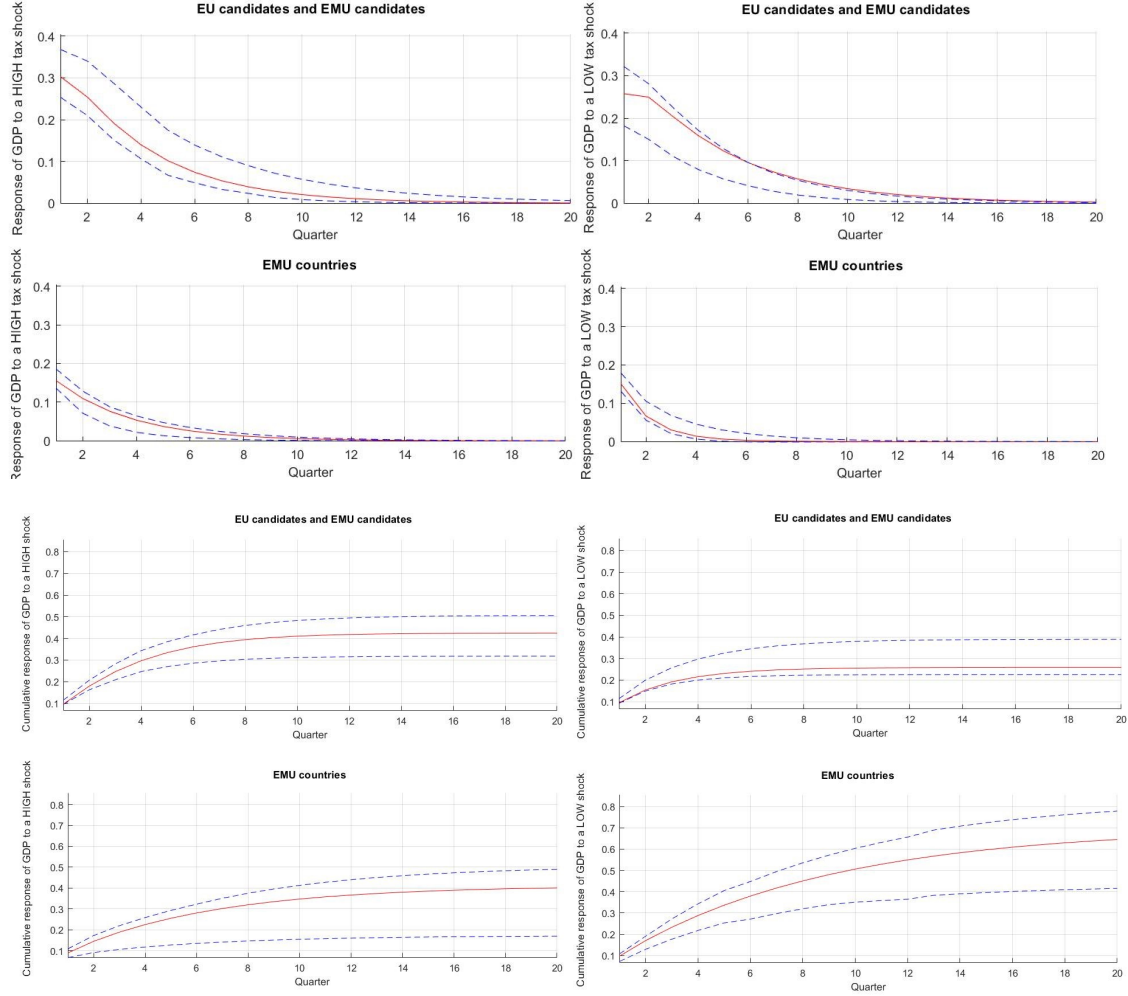
The results are presented in Appendix C (Table 10). We obtain similar findings, in sign, like the ones of our initial study. All the results, for all groups of countries, are the same as the ones obtained in the initial framework. In the long run, we get a higher magnitude for the spending multiplier in the newest EMU countries and a lower one in the EU candidates.

Figure 5: Impulse response functions of GDP to a positive spending shock (expansionary) with interaction terms



Note: Dotted lines represent 90% confidence bands, generated using bootstrapping procedure based on 1,000 replications.

Figure 6: Impulse response functions of GDP to a positive tax shock (contractionary) with interaction terms



Note: Dotted lines represent 90% confidence bands, generated using bootstrapping procedure based on 1,000 replications.

Third, we add a control variable¹⁵ in the model: gross fixed capital formation, on the one hand, and a current account indicator, on the other hand. One control variable is introduced at a time. Hence, we re-estimate our PVAR with four regressors. We keep the same order of variables like in our initial model, namely government spending, taxes followed by the control variable and the GDP.

