

International Fiscal Spillovers: A Review Essay

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This paper provides a review of the empirical literature on fiscal multipliers and international fiscal spillovers. We discuss the various empirical methodologies employed in measuring spillovers, and the degree to which estimated spillovers depend on the state of the business cycle, the stance of monetary policy, the exchange rate regime, and other factors. In an environment where monetary policy is constrained by the zero bound, both fiscal multipliers and international fiscal spillovers are likely to be much larger than in normal times. In general, this prediction is supported in the empirical literature.

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I. Introduction

This essay explores the nature of fiscal spillovers across countries. For almost a decade, economists and policymakers have acknowledged the severe limitations placed on monetary policy as a macroeconomic policy tool. Obviously, monetary policy is unavailable for a response to country specific shocks within a monetary union. For this reason, the issue of fiscal policy, spillovers, and the desirability of fiscal policy constraints within the Eurozone has long been a major item on the academic research agenda. But these debates have become increasingly pressing following the European debt and financial crisis. Aside from the Eurozone however, the global financial crisis and the constraints placed by the zero lower bound on monetary policy has led to a renewed interest on the nature of fiscal policy as a stabilization instrument, even for countries operating under a flexible exchange rate with an independent monetary policy. Nevertheless, fiscal policies followed within a

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single country have international repercussions. A major question that follows from this is how fiscal policy actions taken at the national level are transmitted across borders in an environment with open international trade and financial markets. Although the profession is not unanimous, there is some consensus among economists that a system of flexible exchange rates allows for an independent use of monetary policy without consideration of its external effects. In that case, there is no clear need for international cooperation on monetary policy. But for fiscal policy, there is no such clear agreement. Fiscal policies have complex effects on economic activity, affecting both demand and supply decisions in the private sector, and influencing some sectors more than others. As a result, fiscal policy shocks can have important consequences for both domestic and foreign economies through various channels. In order to make a strong case for an active use of fiscal policy as an economic stabilization tool, it is imperative to have a clear understanding of the nature of these channels.

The next section describes some of the empirical methods that have been employed in order to measure the effects of fiscal shocks, and in particular government spending shocks. Section 3 then reviews the empirical literature on the measurement of fiscal policy multipliers within a domestic economy. Especially since the financial crisis, there has been an active empirical literature that has substantially increased our understanding of the size and nature of government spending multipliers and the spillover effects of government spending shocks. Section 4 turns the focus on the international spillover effects of fiscal shocks. We discuss how these spillovers are likely to depend on the degree of trade and financial openness, as well as the stance of domestic and foreign monetary policy. We also discuss the implications of fiscal spillovers for the desirability of international fiscal policy coordination. Some conclusions then follow, in which we speculate on directions of future research.

II. Empirical Methods

We briefly discuss some of the recent methodological developments in measuring the effects of fiscal policy. The standard VAR and linearized DSGE models, by construction, rule out any state-dependence of output response to fiscal policy. Fiscal multipliers estimated from these linear models, therefore, presumably capture the average multiplier over the full sample instead of the multiplier in recession or a boom. Here we present, without any deep analysis, some of the nonlinear models employed in the literature to study the state-dependent effects of fiscal policy.

2.1. Threshold Var

Consider a two-regime threshold vector autoregression (VAR) model:

$$X_t = \Gamma_1(L)X_{t-1} + \Gamma_2(L)X_{t-1}I[z_{t-d} > c] + u_t \quad (1)$$

where $X_t = (y_{1t}, \dots, y_{kt})$, $u_t \sim N(0, \Omega_t)$ and $\Omega_t = \Omega_1 + \Omega_2 I[z_{t-d} > c]$. Let z_{t-d} denote the threshold variable that determines the prevailing regime with a delay lag d . The indicator function $I[\cdot]$ takes the value of 1 when z_{t-d} exceeds threshold c , and 0 otherwise. The coefficient matrices $\Gamma_1(L)$ and $\Gamma_2(L)$, the delay lag d and the threshold value c are all estimated from the data.

2.2. Smooth Transition VAR

In specification (1), a regime switch happens abruptly at the threshold value c . Alternative, we can replace the indicator function $I[\cdot]$ with a smooth transition function $0 < F(z_t) < 1$, where z_t is the transition variable. The smooth transition vector autoregressive model is given by

$$X_t = (1 - F(z_{t-1}))\Gamma_1(L)X_{t-1} + F(z_{t-1})\Gamma_2(L)X_{t-1} + u_t \quad (2)$$

where now the variance of u_t is given $\Omega_t = \Omega_1(1 - F(z_{t-1})) + \Omega_2 F(z_{t-1})$.

