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Estimating Regime Dependent Fiscal Spillover Effects in a Monetary Union

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Abstract

I estimate regime-dependent spillover effects from government spending shocks across the members of the European Monetary Union (EMU). I use panel regressions for a total of 14 EMU economies from 1997 to 2022. Government spending shocks are defined by unexpected innovations to forecast predictions of government purchases, similar to Auerbach and Gorodnichenko (2013). However, In contrast to business cycle dependence, I investigate the quantitative impact of different fiscal policy regimes of the targeted country, the country of origin, and the monetary union on the spillover multipliers. Thereby, I allow fiscal and monetary policy to follow a two-state Markov Switching process characterizing an *active* and a *passive* regime as in Leeper (1991). Thus, governments differ in their debt reduction efforts to satisfy their budget constraint and monetary policy varies between inflation targeting and restrained price level determination. I find that spillover multipliers are highly regime-dependent, with positive and significant effects when the targeted country is active and the country of origin is passive. These effects are consistent but even larger for members with a high level of debt. However, results suggest that the importance of union-wide fiscal behavior and that of the central bank matters more for highly indebted countries. Thus, the interest rate channel is gaining relevance when debt is high. (JEL: F41;F42; F45; E62; C23)

Keywords: Fiscal Policy; Fiscal Spillovers; Fiscal Multiplier; Multiplier; European Monetary Union; Regime Switching; Fiscal Policy Rules, Monetary-Fiscal Interaction.

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1. Introduction

On December 8th, 2022, the European Defence Agency (EDA) announced that defense spending in its member states had reached a new record high of 52 billion Euros, with 82% of the spending allocated towards equipment procurement. Italy recorded the highest increase in spending, with an additional 4 billion Euros compared to the previous year, followed by Finland, Greece, and Slovenia. The ongoing war in Ukraine suggests that this trend of increased spending is likely to continue in the coming years, leading to a rise in unproductive government spending across many members of the European Monetary Union. Aside from the military spending offensive, the Next Generation EU program provides another example of a coordinated fiscal spending shock to balance out the aftermath of the pandemic.

As the focus has shifted from national to aggregate stabilization measures, more countries are involved in the determinacy of fiscal multipliers. Furthermore, strong cross-border linkages and a single monetary authority cause important dependencies across members. Hence, the efficacy of fiscal spending shocks requires new insight. First, as multiple countries are involved, acceleration and second-round effects should be identified. Second, regarding the structure of a currency union, shocks in one country directly affect economic variables in other members through spillovers. Previous literature has mostly dealt with multipliers in the context of a closed economy. However, for currency union members, the relative importance of spillovers to their own spending measures is significant. Figure 1 displays the share of imports to government purchases in countries of the EMU. Under the assumption that spillovers transfer via the trade channel, this indicates a significant influence on GDP relative to national expenditures. Imports in larger countries such as France, Germany, Italy, or Spain are less than twice the size of government consumption. For other countries, their import reaches more than three times the size of their domestic fiscal spending. Thus, spillover effects induced by trade are likely to be larger for small countries, such as the former Soviet countries, Ireland, and Luxembourg. Hence, taking into account spillover effects on other countries allows a better understanding of the efficacy of fiscal stimulus.

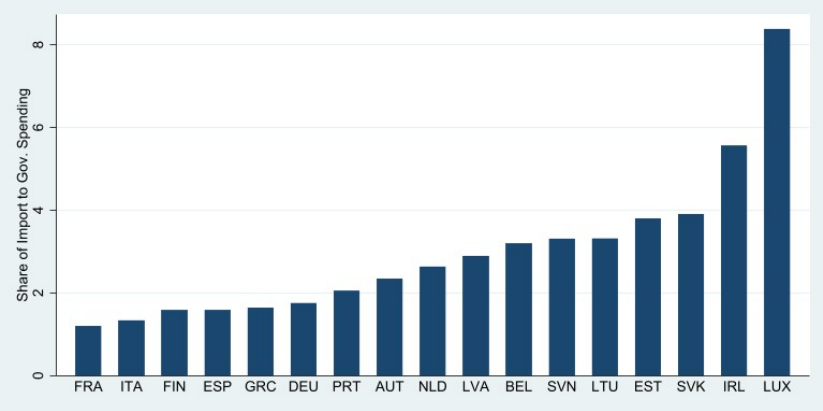

FIGURE 1. Average Share of Imports to Government Purchases 1995-2022

To understand the size of fiscal spillovers is important, as it directly influences the stabilization effects of national fiscal policies. Moreover, members with limited fiscal space depend greatly on foreign fiscal spending to stimulate their economy (Blanchard et al. (2017)). Large and positive spillover effects for highly indebted countries imply stabilizing the economy without rising national expenditures and calling for more coordinated stimulus programs. Hence, the interactions generate freeriding opportunities for some countries at the cost of large countries.

Extending the basic analysis of fiscal spillover multipliers, I investigate the existence of regime dependence. Previous literature has mostly dealt with business cycle dependence (see Auerbach and Gorodnichenko (2012), Canzoneri et al. (2016), Glocker et al. (2019)), indicating larger spillovers in recessions. However, only little is done in the context of fiscal and monetary behavior, despite its great effect on national multipliers, as shown by Davig and Leeper (2011) or Favero and Monacelli (2005). Following the definition by Leeper (1991), fiscal and monetary policy can be sometimes split up into *active* and *passive* behavior. In this definition, active monetary policy shows strong inflation-targeting, increasing interest rates by more than the rise in inflation, while passive behavior reduces the real interest rate. Fiscal policy differs in their reaction to taxes towards debt, where an active regime implies deficit financing and a low reaction to debt, and a passive regime is defined by a stronger reaction of taxes to debt to fulfill the requirements of their budget balance. According to Davig and Leeper (2007), a debt-financed tax cut will increase households' present value of consumption rather than future taxes. Consequently, output and inflation rise, causing debt revaluation as long as interest rates do not follow. Low interest rates, despite high inflation, are an indicator of passive monetary policy. Thus, the combination of active fiscal and passive monetary states generates the highest national multipliers. In a currency union, however, the centralization of the monetary authority allows even an inflation-targeting central bank to cause declining national real interest rates as long as the overall inflation is not too high. Furthermore, due to strong trade linkages,

the behavior of other members might have a significant influence. Active behavior has a lower negative wealth effect and distortions, dampening the labor supply reduction due to lower net return through an increase in income taxes. Thus, active states are characterized by lower pressure on marginal costs and hence, inflation improving the terms of trade for a country and vice versa for the passive regimes. Therefore, domestic and foreign fiscal regimes and the succeeding influence on macroeconomic variables are important for the analysis of national and also spillover multipliers.