¹⁵To build the data set, we use the following sources: Eurostat, Macrobond, and the National Statistics for North Macedonia, Serbia, and Turkey. For both control variables - gross fixed capital formation and the current account-, we use real data: chain linked volumes (2010), million euro.

Adding a control variable does not change the overall results, which are shown in Appendix C (Tables 11 and 12, respectively). We have extremely small changes for the EU candidates in the short run. In the long run, the cumulative spending multiplier is lower, and we get a different sign for the tax multiplier (which was not statistically significant in our initial analysis). EMU candidates present different signs for the spending multipliers, but these multipliers have an extremely low magnitude. EMU countries (historical and newest) exhibit higher cumulative multipliers, compared to the basic results.

Fourth, we test the sensitivity of our results to a different country-group configurations and to a different time period. Specifically, we include another candidate country - Albania - in the EU candidates group and we run our model for the period 2009Q1 to 2017Q1 (for which data on Albania are available).

Including another country into our EU candidates group and estimating the fiscal multipliers for the period 2009Q1-2017Q1 gives robust results, as shown in Appendix C (Table 13). The spending multiplier is still positive, both in the short- and the long run. In the short run, we obtain a higher value for the tax multiplier. As we analyze this time span, we implicitly consider the post-crisis era: this has not been studied in the fiscal multiplier literature so far, in relation to the analyzed EU candidates. The results are rather similar to the ones obtained in our initial analysis.

Fifth, we develop a study that includes direct taxes, besides the indirect taxes that are initially considered. We do this for a shorter time horizon, due to the availability of data on direct taxes¹⁶. The quarterly data used in this robustness check cover the period from 2007Q1 to 2017Q1. We obtain the same values (see Appendix C, Table 14) for the tax multipliers. There is only a change in the spending multipliers (i.e., we obtain negative spending multipliers for the EMU candidate countries both in the short and long runs, while in the initial set of results, we had positive multipliers, which were not always significant). According to Bakker and Klingen (2012), only few EMU candidates (e.g. Poland) intensively used fiscal policy instruments, during the crisis to rescue the economy. Hungary and Romania, deeply affected by the crisis opted for fiscal austerity programs. This might partially explain these results. Several other explanations can be put forward: higher direct taxes are associated with a lower disposable income, which might trigger a diminished level of consumption, and therefore induce a negative spending multiplier effect; these countries' debt cost (as a share of GDP) is considered to be higher than in the EMU countries. Hence higher taxes can be used to pay back the existent debt load in order to stay credible on the debt market (Bakker and Klingen 2012).

Sixth, we explicitly take account of the crisis times and examine how countries' economies reacted, during this period, to fiscal policy. This is done in line with the literature that has highlighted that crisis had a substantial impact on fiscal policy outcomes. We use a dummy variable for the crisis years and quarters (2008Q1-2010Q4), and find that fiscal

¹⁶The quarterly data on direct taxes are collected from the national statistical offices of the EU candidate countries and from Eurostat for the EU members. Direct taxes consist of current taxes on income and wealth (Eurostat 2019).

multipliers exhibit a higher magnitude in crisis times (Appendix D, Figures 11 and 12). This is strongly confirmed by the literature (Baum et al. 2012, Riera-Crichton et al. 2015).

6 Conclusion

The objective of this paper is to compare fiscal multipliers across EU candidates and EU members. In order to have a better overview of the European situation, we choose to group these countries in four categories: three groups of EU members (historical EMU members (group I), newest EMU members (group II), and EMU candidates (group III)), and one group of EU candidates (group IV). We do this as we aim to consider the different stages of European integration while comparing the performance of the fiscal multipliers in Europe. These integration levels also capture country groups' specific features (i.e., the degree of openness).

Following a PVAR approach, we estimate two types of fiscal multipliers for our four groups of countries: government spending multipliers and tax multipliers. These multipliers are computed both in the short run (impact and peak multipliers) and in the long run (cumulative multipliers).

Our findings suggest that increasing government spending will raise GDP in both the EU candidates and EMU candidates, but will slightly diminish it in other EU members, that are already part of EMU. We also find that in the short run, high taxes are associated with a rising GDP in all country-groups, while in the long run, tax multipliers stay positive for the EMU historical members and become negative for the other groups of countries. Overall, these outcomes indicate that spending multipliers are, compared to tax multipliers, more sensitive to the EU or EMU membership. EU membership, as well as EMU membership, affects the response of GDP with respect to changes in public spending. Tax multipliers do not seem to be very sensitive in sign to countries' membership, especially in the short run. Moreover, the effects of tax policy seem immediate in all country groups: almost all tax peak multipliers are registered, in general, in the first quarter after the tax shock. Short-run tax multipliers are higher (in absolute value) compared to the spending multipliers, a result which is not in line with Keynesian theoretical predictions. An interesting result that we obtain is that, in general, in the EU candidates, short-run tax and spending multipliers, seem bigger in absolute value compared to the ones in the EMU members (historical and newest countries). On the contrary, long-run cumulative multipliers are (with few exceptions) stronger, in absolute value, in the historical and newest EMU members compared to those of the EU candidates. Overall, our work shows the presence of heterogeneities, on the European continent, in terms of fiscal policy effectiveness. The results' interpretation can be linked to the different integration levels across the European countries and to the specific characteristics of the considered country groups.