Unlike the case of linear VAR models, constructing impulse responses in nonlinear VAR is not trivial because we have to also take into account the regime switches after the initial shock.¹ But there is an alternative approach, which avoids the difficulty of constructing impulse responses in nonlinear VARs. This is a much simpler and more flexible estimation approach - the local projection method.

2.3. Local Projection Method

The local projection method involves the projection of the variable of interest on lags of variables entering the VAR. For instance, in the case of specification (2), the response of y_1 at horizon h is given by

$$y_{1,t+h} = \alpha_h + (1 - F(z_{t-1})) \sum_k \Gamma_{1h,y} y_{k,t-1} + F(z_{t-1}) \sum_k \Gamma_{2h,k} y_{k,t-1} + u_t \quad (3)$$

By recursively estimating equation (3) for different values of h , we can trace out the impulse of y_1 . One of the main advantages of the local projection method is

¹ See Koop et al. (1996) for constructing impulse responses for nonlinear models.

that we no longer need to keep track of how z changes over time as the effect of regime switches will be captured by the sequence of estimates $\{\Gamma_{1h}\}_h$ and $\{\Gamma_{2h}\}_h$.²

III. What Determines the Fiscal Multiplier?

Before we review the empirical literature on international spillovers, it is necessary to summarize some of the recent developments in the measurement of fiscal policy shocks and the estimates of the size of the fiscal policy multipliers within domestic economies.

3.1. State of Business Cycle

The early empirical studies of fiscal policy attempted to estimate a multiplier which was a single number implied by the data, both time and state-independent. This was a natural procedure to follow from the use of log linear models to estimate unconditional properties of the business cycle. But it is quite likely that the effects of fiscal policy varies over time and the state of the business cycle. Time-series evidence has largely supported the importance of state-dependent fiscal multipliers. Estimating a threshold structural VAR model with quarterly German data, Baum and Koester (2011) find that government spending multipliers are much larger in the downturns (negative output gap) than in expansions (positive output gap). The same conclusion is reached when extending the analysis to G7 economies (Baum et al. 2012). In a separate study, Fazzari et al. (2015), taking capacity utilization as the threshold variable, again confirming that the output response to government spending shocks is larger during periods of economic slack for the U.S. The recent papers by Auerbach and Gorodnichenko (2012 and 2013a) have been very influential in the discussion regarding state-dependent effects of fiscal policy. Using smooth transition threshold VARs and local projections respectively, they find multipliers to be larger in the recessions than in the expansions. In a follow up study, Candelon and Lieb (2013) consider a nonlinear vector error-correction model, where the nonlinearity impacts only the short-run dynamics. They find fiscal multipliers between 1 and 2.4 in recession and around 0.5 in expansion for the U.S, in line with the findings in Auerbach and Gorodnichenko (2012). In a separate but related study, taking into account of whether fiscal policy is procyclical or countercyclical, Riera-Crichton, Vegh and Vuletin (2015) find that the estimated fiscal multiplier in recessions is even larger when government spending is going up. Exploring variations in regional/state spending in U.S, Nakamura and Steinsson

² See Auerbach and Gorodnichenko (2013a) for details.

(2014) and Shoag (2010) also reach similar conclusions.

State dependency in response to fiscal shocks may extend to other definitions of states besides the business cycle. To explore the role of confidence in the transmission of government spending shocks, Bachman and Sims (2012) include an additional variable in the vector autoregression — a subjective measure of consumer confidence from the Michigan Survey of Consumers. Using a smooth transition threshold VAR model as in Auerbach and Gorodnichenko (2012), they find that confidence seems crucial in explaining the differential output responses to government spending shocks over the business cycle. Upon further analysis, decomposing confidence into “fundamentals” and “sentiment” shocks, they conclude that the channel through which confidence elevates output response in recession is not through sentiment-induced spending surge but rather through “fundamentals” operating at low frequencies, which they attribute to higher productivity. Adding the ratio of real government investment to real government consumption in the VAR model, they find that recession features a significantly more persistent response in government investment relative to consumption. They interpret the results as suggesting that differences in the composition of government spending (investment v.s consumption) are responsible for the differential output responses. That is, higher relative government investment in recessions increases productivity, raises confidence, and stimulates output.