Hence, this paper tries to identify the impact of fiscal spillovers on output within the European Monetary Union by using local projection methods following the setup by Auerbach and Gorodnichenko (2013). Specifically, government spending shocks that cross borders are constructed through unexpected innovations from forecast errors for government expenditures as in Ramey (2011) and the relative trade intensity towards another member since shocks are assumed to spill over through the trade channel. Regime dependence is created by weighting these spending shocks with the resulting regime probabilities from the estimated Markov switching policy rules.

I find that spillover multipliers are large and positive among the members of the EMU. They are more than twice as large when the targeted country (OT) behaves actively, and the country of origin (OC) is passive when the shock is issued. Furthermore, monetary policy plays a negligible role for members of the EMU, while fiscal regimes are essential. Highly indebted countries benefit even more from foreign spending shocks. Furthermore, in contrast to the general member, these countries show larger multipliers when the overall union is active and keeps the price level and, thus, interest rates low. Moreover, while the results indicate that monetary policy behavior is negligible for the average member, highly indebted members require a passive monetary policy to maintain low costs for debt.

The next section will summarize the previous literature on fiscal spillover multipliers. In Section 3, I explain the data used to construct state probabilities and foreign government spending shocks. Section 4 will then explain the model's setup and outline the regression equations used for this analysis. The results for these equations are presented and discussed in section 5, followed by some concluding remarks.

2. Previous Literature

Previous literature has dealt broadly with the regime dependence on government spending multipliers. For example, Bilbiie et al. (2008) and Perotti (2004) differentiate its level based on monetary behavior and find larger multipliers after the 80s as fiscal transmission mechanisms changed significantly with a transition of monetary policy towards inflation targeting. Ilzetzki et al. (2013) find larger multipliers in very open countries with flexible exchange rates, much in contrast to Corsetti et al. (2013).

Furthermore, many papers have focused on the business cycle dependence of fiscal multipliers: Glocker et al. (2019), Auerbach and Gorodnichenko (2012), and Canzoneri et al. (2016) have found multipliers to be much larger than one during recessions. Similar conclusions are drawn by Baum and Koester (2011) for Germany, Baum et al. (2012) for the G7 and Nakamura and Steinsson (2014) Fazzari et al. (2015) for the US. Drivers of this phenomenon are the existence of financial frictions that hinder fast price adaptions, thus, reducing crowding out effects, unexploited production capacity, and psychological effects.

Another strand of literature argues for the importance of fiscal behavior and budgetary conditions that influence the efficacy of government spending. Mountford and Uhlig (2009) and Davig and Leeper (2011) have found larger multipliers whenever spending was deficit-financed because the negative wealth effect on households is small. Others, however, argue that fiscal consolidation and low debt benefit the impact of fiscal stimulus (Bernoth et al. (2006), Huidrom et al. (2020), Ilzetzki et al. (2013) or Corsetti et al. (2013)). Since higher consolidation efforts will decrease the risk premium on government bonds, the effect on real interest rates declines, allowing larger consumption and output. Due to the restrictions of a single monetary policy, De Grauwe and Ji (2013) find this effect to be even larger for Euro Area members. Cugnasca and Rother (2015) shows that both facts (consolidation and deficit-financed spending) are not mutually exclusive but depend on how consolidation is done. A tax-financed consolidation causes multipliers to be lower than in the case of future spending cuts. In both cases deficit will be reduced; however, increasing current or future taxes, in contrast to cutting spending, directly affects households' budget constraints. This paper identifies, as well, the influence of fiscal behavior on government spending shocks; however, instead of their national impact, I analyze its effect on foreign spillovers. Fiscal stimulus does not just affect a country's macroeconomic variables but influences other economies simultaneously. Especially for tightly linked European countries, national stabilization mechanisms might spill over through various channels such as trade, monetary policy, and the labor market. Rising spending in one country can lead to an appreciation of the real exchange rate worsening terms of trade (Benetrix and Lane (2013)). These trade effects are significantly large for small countries that rely largely on their trade balance. However, this might improve the partner country's competitiveness because the spillover multiplier increases with a higher account surplus (Clancy et al. (2016)). The monetary channel, on the other side, might dampen this positive trade effect due to its aim of price stability. A government spending shock increases overall inflation enticing the central bank to raise interest rates for the whole union and so cause an inter-temporal shift in consumption (Faini et al. (2006)). Eventually, this excess spending needs to be reversed, which might then lead to a fall in long-term

interest rates (Corsetti et al. (2010)). Additionally, tightly linked labor markets allow workers to wander across borders, reducing labor supply in the receiving country. Thus, whether or not spillover multipliers are positive and large depends on which effects dominate.

As in Poghosyan et al. (2017), Alloza et al. (2020) and Clancy et al. (2016), I find spillover effects to be mostly positive and large among the members of the Euro Area, especially for small countries. Simultaneously, the transmission through monetary policy seems negligible for single currency areas (Benassy-Quere and Cimadomo (2007)). Thus, since small trade-intensive countries benefit largely from trade effects and spillovers compared to national solutions, like Beetsma and Giuliodori (2011) and Hebous and Zimmermann (2013), I argue for the importance of coordinated fiscal policy.

While Faccini et al. (2016) analyze the spillovers from the US to trade partners and find little evidence for regime dependence, Corsetti et al. (2010) and Ivanova and Weber (2011) highlight the importance of debt-consolidation regimes for fiscal spillover effects, especially for small open economies. Both use DSGE models to quantify the effect, while I apply an empirical approach to estimate these consolidation-dependent spillover effects for members of the EMU. For that, I rely on the setup from Auerbach and Gorodnichenko (2013), but instead of business cycle dependence, I extend this analysis through an identification process for time-varying fiscal policy regimes which follow a two-state Markov process as in Davig and Leeper (2011). In contrast to the theoretical model from Vetlov et al. (2017), I find significant differences between multipliers in different fiscal regimes.