These results are confirmed by robustness checks run at different levels. First, we employ an alternative methodology (i.e., IPVAR) within a different country grouping (allowing

us to distinguish between, on the one hand, the EU candidates and EMU candidates, as a group, and, on the other hand, the historical and newest EMU members, as another group). Second, we reorder the variables in the initial PVAR. Third, we include additional variables in the PVAR model, too. Fourth, we introduce another EU candidate (i.e., Albania) in the analysis and run the model over the post-crisis period only (i.e., the data for Albania are available only for this post-crisis time span). Fifth, we add, in the estimations, a direct taxation variable and run the model for a shorter period (for which the data are available). These results hold to these various robustness tests. Lastly, we specifically take account of the crisis effects: to do this, we employ an IPVAR approach. This allows introducing a dummy variable, in the model, to capture the crisis years and quarters, and further on, it allows terms to interact. We obtain similar results in terms of sign for the multipliers, as in the initial analysis, but document that both tax and spending multipliers are stronger, in magnitude, in crisis times, across the EU candidates and the EU members.

Appendix A

Table 5: Panel unit root test - historical EMU members

Time series	Im-Pesaran-Shin	
	Without trend	With trend
GDP	-1.9245 (0.02)	-1.9103 (0.02)
Government consumption	-4.4710 (0.00)	-5.3174 (0.00)
Taxes (less subsidies) on products	-3.4020 (0.00)	-3.7111 (0.00)

***Note:** p-value in parenthesis.*

Table 6: Panel unit root test - newest EMU members

Time series	Im-Pesaran-Shin	
	Without trend	With trend
GDP	-1.4009 (0.08)	-1.4729 (0.07)
Government consumption	-4.1249 (0.00)	-4.4855 (0.00)
Taxes (less subsidies) on products	-6.3820 (0.00)	-6.5018 (0.00)

***Note:** p-value in parenthesis.*

Table 7: Panel unit root test - EMU candidates

Time series	Im-Pesaran-Shin	
	Without trend	With trend
GDP	-2.3610 (0.00)	-1.1813 (0.10)
Government consumption	-7.1410 (0.00)	-7.3733 (0.00)
Taxes (less subsidies) on products	-6.0036 (0.00)	-6.0615 (0.00)

***Note:** p-value in parenthesis.*

Table 8: Panel unit root test - EU candidates

Time series	Im-Pesaran-Shin	
	Without trend	With trend
GDP	-4.2798 (0.00)	-4.9523 (0.00)
Government consumption	-6.1522 (0.00)	-6.3718 (0.00)
Taxes (less subsidies) on products	-3.6020 (0.00)	-4.4248 (0.00)

Note: p-value in parenthesis.

Appendix B

Table 9: Short and long run results for fiscal multipliers

Country group	Impact multiplier		Peak multiplier		Cumulative multiplier	
	Spending	Tax	Spending	Tax	Spending	Tax
Historical EMU countries	-0.01	0.07	-0.02 (Q 4)	0.07 (Q 1)	-2.40	1.88
Newest EMU countries	-0.05	0.11	-0.08 (Q 5)	0.11 (Q 1)	-3.84	-0.45
EMU candidates	0.002	0.05	0.02 (Q 4)	0.05 (Q 1)	0.41	-0.21
EU candidates	0.05	0.12	0.05 (Q 2)	0.12 (Q 1)	0.88	-0.15

Appendix C

Table 10: Robustness - short and long run results for fiscal multipliers - changing order

Country group	Impact multiplier		Peak multiplier		Cumulative multiplier	
	Spending	Tax	Spending	Tax	Spending	Tax
Historical EMU countries	-0.01	0.07	-0.01 (Q 4)	0.07 (Q 1)	-2.40	1.88
Newest EMU countries	-0.03	0.11	-0.06 (Q 4)	0.11 (Q 1)	-4.09	-0.64
EMU candidates	0.002	0.05	0.02 (Q 4)	0.05 (Q 1)	0.41	-0.21
EU candidates	0.03	0.12	0.03 (Q 1)	0.12 (Q 1)	0.88	-0.15