We should note that not all studies have found evidence for state-dependent fiscal multipliers. Caggiano et al. (2015) report no significant differences for multipliers in recessions versus expansions, though they do find that output responses to fiscal shocks are significantly different between deep recessions and strong expansions. Owyang, Ramey and Zubairy (2013), using local projection technique and military news for identifying government spending shocks, find multipliers within the range of 0.7 to 0.9 for both states of high unemployment and low unemployment over the sample period from 1890 to 2010 for U.S. However, they do find evidence of considerably higher multipliers during periods of economic slack for Canada over the sample period from 1921 to 2011. In a related study looking only at U.S historical data, Ramey and Zubairy (2014) find no evidence that fiscal multipliers depend on the state of the business cycle. They make an explicit comparison to the results in Auerbach and Gorodnichenko (2012 and 2013a). They argue that the differences in findings can be mostly attributed to assumptions underlying the construction of impulse response and ways in which multipliers are calculated. Specifically, Auerbach and Gorodnichenko (2012) construct the baseline impulse responses without taking into account the state transitions and the feedback from government spending shock to state; and Auerbach and Gorodnichenko (2013a) use an ex post conversion factor and calculate the multipliers by comparing the path of output to the *impact* of government spending.

There has also been a small theoretical literature exploring the case for state

dependent effects of fiscal shocks. Michaillat (2011) shows that countercyclical fiscal multipliers can arise in a searching and matching model with wage rigidity and diminishing marginal returns to labor. In recessions, negative technology shocks drive the marginal product of the least productive workers below the wage, resulting in job rationing where unemployment persists even in absence of matching frictions. Government spending directed at public sector jobs therefore can effectively raise employment without crowding out private employment much. On the contrary, jobs are not rationed in expansions, and the crowding out of private employment by the hiring in public sector is stronger. Canzoneri et al. (2016) provide an alternative explanation for the state-dependence of fiscal multipliers, introducing countercyclical bank intermediation costs to a banking model developed by Curdia and Woodford (2010). With this cyclical financial friction embedded in the model, the financial accelerator effect is much stronger in recessions than in expansions. Government spending, on the one hand, reduces household consumption because of the higher tax obligations; on the other hand, it ameliorates the economy, narrowing the spread between the borrowing rate and deposit rate and consequently encouraging more borrowing and consumption (kick-starting the financial accelerator process). In recessions, the latter effect is stronger, creating a larger fiscal multiplier.

By contrast, canonical DSGE models, even solved with higher order perturbation, appear to have a hard time generating state-dependent multipliers, and even harder time delivering countercyclical multipliers. Sims and Wolff (2017) calibrate a medium scale DSGE model and find that the output multiplier for government consumption is slightly above one and weakly procyclical, while the output multiplier for government investment hardly varies across states.

3.2. The Importance of the Exchange Rate Regime

The classic Mundell-Fleming model predicts that the effect of fiscal policy on output depends on which exchange rate regime is operative. Under a flexible exchange rate, an expansionary fiscal shock raises the domestic interest rate, attracting capital inflows, and subsequently, the domestic currency appreciates, which crowds out net exports and offsets the direct effect of the fiscal spending on the demand for domestic goods. In contrast, with a fixed exchange rate regime, monetary policy is accommodative, expanding the domestic money supply and preventing the exchange rate from appreciating. Net exports, as result, remain unaffected by movements in the exchange rate, while at the same time, private demand rises in response to expansionary monetary policy, augmenting the effect of fiscal policy. Empirical evidence has been mostly consistent with this theoretical prediction that fiscal multiplier tends to be bigger under a fixed exchange rate regime than under a flexible exchange rate regime.