3. Data

3.1. Fiscal State Dependence

Regime dependence of spillover multiplier is based on fiscal and monetary regimes within the countries and the union. Hence, I discuss the estimation procedure and the resulting state probabilities in this section. Both sectors are represented by policy rules following Davig and Leeper (2011). Thus, monetary policy follows a standard Taylor rule where nominal interest rates are reacting either more than one towards increases in inflation (*active*) or less, such that real rates decline (*passive*). While fiscal policy differs in its behavior of taxes towards debt, showing an *passive* regime when the coefficient is sufficiently high and *active* when it is not. However, in contrast to Leeper (1991), I sort countries' regimes into active and passive even when they do not differ in their response of adjusting the surplus to fulfill the budget balance. Some will simply vary in their intensity of taxes responding to debt.

I first estimate the equation for monetary policy, characterized by a standard Taylor Rule:

$$R_t = \alpha_0(S_t^\pi) + \alpha_\pi(S_t^\pi)\pi_t + \varepsilon_t^\pi.$$

Nominal interest rate R_t is the effective federal funds rate for the Euro Area over three months, and π_t is the consumer price index covering the Euro Area. All data is taken from the OECD database. The policy rule is then estimated via a unique switching equation following a Hidden Markov Process as in Hamilton (1994). S_t^π defines the state variable, taking a value of 0 or one, depending on the state the central bank is in and following a Markov Switching process. Hence, the resulting regime probabilities are $Prob(S_t^\pi = k)$ for both values of k ($\in (0,1)$). Based on the value of α_π, I then define the one regime as active with a resulting coefficient of 1.03 and the other as passive with a value of 0.72. The resulting regime probabilities for the passive monetary regime can be found in the bottom right graph, showing a passive behavior right before the Great Recession and during the phase of the zero lower bound from 2010-2019.

At the same time, governments and the union differ in their reaction to taxes towards deviations in debt. A passive fiscal regime is generally characterized by a greater debt reduction effort than the long-term real interest rate to satisfy the budget balance. In contrast, the active regime keeps tax responses to debt low (Leeper (1991)). It implies that passive governments adjust their surplus in a way to endogenously satisfy their budget constraint, while active behavior requires price level or interest rate adjustments to guarantee a stable equilibrium.

Fiscal policy is estimated for 14 members and the union itself following the policy rule,

$$\tau_t = \gamma_0(S_t^\tau) + \gamma_y(S_t^\tau)y_t + \gamma_d(S_t^\tau)d_{t-1} + \gamma_g(S_t^\tau)g_t + \varepsilon_t^\tau.$$

The variable S_t here defines the state variable, defining the fiscal regime in period t. I refer to annual data from the OECD national accounts for the regime-varying equations. For τ_t, I use total tax receipts net transfers, d_t is the gross public debt, and g_t represents government purchases and investments. The output gap $\hat{y}_t$ is defined by the difference between actual and potential gross domestic product at current prices deducted as annual time series from the AMECO database. All variables are divided by the gross domestic product and interpolated into quarterly data. Based on the resulting coefficient of γ_d, I separate each regime into the active or passive regime. The resulting regime probabilities of $Prob(S_t^\tau = k)$ will then serve as a weighting measure to construct fiscal spending shocks according to their prevailing regime. Figure 2 and 3 display the resulting regime probabilities for each member's passive regime and the aggregate European Union.

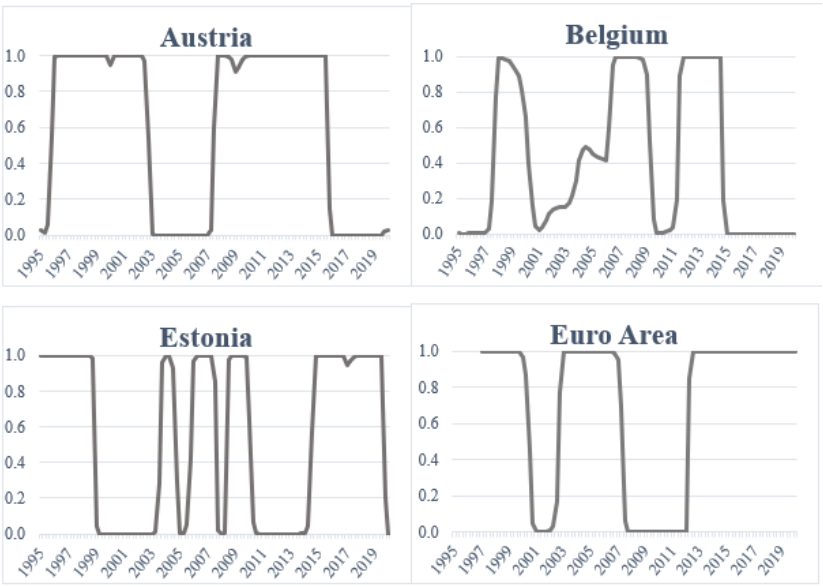

FIGURE 2. Regime Probabilities for Passive States Across Countries

The resulting coefficients for each country across regimes can be found in 1. Additionally, one can derive the coefficients on government spending γ_g to understand how severe the regimes are. In order to divide the countries into the two regimes, I calibrate the country-specific β for which I identify a threshold value of γ_b for which a country is passive. However, even if one country is not considered passive or active by this definition, I still claim that one period is *more* active or passive in its intensity.

	AUT	BEL	EST[a]	FIN	FRA	GER	GRC	IRL
$\gamma_b(S=0)$	-0.06^{***}	0.098^{***}	0.21^{***}	0.043^{***}	0.077	0.025^{***}	0.093^{***}	0.038^{***}
$\gamma_b(S=1)$	-0.064^{***}	-0.087^{***}	0.2^{***}	-0.023^{***}	-0.085	0.011^{***}	0.071^{***}	0.007
$\gamma_g(S=0)$	-0.708^{***}	-0.185	0.362^{***}	0.317^{***}	1.376^{***}	0.187^{***}	0.283	0.133^{***}
$\gamma_g(S=1)$	-1.101^{***}	1.097^{***}	0.198^{***}	0.633^{***}	1.02^{***}	0.104^{***}	-0.252^{***}	0.634^{***}
$\bar{\gamma}_b$	0.0163	0.0175		0.0209	0.0207	0.0173	0.0442	0.024