Table 11: Robustness - short and long run results for fiscal multipliers - adding another control variable (Gross Fixed Capital Formation)

Country group	Impact multiplier		Peak multiplier		Cumulative multiplier	
	Spending	Tax	Spending	Tax	Spending	Tax
Historical EMU countries	-0.01	0.01	-0.02 (Q 1)	0.01 (Q 1)	-1.00	2.62
Newest EMU countries	-0.06	0.11	-0.13 (Q 4)	0.11 (Q 1)	-6.44	-0.28
EMU candidates	-0.01	0.06	-0.01 (Q 1)	0.06 (Q 1)	-0.16	0.31
EU candidates	0.01	0.10	0.01 (Q 3)	0.10 (Q 1)	0.24	0.37

Table 12: Robustness - short and long run results for fiscal multipliers - adding another control variable (Current Account)

Country group	Impact multiplier		Peak multiplier		Cumulative multiplier	
	Spending	Tax	Spending	Tax	Spending	Tax
Historical EMU countries	-0.01	0.08	-0.02 (Q 6)	0.08 (Q 2)	-3.48	3.00
Newest EMU countries	-0.03	0.11	-0.01 (Q 3)	0.11 (Q 1)	-2.2	-0.1
EMU candidates	-0.010	0.07	-0.01 (Q 2)	0.07 (Q 1)	-0.15	0.43
EU candidates	0.001	0.13	0.05 (Q 3)	0.13 (Q 1)	0.52	0.91

Table 13: Robustness - short and long run results for fiscal multipliers - with four EU candidate countries (Albania included) and a different period (2009-2017)

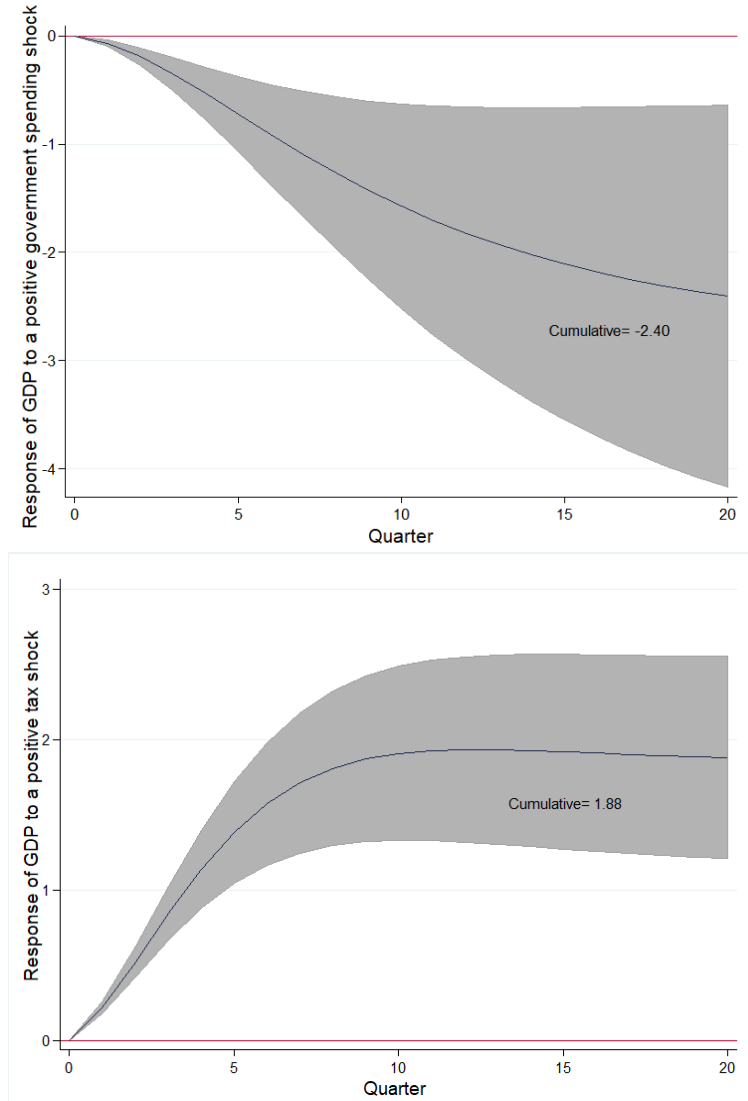
Country group	Impact multiplier		Peak multiplier		Cumulative multiplier	
	Spending	Tax	Spending	Tax	Spending	Tax
EU candidates	0.01	0.22	0.02 (Q 1)	0.22 (Q 1)	0.1	-0.22