Corsetti et al. (2012a) implement a two-stage estimation strategy: using a panel of OECD countries, they first identify government spending shocks as residuals from an estimated fiscal policy rule; and subsequently trace out the dynamic impact of government spending on macroeconomic variables, controlling for different economic environments. They find that the output multiplier is indeed larger under an exchange rate peg. These results have been supported in other studies. Born et al. (2013) and Ilzetki et al. (2013), using panel VAR and different data samples, also find the output response to a government spending shock to be higher under peg. Notwithstanding the similarity in results, there are some noteworthy differences between the studies, pertaining to the real exchange rate and interest rate responses. Under flexible exchange rates, Born et al. (2013) and Ilzetki et al. (2013) report an appreciation of the real exchange rate in the short run and a depreciation in the medium run, while Corsetti et al. (2012a) find no evidence of a short run appreciation. Under fixed exchange rates, the estimates of Born et al. (2013) and Corsetti et al. (2012a) imply that there is an appreciation of the real exchange rate following a fiscal expansion, but Ilzetki et al. (2013) report no significant response at all in the real exchange rate. Regarding the interest rate response, Born et al. (2013) and Ilzetki et al. (2013) find monetary policy to be more accommodative under a fixed exchange rate, which is quite in accordance with the prediction of any standard model open economy model. But against this, Corsetti et al. (2012a) observe that monetary policy is in fact less accommodative under fixed exchange rates. They rationalize this according to the argument that the full credibility of the exchange rate peg is likely to be violated by many countries and time periods in their sample, so that in fact even though a country is on an exchange rate peg, monetary policy may have to raise interest rates to defend the currency peg following a fiscal expansion.

Kim (2015) analyzes the effects of government consumption shocks on the real exchange rate and current account for high versus low international capital mobility, high versus low trade openness, large versus small countries, in addition to flexible versus fixed exchange rate regimes. Using data on 18 industrial countries, he finds that government consumption shocks lead to a real exchange rate depreciation under a floating exchange rate, but there is an insignificant response under a fixed exchange rate regime. In his analysis the effects of government consumption shocks on the real exchange rate and the current account are significant in countries with low capital mobility.

Using a New Keynesian small open economy model with a financial friction that excludes a fraction of households from asset market, Born et al. (2013) are able to account for the differential responses across exchange rate regimes as suggested in the time series evidence. To shed light on fiscal transmission mechanism, they show that adjustments in private expenditure to a fiscal shock is the key component in driving the differences in short-run multipliers. Specifically, under either exchange

rate regime, government spending will raise the long term real interest rate, “crowding out” the expenditure of asset holders. On the other hand, government spending will also create a positive wealth effect through higher wages, “crowding in” the expenditure of non-asset holders. The crowd-in effect is stronger under a fixed exchange rate regime, creating a more pronounced output response. This suggested mechanism is also consistent with findings in Karras (2011), where government spending lowers private consumption under flexible exchange rates, but increases private consumption under fixed exchange rates.

Corsetti et al. (2013b) emphasize that the transmission of fiscal policy under floats and pegs should not be analyzed independently of the monetary and fiscal stance in the medium run. In a small open economy New Keynesian model with government spending reversals, they show that the expansionary effect of fiscal policy is greatly amplified under flexible exchange rates when monetary policy is highly accommodative. Moreover, the anticipation of medium run fiscal consolidation could potentially make fiscal stimulus more effective under floats.

3.3. The Stance of Monetary Policy and the Zero Lower Bound

As implied by the discussion of the previous section, the transmission and effectiveness of fiscal policy hinges on the conduct of monetary policy. Accommodative monetary policy facilitates large multiplier effects because policy rates are kept relatively low, minimizing the crowding out of private demand by government spending. In contrast, an inflation-targeting monetary stance dictates a rise in the interest rate to combat inflationary pressure from a government spending increase, which curbs the response of private sector spending, leading to lower multipliers.

In the special case where monetary policy is constrained at zero lower bound (ZLB), Woodford (2011) shows that the government spending multiplier is larger than one and that optimal government purchases can be quite substantial, and moreso when the ZLB constraint on policy is expected to persist. Moreover, the timing of government purchases and the associated distortionary budget-balance tax increase is critical - for large multiplier effects, both should occur while ZLB is still binding. Similarly, Christiano et al. (2011) show that in a calibrated medium scale DSGE model, when government spending goes up for 12 quarters and the nominal interest rate remains constant (eg. stuck at ZLB), the impact multiplier is roughly 1.6 and reaches a maximum of 2.3. They further address the importance of the timing of government spending, noting that the multiplier is higher, the larger the fraction of government spending that takes place when the ZLB binds.