	ITA	LUX	NLD	PRT	SVK	SVN	SPA	EA
$\gamma_b(S=0)$	0.064^{***}	0.059^{***}	-0.036^{***}	0.032^{***}	0.0286	0.011^{***}	0.074^{***}	0.022^{***}
$\gamma_b(S=1)$	0.042^{***}	-0.022	-0.171^{***}	0.012^{***}	0.001	-0.058^{***}	-0.028^{***}	0.013^{**}
$\gamma_g(S=0)$	0.107^{***}	0.72^{***}	0.065	0.008	0.236^{***}	-0.126	0.62^{***}	0.51^{***}
$\gamma_g(S=1)$	0.291^{***}	0.441^{***}	0.249^{***}	-0.415^{***}	0.176^{***}	-0.391^{***}	0.378^{**}	0.607^{***}
$\bar{\gamma}_b$	0.0263	0.0138	0.0143	0.0301	-0.0074	-0.0052	0.0209	0.0216

TABLE 1. Estimated coefficients and a threshold value for 16 members and the union.

a. No data availability to construct $\bar{\gamma}_b$

Some countries, just like Greece, however, have a relatively low threshold $\bar{\gamma}_b$ since it is measured on the long-term average. Since their real interest rate on government bonds was much higher during 2010-2013, when they had to behave passively, I claim these countries are switching across both regimes based on a much higher threshold. The same is true for Italy.

I set the regime probabilities into a historical context and compared them to previous tax reforms in these countries.

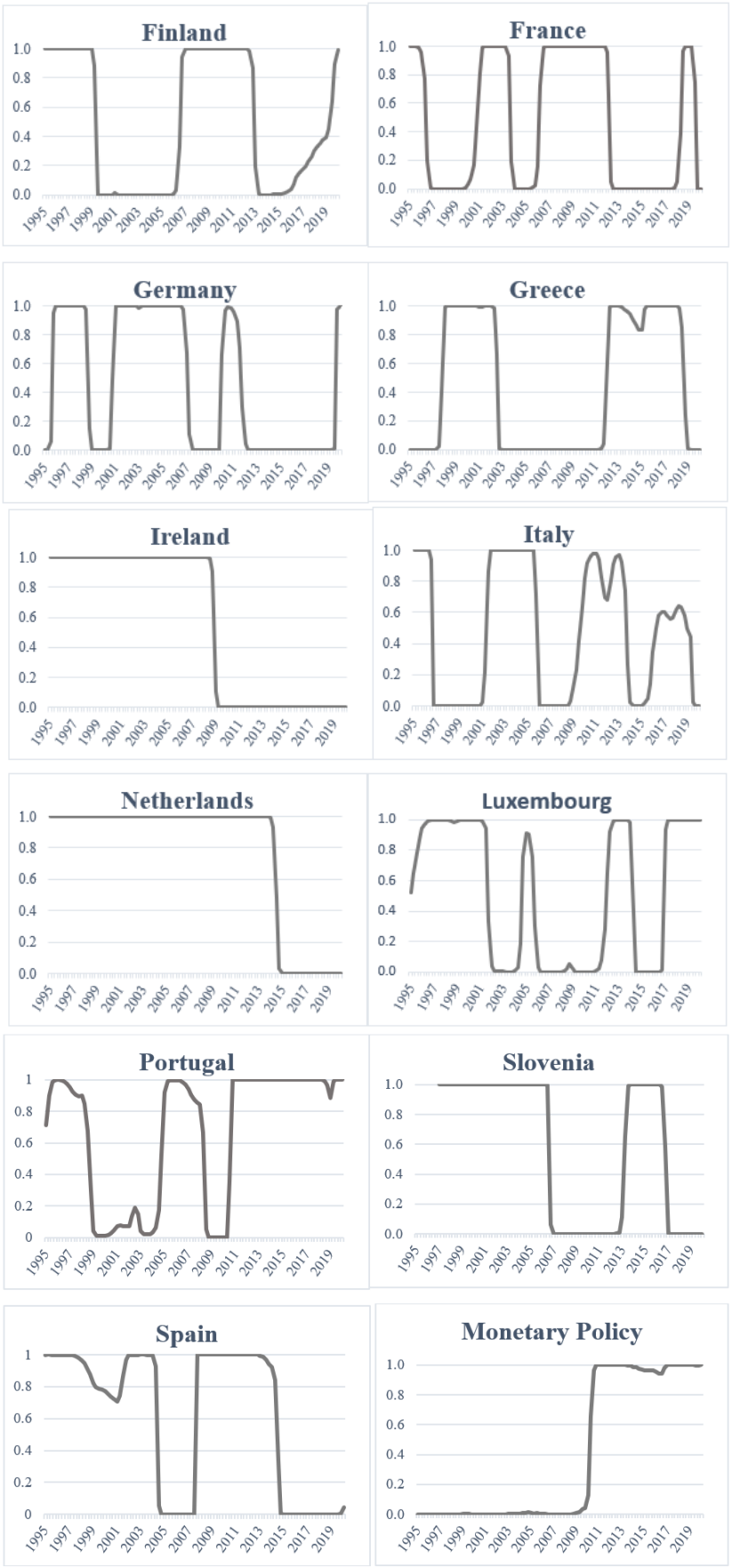

FIGURE 3. Regime Probabilities for Passive States Across Countries

Belgium, for example, experienced a large progressive tax reform from 2002 to 2005, reducing overall income taxation, while a major corporate tax reform was initiated in 2018 (Abreu (2004), Robbroeck (2018)), signaling the existence of active periods right afterward. While Germany, Finland, and the Netherlands lowered income taxes with the initiative in 2011, other members such as France, Spain, Portugal, and Luxembourg increased their overall tax rates to consolidate their existing debt (European Comission (2011)). The latter country also initiated a deducting tax reform in 2001, where reductions ranged from deductions to higher progressiveness (Liegeois et al. (2010)). In 2008 Germany introduced interest expense deductibility and a corporate tax reduction to stimulate the economy after the financial crisis. These numerous historical reductions align with active fiscal regimes, while tightening reforms show the rise of passive regime probabilities. Portugal has been behaving actively since 2000; however, in 2013, large savings reforms were introduced that, for example, increased income taxation on the worker's side by 7% (International Monetary Fund (2016)).