Table 14: Robustness - short and long run results for fiscal multipliers - including direct taxes over the period 2007-2017

Country group	Impact multiplier		Peak multiplier		Cumulative multiplier	
	Spending	Tax	Spending	Tax	Spending	Tax
Historical EMU countries	-0.01	-0.05	-0.01 (Q1)	-0.08 (Q1)	-0.26	-1.81
Newest EMU countries	-0.06	0.11	-0.18 (Q6)	0.11 (Q1)	-12	-4.78
EMU candidates	-0.01	0.03	-0.01 (Q1)	0.03 (Q1)	-0.28	0.25
EU candidates	-0.03	0.07	-0.03 (Q1)	0.07 (Q1)	-0.42	0.40

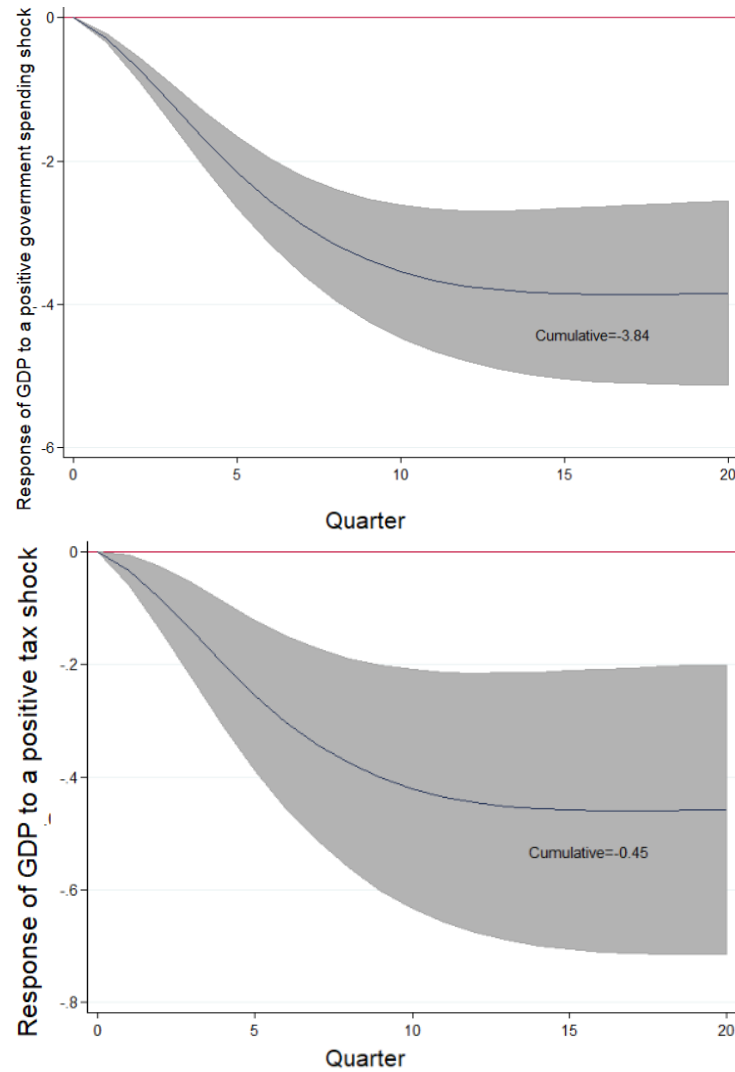
Appendix D

Figure 7: Cumulative Impulse response functions to fiscal shocks in historical EMU countries