While these papers make the case for large multiplier effects at the ZLB, they have the property of Ricardian Equivalence, meaning in this context that (under lump sum taxation) the financing of fiscal spending is irrelevant for the quantitative

assessment of multipliers. Devereux (2010) develops a New Keynesian OLG model to analyze how monetary policy responses affect the size of fiscal multipliers, and how deficit financed spending may have quite different effects from balanced budget spending. He finds that under normal times, when monetary policy follows an inflation targeting Taylor-type rule, the multiplier is low, and there is little difference between a deficit financed expansion and a balanced budget expansion. But under the ZLB, there is a large gap between the two types of financing. In particular, at the ZLB, a balanced budget expansion has a small multiplier effect, while a deficit financed expansion may have a very large multiplier response of GDP.

Open economy multipliers may be very large also, under the ZLB. But they will work through a different channel. Cook and Devereux (2011a) find that in an open economy, fiscal expansion can lead to multipliers substantially larger than unity at the ZLB because of terms of trade depreciation, which further stimulates the demand for home goods.

Not all instruments of fiscal policy are equally effective at ZLB. Eggertsson (2011) shows that in a New Keynesian DSGE model, labor and capital tax cuts are contractionary while government spending is expansionary at the ZLB.³ The intuition behind the negative effect of tax cuts is that they create deflationary pressures in the model, and that given that the nominal interest rate is stuck at zero, this raises the real interest rate, thereby lowering demand. Boneva et al. (2016) provide a different perspective, suggesting that supply-side fiscal stimulus (tax cuts) can be expansionary using nonlinear solution methods. Also, under some empirically relevant parameterizations, the government spending multiplier is small but supply-side fiscal stimulus such as labor tax cuts induces higher employment. In another study, Mertens et al. (2014) show that in a confidence-driven liquidity trap, government spending is deflationary and a tax cut is expansionary, contrary to Eggertsson (2011).

Empirical evidence on multipliers at the ZLB is somewhat mixed. Looking at the historical data from the U.S, Ramey and Zubairy (2014) could not find any definitive evidence of a larger multiplier at the ZLB. There are some suggestions of a relatively higher multiplier at some horizons at the ZLB after excluding data from World War II, but the results are not robust or statistically significant. However, in a study using Japanese data from 1980 to 2014, Miyamoto et al. (2016) do find multipliers at the ZLB to be twice as big as multiplier at normal times, 1.5 on impact at ZLB versus 0.7 outside of ZLB.

Two interesting recent papers study the ZLB episode in Japan. Jeong, Kang and

³ Eggertsson terms the contractionary effect of labor tax cuts and capital tax cuts, the paradox of toil and the paradox of thrift, respectively. That is, when everyone tries to work more, there will be less work in the aggregate; and when everyone tries to save, there will be less savings in aggregate.

Kim (2017) and Kang and Kim, (2017) find that the fiscal multiplier increased significantly in Japan during the zero lower bound period. In fact, as predicted by theoretical models like Christiano, Eichenbaum and Rebelo (2011), they find that the real interest rate is reduced by a fiscal expansion, thus stimulating private activity so consumption and investment rise. In addition, consistent with Cook and Devereux (2011) and Fujiwara and Ueda (2012), they find that the real and nominal exchange rate depreciates as consumption and output increase following the spending shock.

3.4. Other Factors

The effectiveness of fiscal policy also depends on various other economic conditions. Auerbach and Gorodnichenko (2013a) find that higher labor market rigidity (measured in terms of protection of labor relations and labor market regulation) leads to a more pronounced cyclical variation in multipliers and amplifies the output response in recessions. Using a binary classification of trade openness based on the ratio of trade to GDP above or below 60%, Ilzetki et al. (2013) find that the fiscal multiplier is smaller in a more open economy, consistent with the textbook Mundell-Fleming model, where the increase in aggregate demand partly leaks through imports. Karras (2012), looking at a panel of 62 developed and developing economies, also reaches the same conclusion. In fact, he estimates that for every 10% increase in the trade to GDP ratio, the magnitude of the long-run fiscal multiplier decreases by 5-6%. Auerbach and Gorodnichenko (2013a), however could not confirm this finding in a panel of OECD countries, using either mean tariff or trade to GDP ratios as a measure of trade openness.⁴ The type of fiscal policy being implemented also seems to matter for the effectiveness of fiscal policy. Candelon and Lieb (2013) find that deficit-financed government spending has a much bigger multiplier effect than deficit-financed tax cut in recessions (maximum 2.4 v.s less than 0.5). The opposite is true in expansions, where a deficit-financed tax cut has a more persistent effect on aggregate output. Alesina et al. (2015) estimate the output effect of fiscal consolidation plans in a quasi-panel model and find that tax-based adjustments are associated with higher output costs than expenditure-based adjustments. The difference is mostly attributed to the response of private investment than that of consumption.