3.2. Construction of Government Spending Shocks

To construct unexpected government spending shocks, I use deviations from OECD Economic Outlook projections that are unexpected and independent of fundamentals. For changes in government spending, I use the forecasts for government final expenditures in volume and constant prices from December 1997 until the end of 2022. The first few years are only available as semiannual data; thus, I will transform all variables within the analysis into semiannual data. I then calculate the growth rates for the current period and the expected growth rate for the period in $t+1$. Thus, the resulting differences between the expected growth in an economic projection of year t are compared to the current growth in the projection database of year $t+1$. Thus, an innovation at time t of horizon p is constructed for each country via,

$$\xi_{t,q} = g_t - E_{t-p}(g_t|I_{t-p}) \tag{1}$$

To control for any revisions in the forecasts of the following periods, different horizons ($p \in (1,2,3)$) are compared with each other. The final revision corrected innovations $E_{t,q}$ are then used to construct government spending shocks. These spending shocks are regressed on various macroeconomic variables to correct for the possibility of fundamental changes responsible for these innovations.

$$\xi_{t,q} = \gamma_0 + \gamma_1 Y_{q,t} + \gamma_2 I_{q,t} + \gamma_3 M_{q,t} + \gamma_4 X_{q,t} + \nu_{q,t}$$

$$\xi_{t,q} = \gamma_0 + \sum_{s=0}^{T} \gamma_s X_{q,t-s} + \nu_{q,t} \tag{2}$$

where X contains various macroeconomic variables like GDP, consumption, import, export, and investment to correct for any fundamental changes in these projection errors. The residual $\nu_{q,t}$ contains all the unaccounted factors within these projection errors. For $\mathcal{G}$, these residuals are then set in relation to the country's actual fiscal spending level and its import ratio relative to it, such that it evolves according to,

$$\mathcal{G}_{i,t} = \sum_{q \neq i} (M_{i,q,B}/G_{q,B}) \times (\nu_{q,t} \times G_{q,t-1}) \tag{3}$$

where the residual is multiplied by the lagged government spending in Euro to express it in values. Since I assume government spending shocks to transmit through the trade channel, the indicator used to construct spillover effects is the relative trade share compared to government purchases ($M_{i,q,B}/G_{q,B}$). The trade shares are measured with data from imports and exports of goods and services as well as GDP; all series are in national currency and current prices and are seasonally adjusted. This way, one can correct for the heterogeneity coming through larger trade linkages across countries or influenced by one country's size. Moreover, the setup in equation 3 describes how fiscal shocks are assumed to be working across countries: Through the trade channel and especially through the import of goods from other members. Thus, a spillover shock in country i is constructed through the unexpected increase in government spending in country q where a share of it is imported into country i.

A further specification to introduce the regime dependence in the country of origin can be generated by modifying equation 3 by multiplying the resulting shock sequence with the regime probabilities. Thus, the unexpected shock $\mathcal{G}$ imported from country q can be separated in the following expressions,

$$\mathcal{G}^{act}_{i,t} = \sum_{q \neq i} (M_{i,q,B}/G_{q,B}) \times (S^{act}_{t})(\nu_{q,t} \times G_{q,t-1}) \tag{4}$$

$$\mathcal{G}^{pas}_{i,t} = \sum_{q \neq i} (M_{i,q,B}/G_{q,B}) \times (1 - S^{act}_{t})(\nu_{q,t} \times G_{q,t-1}) \tag{5}$$

These two resulting shock constructions can then be used to estimate multipliers under an external regime switching. This way, I can now also identify the impact of the fiscal regime of the country of origin on its spillover effect to another country.

Using these definitions of unexpected government spending shocks, I estimate their impact on GDP. Output Y_t is measured as the gross domestic product national currency in current prices and seasonally adjusted. G_t is taken from the government's final expenditure at current national prices and seasonally adjusted. All data is made stationary by applying the Hodrick-Prescott filter. Furthermore, the analysis allows for correlation across countries and time in the errors according to Driscoll and Kraay (1998).

The panel estimates are based on quarterly and semiannual data from 14 Euro Area countries from the first quarter of 1997 to 2020. All data is derived from the OECD database and is available until 2022. However, the sample will be restricted up to the first quarter of 2020 to eliminate any effects influenced by the pandemic. All variables are transformed or linearly interpolated to semiannual data due to the availability of forecast data.

4. Methodology

4.1. Baseline Model

In order to estimate the impact of fiscal spillovers on multipliers within another country, I will rely on the approach set up in Auerbach and Gorodnichenko (2013) and Auerbach and Gorodnichenko (2012). Thus, I regress the change of output over a horizon of $h \in [1; H]$ on the government spending shocks coming from other countries over the set of members of the currency union via a Panel Estimation as the following,

$$\frac{Y_{i,t+h} - Y_{i,t-1}}{Y_{i,t-1}} = \alpha_h \frac{\mathcal{G}_{i,t}}{Y_{i,t-1}} + \sum_{s=1}^{m} \beta_{h,s} \frac{\Delta Y_{i,t-s}}{Y_{i,t-s-1}} + \sum_{s=1}^{m} \delta_{h,s} \frac{\Delta G_{i,t-s}}{Y_{i,t-s-1}} + \varphi_{i,h} + \mu_{t,h} + \varepsilon_{i,t,h}. \tag{6}$$

Where $Y_{i,t}$ and $G_{i,t}$ describe output and government spending in the country i at time t, $\varphi_{i,h}$ and $\mu_{t,h}$ are country and time fixed effects and $\mathcal{G}$ denotes the fiscal spending shock that origins in a different country. All variables are expressed in differences and divided upon the lagged value of GDP such that the sequence of $\{\alpha_h\}_{h=0}^{H}$ can be directly interpreted as the fiscal impact multiplier of horizon h. Since equation 6 is the baseline regression, the resulting multipliers describe the impact of government stimulus in other countries on the average EMU member. Assuming these countries are much more comparable than OECD or G7 countries through their shared monetary policy, strong trade relations, and shared cultural identities, the average effect is quite informative.