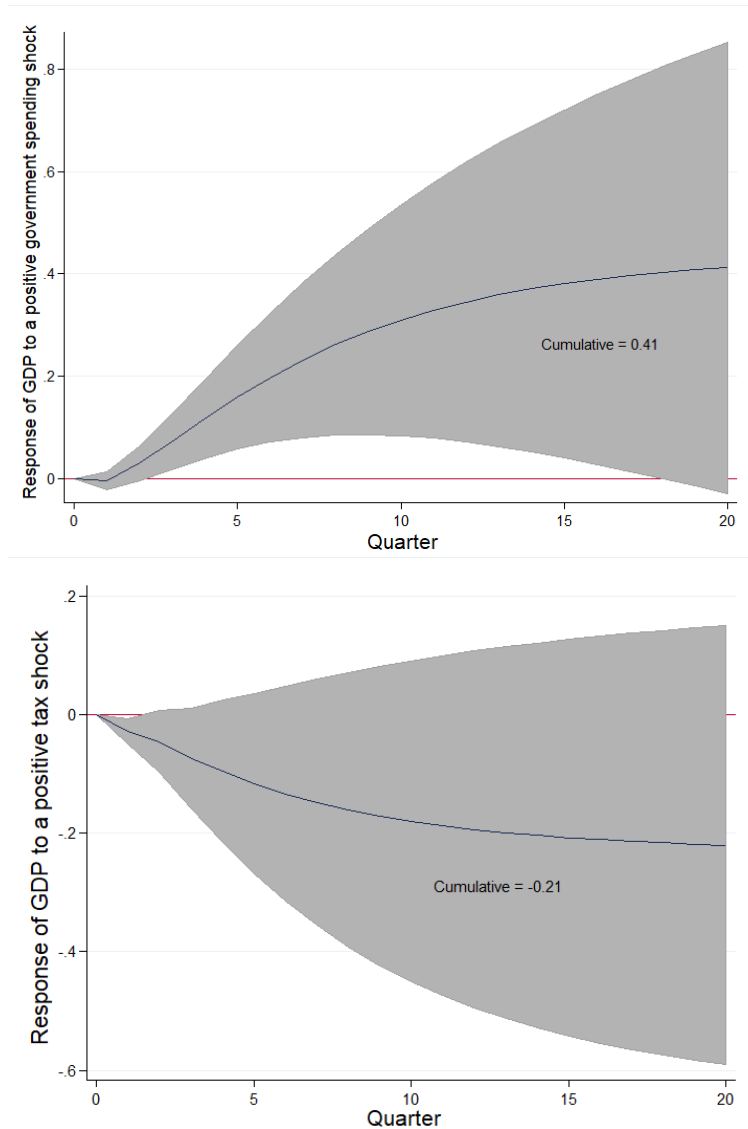
Note: The results are based on a Monte Carlo simulation with 1000 replications using a 90% confidence interval (shaded area). Each figure gives the impulse responses to a one-standard-error positive government expenditure shock (top figure) or positive tax shock (bottom figure). The former represents to an expansionary fiscal policy while the latter captures a contractionary fiscal policy.

Figure 8: Cumulative Impulse response functions to fiscal policy in newest EMU countries



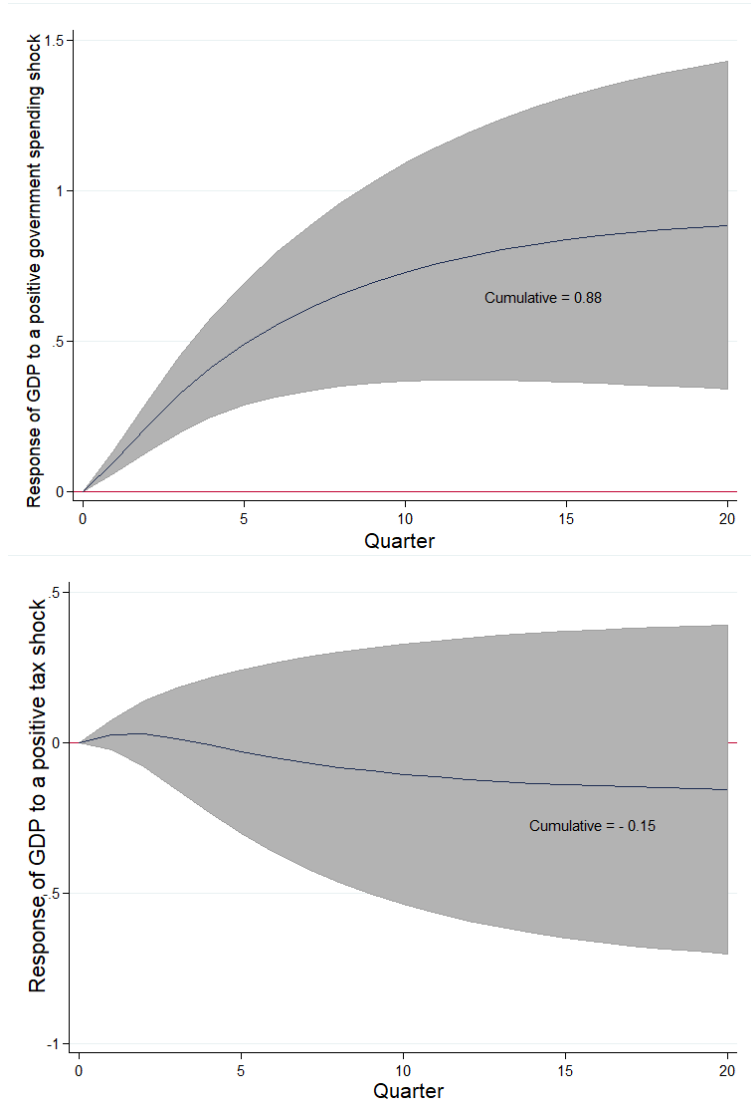
Note: The results are based on a Monte Carlo simulation with 1000 replications using a 90% confidence interval (shaded area). Each figure gives the impulse responses to a one-standard-error positive government expenditure shock (top figure) or positive tax shock (bottom figure). The former represents to an expansionary fiscal policy while the latter captures a contractionary fiscal policy.