It is likely that in times of financial crisis, fiscal policy can be a potent stabilization tool. Corsetti et al. (2012a) report that the output multiplier is 2.3 on impact and remains above 2 at longer horizons during financial crises. Alfonso et al. (2017), using a financial stress index as a threshold variable in a nonlinear VAR analysis, find that the response of output growth to changes in the debt ratio (proxy

⁴ Auerbach and Gorodnichenko (2013a) attribute this surprising result to omitted variable bias.

for overall stance of fiscal policy) is positive and larger in a high stress regime. However, debt sustainability should also be taken into consideration when evaluating the effectiveness of fiscal stimuli. Ilzetki et al. (2013) find that when the debt-to-GDP ratio exceeds 60%, fiscal policy becomes ineffective. Similarly, Nickel and Tudyka (2014) estimate an interacted panel VAR model in a sample of 17 European countries and find that fiscal policy is expansionary when the debt-to-GDP ratio is low and turns contractionary when the debt-to-GDP is high. Also, Auerbach and Gorodnichenko (2013a) find that the output response to a government spending shock is significantly lower in recessions when the debt is high and that cyclical variation in multipliers vanishes as the debt to GDP ratio approaches 1. Looking at the time variation of spending multipliers in the euro area for the period 1980 to 2008, Kirchner et al. (2010) again confirm that rising government debt decreases the size of fiscal multipliers, particularly in the long run. Extending the framework of Curdia and Woodward (2010), Corsetti et al. (2013a) show that high public indebtedness can negatively impact fiscal multipliers through a “sovereign risk channel”. A deteriorating fiscal position increases the risk of sovereign default, commanding a higher sovereign risk premia on government bonds, which in turn raises the cost of financial intermediation and widens private credit spreads. In the case that monetary policy is constrained (e.g. at the ZLB) and that the interest rate cannot be cut to offset the impact of higher risk premia, fiscal policy becomes ineffective and even counter-productive.

IV. International Fiscal Spillovers

Following the terminology in Alcidi et al. (2016), a fiscal spillover is defined as the influence of fiscal policy measures (such as taxes or government spending) in one country (source country) on another (recipient country) country. As we have seen in the previous section, fiscal multipliers depend on a multitude of factors, and consequently the effectiveness of (domestic) fiscal policy should be assessed in a holistic way, taking into due consideration the various economic aspects at play. Naturally, it is expected that the effect of fiscal spillovers is also determined by many aspects of the economy in both the source country and the recipient country. In this section, we will first discuss the transmission channels of international fiscal spillovers, and then proceed to an examination of fiscal spillovers under different economic environments.

4.1. Transmission Channels⁵

4.1.1. Trade Channel

The key and perhaps the most obvious transmission channel of fiscal spillovers is through trade linkages. The extent of trade spillovers can be seen as the confluence of *demand effects and a competitiveness effect*. An expansionary domestic fiscal policy, by the usual Keynesian multiplier argument, induces an increase in consumption demand. Depending on the degree of trade openness, a positive spillover on foreign output can be large due to ‘demand leakages’ from the domestic economy. But the domestic fiscal stimulus also affects the real exchange rate. In the case of real exchange rate appreciation, which is predicted by standard theory, domestic goods are relatively more expensive than foreign goods. The larger is the trade price elasticity, the bigger the boost on foreign output through higher import demand. Corsetti et al. (2012) show that in a model with expected government spending reversals, the real exchange rate depreciates in response to fiscal stimulus. In this case, the fiscal spillover on foreign output is negative — the larger the trade elasticity, the more negative is the spillover. In Cook and Devereux (2011), it is shown that the ZLB constraint also leads to the prediction of negative fiscal spillovers across countries.

Empirically, there is little consensus on how the real exchange rate responds to domestic fiscal shocks. Kim and Roubini (2008) and Monacelli and Perotti (2010) find that the real exchange rate depreciates, while Beetsma et al. (2008) report real exchange rate appreciation, though with a delay. More recently, Auerbach and Gorodnichenko (2016), using high frequency data of U.S defense spending, find that the exchange rate appreciates in response to spending announcements, but not to actual fiscal outlays. They attribute the differences in results to the use of low frequency data and the use of actual spending in previous studies.