4.2. Regime Dependent Models

The first model, considering the impact of the different fiscal regimes, will measure how the regime in country i changes the resulting spillover multiplier. For that, equation 6 is extended by the weighted shares of the regressors, depending on the

regime probabilities:

$$\frac{Y_{i,t+h} - Y_{i,t-1}}{Y_{i,t-1}} = \alpha_h^{act}(S_t^{act})\frac{\mathcal{G}_{i,t}}{Y_{i,t-1}} + \alpha_h^{pas}(1 - S_t^{act})\frac{\mathcal{G}_{i,t}}{Y_{i,t-1}} + \sum_{s=1}^{m}\beta_{h,s}^{act}(S_t^{act})\frac{\Delta Y_{i,t-s}}{Y_{i,t-s-1}} +$$

$$+ \sum_{s=1}^{m}\beta_{h,s}^{pas}(1 - S_t^{act})\frac{\Delta Y_{i,t-s}}{Y_{i,t-s-1}} + \sum_{s=1}^{m}\delta_{h,s}^{act}(S_t^{act})\frac{\Delta G_{i,t-s}}{Y_{i,t-s-1}} + \sum_{s=1}^{m}\delta_{h,s}^{pas}(1 - S_t^{act})\frac{\Delta G_{i,t-s}}{Y_{i,t-s-1}} +$$

$$+ \varphi_{i,h} + \mu_{t,h} + \varepsilon_{i,t,h}. \tag{7}$$

S_t^{act} defines the regime probability that a member, the union itself, or monetary policy is perceived to behave actively. This regression then generates multipliers in different states of the targeted country. For one, whether the domestic fiscal policy behavior matters; secondly, whether the union-wide fiscal policy has an impact; and third, how the monetary policy affects the results.

In the second setup, I estimate the impact of the fiscal regime in the country of origin. For that, I include the different $\mathcal{G}$-shock specification from equations **??** and **??** in the baseline model. The modified baseline model then results in

$$\frac{Y_{i,t+h} - Y_{i,t-1}}{Y_{i,t-1}} = \alpha_{h,A}\frac{\mathcal{G}_{i,t}^{act}}{Y_{i,t-1}} + \alpha_{h,P}\frac{\mathcal{G}_{i,t}^{pas}}{Y_{i,t-1}} + \sum_{s=1}^{m}\beta_{h,s}\frac{\Delta Y_{i,t-s}}{Y_{i,t-s-1}} + \sum_{s=1}^{m}\delta_{h,s}\frac{\Delta G_{i,t-s}}{Y_{i,t-s-1}} +$$

$$+ \varphi_{i,h} + \mu_{t,h} + \varepsilon_{i,t,h}. \tag{8}$$

The influence of the country of origin can be explained by the impact of its reaction toward its spending shock and the effect on its competitiveness. The larger responsiveness of taxes to debt increases the relative prices of these goods. This will worsen the terms of trade and hence, cause a loss in countries q's competitiveness. Imports will be lower, and so the overall government shock might be lower, but the effect on output for a given value of $\mathcal{G}$ in country i might be larger since the country gains relative competitiveness in trade.

Lastly, by combining the specification of regression 7 and 8, I receive the cross-country regime interdependence effect on the multipliers. I restrict the analysis to only focus on country-specific changes assuming the monetary and overall union to

be constant. Thus, lastly, I run the following regression,

$$\frac{Y_{i,t+h} - Y_{i,t-1}}{Y_{i,t-1}} = \alpha_{h,A}^{act}(S_t^{act})\frac{\mathcal{G}_{i,t}^{act}}{Y_{i,t-1}} + \alpha_{h,P}^{act}(S_t^{act})\frac{\mathcal{G}_{i,t}^{pas}}{Y_{i,t-1}} + \alpha_{h,A}^{pas}(1 - S_t^{act})\frac{\mathcal{G}_{i,t}^{act}}{Y_{i,t-1}} +$$
$$\alpha_{h,P}^{pas}(1 - S_t^{act})\frac{\mathcal{G}_{i,t}^{pas}}{Y_{i,t-1}} + \sum_{s=1}^{m}\beta_{h,s}^{act}(S_t^{act})\frac{\Delta Y_{i,t-s}}{Y_{i,t-s-1}} + \sum_{s=1}^{m}\beta_{h,s}^{pas}(1 - S_t^{act})\frac{\Delta Y_{i,t-s}}{Y_{i,t-s-1}} +$$
$$\sum_{s=1}^{m}\delta_{h,s}^{act}(S_t^{act})\frac{\Delta G_{i,t-s}}{Y_{i,t-s-1}} + \sum_{s=1}^{m}\delta_{h,s}^{pas}(1 - S_t^{act})\frac{\Delta G_{i,t-s}}{Y_{i,t-s-1}} + \varphi_{i,h} + \mu_{t,h} + \varepsilon_{i,t,h}. \tag{9}$$

The fiscal regime in country i, together with country q's behavior, might generate even larger multipliers through interdependence. Thus this last regression identifies the best cooperation behavior between two union members.

5. Results

5.1. Government Spending Shocks

The summary statistic for the resulting government spending shocks can be found in Figure 4. Overall the mean is centered around zero for all countries. The standard deviation, however, differs quite significantly across the members of the Euro Area. Large countries seem to be more constant in their spending, while especially eastern countries have a standard deviation up to 34% in Slovakia. Thus, high trade shares seem to influence the volatility of spending shocks. Another interesting fact stands out when looking at the correlations between the shocks. While most countries seem to increase spending at times when their neighbors do so as well, France and Austria show opposing effects toward Germany. Thus, when Germany introduces fiscal packages, its neighbors seem to hold back on their own expenses. This behavior indicates that countries are aware of possible spillovers when their trade relations are relatively tight. Other countries that show very similar business cycles and share common political and historical developments, such as Slovenia and Slovakia, are almost perfectly correlated.

	Mean	Standard Deviation	AUT	BEL	DEU	ESP	EST	FIN	FRA	GRC	IRL	ITA	LUX	NLD	PRT	SVK
AUT	-0.00	0.23														
BEL	-0.00	0.40	0.3502													
DEU	0.00	0.12	-0.2435	0.7692												
ESP	-0.00	0.11	0.1769	0.8719	0.7966											
EST	0.00	0.28	0.0628	-0.1744	-0.1862	-0.2336										
FIN	-0.00	0.09	0.8853	0.7111	0.1678	0.4967	-0.0901									
FRA	-0.00	0.09	0.8518	0.0897	-0.3469	-0.1010	0.1055	0.6916								
GRC	-0.00	0.03	0.8293	0.4946	0.1182	0.3349	0.1259	0.8219	0.8305							
IRL	-0.00	0.19	0.7489	0.7989	0.3580	0.6363	-0.0865	0.9135	0.5019	0.7215						
ITA	-0.00	0.08	0.4733	0.9012	0.6364	0.8893	-0.2256	0.7482	0.2038	0.5352	0.8142					
LUX	-0.00	0.17	0.7007	0.8590	0.4675	0.7681	-0.1110	0.8976	0.4480	0.7335	0.9681	0.8990				
NLD	-0.00	0.23	0.8982	0.4676	-0.0079	0.4223	0.0262	0.8635	0.7901	0.8513	0.7956	0.6417	0.8243			
PRT	0.00	0.12	0.4507	0.6649	0.4928	0.5365	-0.1323	0.6418	0.4841	0.6714	0.6653	0.7587	0.6911	0.5674		
SVK	-0.01	0.34	0.9447	0.4864	-0.0677	0.3090	-0.0185	0.9171	0.7490	0.7699	0.8477	0.6070	0.7888	0.8690	0.5296	
SVN	-0.01	0.26	0.9380	0.4832	-0.0102	0.3221	0.0037	0.8977	0.7609	0.8607	0.8251	0.5811	0.7855	0.8735	0.5205	0.9655