Figure 9: Cumulative Impulse response functions to fiscal policy in EMU candidates



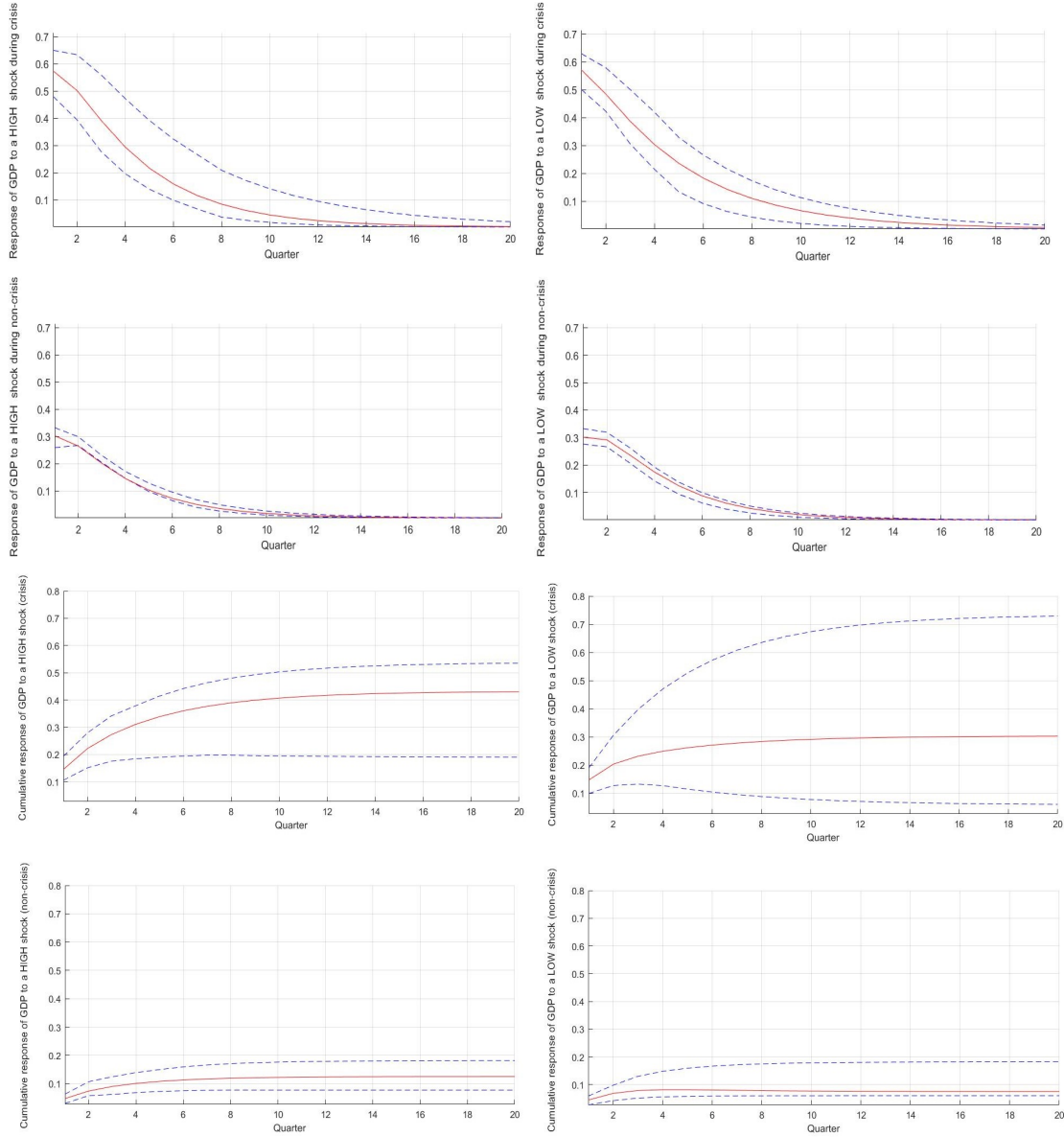
Note: The results are based on a Monte Carlo simulation with 1000 replications using a 90% confidence interval (shaded area). Each figure gives the impulse responses to a one-standard-error positive government expenditure shock (top figure) or positive tax shock (bottom figure). The former represents to an expansionary fiscal policy while the latter captures a contractionary fiscal policy.

Figure 10: Cumulative Impulse response functions to fiscal policy in EU candidates



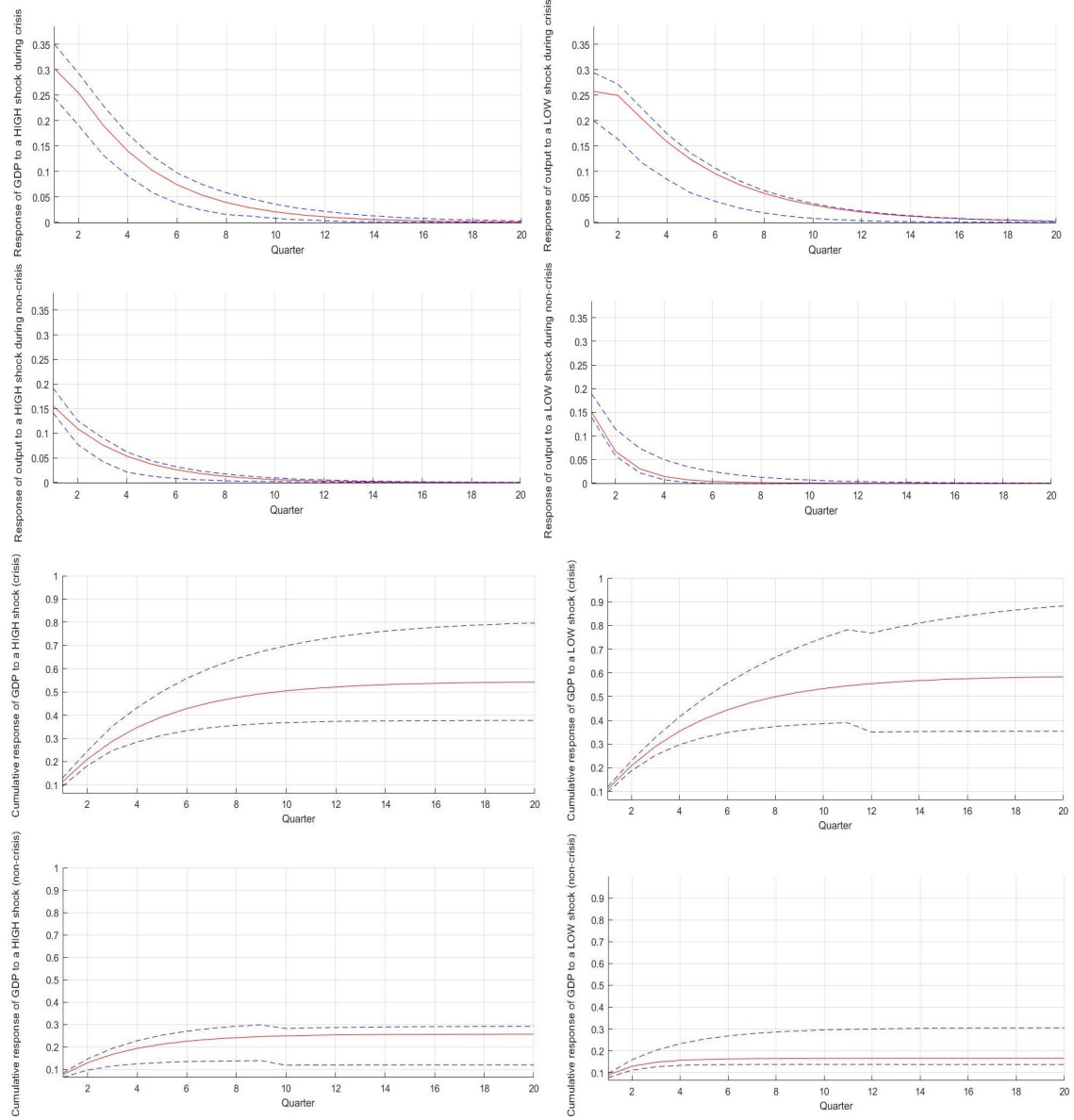
Note: The results are based on a Monte Carlo simulation with 1000 replications using a 90% confidence interval (shaded area). Each figure gives the impulse responses to a one-standard-error positive government expenditure shock (top figure) or positive tax shock (bottom figure). The former represents to an expansionary fiscal policy while the latter captures a contractionary fiscal policy.

Figure 11: Impulse response functions of GDP to increasing government spending with crisis interaction period



Note: Dotted lines represent 90% confidence bands, generated using bootstrapping procedure based on 1,000 replications.

Figure 12: Impulse response functions of GDP to increasing taxation with crisis interaction period



Note: Dotted lines represent 90% confidence bands, generated using bootstrapping procedure based on 1,000 replications.

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