FIGURE 4. Summary statistics government spending shocks across countries in Percentage of GDP

An additional analysis of the spending shocks yields insight into the relationship with the business cycle. Table 2 shows the cyclical behavior of the fiscal stimulus in each country. Not all members behave counter-cyclical as recommended by the Keynesian theory. While Austria, France, Finland, and the Netherlands have a negative correlation between GDP and spending in period t (ρ_{dy_t,dg_t}), Germany and the southern countries are pro-cyclical. This explains part of the negative correlation between Germany and its neighbors in their spending behavior.

	AUT	BEL	DEU	ESP	EST	FIN	FRA	GRC	IRL	ITA	LUX	NLD	PRT	SVK	SVN
ρ_{dy_t,dg_t}	-0.22	0.02	0.13	0.14	0.03	-0.20	-0.30	0.11	0.13	-0.08	-0.22	-0.19	0.03	-0.06	-0.06
ρ_{dy_{t-1},dg_t}	0.40	0.25	-0.01	0.12	-0.03	0.08	0.39	0.48	-0.03	0.28	0.06	0.38	0.39	0.20	0.29

TABLE 2. Correlation government spending shocks per GDP with Business cycle

5.2. Estimation Results

Table 3 displays the results for the baseline regression from equation 6. The analysis is separately done for two-time horizons. In one, I use the whole unbalanced sample from 1997 to the first quarter of 2020, while in the other, I leave out the years 2008-2009. Leaving out the periods of the financial crisis proves spillover multipliers to be regime- and not just cycle-dependent. Furthermore, this event was are rather extreme and, thus, cause concern for biased effects. Throughout this analysis, the resulting multipliers are relatively large this is due to the fact that they are displayed in terms of the amount of spending that spills over.

	(1)	(2)
Spillover Multiplier	0.99^{**}	0.99^{**}
	(0.51)	(0.51)
Without 2008/2009	No	Yes

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 3. Regression Output Linear Analysis Eq. 6

Table 3 only displays the results for the fixed weights case where the import to government spending ratio is held constant over time. Using variable weights reduces the level of coefficients and their significance only marginally. Overall, the general spillover multipliers are positive but slightly below one, indicating a gain through foreign fiscal stimulus independent of the fiscal regimes in place. Thus, as fiscal stimulus is initiated in one country, the target country's GDP will increase by almost the same amount as the fiscal spending transferred through the trade channel. This result implies that either an expansive government will directly purchase some fraction of imported products, increasing the trade balance for the trading country, or the receiving country benefits indirectly through a relative depreciation of the real exchange rate. Moreover, since the targeted government does not need to finance

the fiscal spending, there are only small negative wealth or substitution effects from rising taxes. Therefore, these spillover multipliers are likely to be larger than aggregate effects.

Table 4 displays the results from regression equation 7. These results indicate a significant increase when allowing for regime dependence. In active targeted countries, the spillover multiplier increases by more than twice the size of the shock when leaving out 2008/09. Thus, when a country responds with higher taxes towards changes in its output, it creates a larger negative wealth effect. Furthermore, when these are distortionary income taxes, the reduction in net wages will decline labor supply while labor demand increases, causing a rise in marginal costs and prices. This then worsens the terms of trade, and the country loses competitiveness. Additionally to this analysis, I examine whether it matters for the targeted country to be within an active or passive union. The results indicate a weak benefit from a passive union supporting the gain in relative competitiveness compared to the other members. Hence, a member country benefits more from a gain in competitiveness than a decline in overall inflation and, thus, in real interest rates. This fact is further supported by the fact that the multipliers of different monetary policy behavior are insignificant.

	Fiscal Policy TC		Fiscal Policy EMU		Monetary Policy	
	active	passive	active	passive	active	passive
Spillover Multiplier	1.64^{*}	-0.30	1.18	0.78^{*}	1.46^{*}	0.60
	(0.89)	(0.83)	(1.29)	(0.44)	(0.78)	(0.51)
Without 2008/2009	2.0^{**}	-1.09^{**}	0.56	0.87^{**}	1.12	0.71
	(0.97)	(0.52)	(1.71)	(0.44)	(0.77)	(0.55)

t- statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 4. Regression Output Nonlinear Analysis Eq.7

Table 5 shows how fiscal behavior in the country of origin influences its spillover multipliers to other countries. Thus, whenever the country of origin is in a passive regime, the multiplier for the targeting country is, on average, almost twice as big as in the baseline regression. This result is fully in line with the idea of high taxes being responsible for a loss in terms of trade and hence, increasing the benefit through spending spillovers across the border. Furthermore, sharing one centralized monetary policy puts more weight on the behavior of others.

	Fiscal Policy OC	
	active	passive
Spillover Multiplier	0.94	1.50^{***}
	(0.85)	(0.50)
Without 2008/2009	1.35	1.84^{***}
	(0.86)	(0.77)

t- statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 5. Regression Output Linear Analysis Eq. 8

The last analysis combines the previous results. Hence it describes the interacting effects between the receiving and originating country from equation 9. Table 6 displays the multipliers according to the countries' regime mix. The greatest multiplier, with 3.39, is reached when the targeted country is active, and the country of origin is passive. These results imply a strong impact of the trade channel on the benefit of government stimulus spillovers.

	Fiscal Policy Regime Mix (OC/TC)			
	active/active	passive/active	active/passive	passive/passive
Spillover Multiplier	0.62	2.70^{***}	-0.22	-0.08
	(0.87)	(0.87)	(1.20)	(1.06)
Without 2008/2009	0.92	3.46^{***}	-2.37^{***}	0.09
	(0.97)	(0.93)	(0.97)	(1.02)

t- statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 6. Regression Output Linear Analysis Eq. 9

Furthermore, the resulting multipliers indicate a ranking of regime mixes to generate larger spillover multipliers. While a passive/active mix generates the largest results, it is still beneficial for the targeted countries to behave actively when the other country is active. The worst regime mix is achieved under a passive targeted country and an active country of origin, leading to the greatest loss in terms of trade. Overall these high differences in multipliers suggest that since government stimulus is quite expensive, it might be beneficial to participate in a coordinated fiscal action across the union, especially for countries facing low fiscal space (Hebous and Zimmermann (2013)).

5.3. Highly Indebted Countries

As Huidrom et al. (2020) claims, fiscal multipliers tend to be lower with a high debt burden, for one, because expenses need to be mostly financed by taxes, which induces a large negative wealth effect. Secondly, the risk premium on bonds is relatively higher. However, spillover effects might resolve this issue when national solutions cannot yield the required stabilization. I restrict the sample to a subset of members to analyze the final impact of such spillovers in highly indebted countries. Thus, I apply the previous regressions to France, Italy, Greece, Spain, Portugal, and Belgium, all of which have

higher debt-to-GDP ratios than the average level of the Euro-Zone, which lies at around 95% in 2021. Since fiscal spillover shocks are not restricted, they still measure the overall inflow of foreign government spending through trade independent of the country of origin. Therefore, only the country indicator i is restricted to these six members.

	(1)	(2)
Spillover Multiplier	1.71^{**}	1.24^{**}
	(0.82)	(0.64)
Without 2008/2009	No	Yes

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 7. Regression Output Linear Analysis Eq. 6 for highly indebted Members

The general non-regime-dependent spillover multipliers are significantly larger for highly indebted countries than for the whole union (Figure 7). With a multiplier of 1.71, it reaches far above one, even when leaving out the Great Recession. These results imply a larger benefit through spillovers for debt-intensive countries, supporting coordinated fiscal policy solutions instead of national ones.

When including regime dependence in country i, Table 8 emphasizes the large benefit of active behavior within the receiving country. However, the behavior of the rest of the union is more important for the effect of spillovers. In contrast to the analysis before, highly indebted countries benefit largely from an active union. This leads to an overall lower price level, reducing the pressure on monetary policy to increase interest rates and, with it, the costs for refinancing. Thus, the monetary channel is more important than the trade effect for this set of countries. The results of regime switching country of origin furthermore support this. It is still more beneficial when the spending shock comes from a passive country, but this difference is not as high as before. Hence, high debt increases the transmission through the financial market, and thus, the union's behavior becomes important for business cycle stabilization within such countries.

	Fiscal Policy TC		Fiscal Policy EMU		Monetary Policy		Fiscal Policy OC	
	active	passive	active	passive	active	passive	active	passive
Spillover Multiplier	1.96^{**}	0.86	2.35^{**}	1.23^{**}	1.84	2.43^{***}	3.74^{***}	3.49^{***}
	(0.98)	(0.81)	(1.16)	(0.57)	(1.28)	(0.64)	(1.41)	(1.28)
Without 2008/2009	1.91^{**}	-0.73	6.02^{***}	1.04^{*}	-0.07	2.58^{***}	2.52	3.50^{***}
	(0.92)	(1.33)	(1.67)	(0.55)	(0.82)	(0.78)	(1.75)	(1.26)

t- statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 8. Regression Output Nonlinear Analysis Eq. 7& 8

The results on monetary policy show that for countries with high debt levels, monetary behavior is important to keep the pressure from debt low. This finding is consistent with the literature on how uncertainty through larger debt declines the

benefit of government spending. Part of this large effect can be attributed to the fact that economic downturns were occurring simultaneously with the passive monetary policy, and they yield larger multipliers in general (Auerbach and Gorodnichenko (2013)).

Table 9 shows the regime mixes that generate the highest multipliers for countries with high debt levels. The results are qualitatively the same as in the analysis for the general member. However, they are much larger.

	Fiscal Policy Regime Mix (OC/TC)			
	active/active	passive/active	active/passive	passive/passive
Spillover Multiplier	1.77	5.73^{***}	-0.56	-0.12
	(1.62)	(2.45)	(1.87)	(0.66)
Without 2008/2009	1.69	5.07^{***}	-3.24^{*}	-1.81^{***}
	(1.59)	(2.02)	(1.89)	(0.66)

t- statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 9. Regression Output Linear Analysis Eq. 9

Hence, these results show that a well-coordinated fiscal policy program can benefit countries with low fiscal states. Through high trade linkages, some members will benefit greatly from a sudden increase in spending across the country, but only when both countries are in the preferred regime and the whole union focuses on price level stability.

6. Conclusion

In conclusion, spillover multipliers within the EMU are highly regime dependent, not just on the business cycle, as previous literature has shown, but also based on fiscal policy behavior. Spillovers are not just influenced by the regime of the targeted country and the country of origin but also by the fiscal behavior of the union. In contrast, the behavior of a monetary policy is insignificant for the average member. A Euro Area member can generate substantial spillovers when in the right regime. The largest impact on output is achieved when the targeted country is behaving actively, and the foreign country is passive such that the terms of trade benefits are the largest. The same argument supports the finding that a passive union-wide fiscal policy is beneficial.

The results and obvious transmission channels differ for highly indebted members. While multipliers are generally larger, they show an even greater regime dependence than their more sustainable neighbors. As Blanchard et al. (2017), I find evidence for a significant increase in production in the periphery through spending shocks across their border. Again, the active and passive mix for the targeted and country of origin generates the largest multipliers. However, highly indebted countries benefit largely

from an active union, so overall inflation is kept low. Additionally, the central bank regime has a strong and significant effect on the size of multipliers. Since an inflation-targeting monetary policy would cause even greater pressure on their budget balance, a passive regime guarantees larger benefits from government spending increases.

Overall, the results suggest the great importance of coordinated fiscal stimulus programs in currency unions since multipliers can vary substantially with the behavior of each participant. Since fiscal spillovers are a way to stimulate an economy without increasing one's expenditures, countries with low fiscal space can benefit from a cross-border stimulus under certain conditions. It enables these countries to wait for free-riding possibilities when certain regimes are in place. This yields new insight into the topic of fiscal stabilization mechanisms. In order to prevent this free lunch for highly indebted countries, the ECB should maintain its aim for price level stability while the members should strictly initiate fiscal deficit regulations.

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