4.1.2. Financial Channel

The financial channel is another important transmission channel of fiscal spillovers. A rise in government debt as a result of a debt-financed fiscal expansion can raise the domestic interest rate either because of a fall in savings or an increase in the risk premium. To the extent that domestic the interest rate spills over to foreign interest rates, foreign output is negatively impacted as the intertemporal price of consumption rises. Theoretically, with government spending reversals, long-term rates can also fall, and through a financial channel transmission, this increases foreign consumption and output (Corsetti et al. 2010 and Corsetti. et al. (2011)).

⁵ see European Commission’s quarterly report on euro area for a more thorough discussion of transmission channels.

Empirical evidence lends support to interest rate spillovers. Alper and Forni (2011) find that a rise in the debt ratio of an advanced economy (AE) puts an upward pressure on the long-term real yields of emerging market economies (EMEs) and other AEs past a threshold of 70-80 percent of GDP. Moreover, AEs' real rates have a positive spillover effect on EMEs' and other AEs' real rates. Using a Global VAR model, Caporale and Girardi (2013) assess the impact of domestic and foreign government debt accumulation on long-term interest rates for EMU countries and find that much of the variability in long-term interest rates is accounted by foreign factors. Moreover, the country origin of the shock matters for the direction of the interest rate response. For instance, new debt issuances in Germany tend to reduce the long-term yields (20 to 35 basis points), whereas new issuances in Italy tend to increase the yields by up to 20 basis points. Similarly, Faini (2006) find that there are significant fiscal spillovers among EMU members through an interest rate channel. Moreover, high debt countries with unsustainable fiscal policies appear to have stronger interest rate spillovers.

4.1.3. Evidence of Fiscal Spillovers: Trade v.s Financial

Beetsma et al. (2006) employ a two-block approach to investigate the trade spillovers of fiscal policy in EU. In the first step, they estimate the response of output to fiscal shocks in a panel VAR model (fiscal block). In the second step, they consider a dynamic version of gravity model to estimate the effects of domestic output on bilateral exports (trade block). Combining the estimates from both blocks, they are able to calculate the effect of fiscal shocks on bilateral exports and thereby on foreign output. Their results indicate that fiscal spillovers are economically significant. Moreover, the magnitude of spillovers varies with the size of the source country in which the fiscal shock originates and with the intensity of trade between the source country and recipient countries. A fiscal stimulus of 1% GDP in Germany leads to an average increase of 0.15% of foreign GDP for a spending increase, and 0.05% for a tax cut. In contrast, a fiscal stimulus in Greece increases foreign GDP by an average of 0.01% (0.005%) for a spending increase (a tax cut).

Bénassy-Quéré and Cimadomo (2006) examine the fiscal spillovers from Germany to the seven largest European Union economies over the period 1971-2004, using a Factor Augmented VAR model. They find that expansionary fiscal policies in Germany, especially tax cuts, have a positive effect on neighboring countries, but less so for remote ones, consistent with the view of trade spillovers dominating interest rate spillovers given that for almost all subsamples, interest rate are not significantly raised.

Using narrative data on fiscal adjustments identified by Devries et al. (2011), Hebous and Zimmermann (2013b) find that the international transmission of fiscal consolidations works mainly through the trade channel instead of financial channel. The reaction of the interest rate to fiscal consolidations is insignificant, whereas the

response of exports to foreign fiscal consolidations is negative, particularly for European countries, although the U.S seems to be insulated from foreign fiscal consolidations. On the contrary, Faccini et al. (2016) find that foreign real interest rates fall statistically significantly in response to U.S government spending shocks but the trade balance stays flat and insignificant, pointing to the importance of financial channel.⁶

Model-based estimations tend to suggest a limited scope of fiscal spillovers. Simulating four major macroeconomic models, Gros and Hobza (2001) find that effect of fiscal spillovers is quite small. To a large extent, the trade channel and financial channel work in opposite directions, canceling each other out and resulting an ambiguous net effect of fiscal spillovers. A government spending shock of 1% of GDP in Germany has an average spillover effect in the whole euro area between -0.03% and +0.04% on impact. Similarly, Attinasi et al. (2017), simulating the consolidation episodes of 2010-13 in euro area countries in the New Multi-Country Model, find that the overall fiscal spillovers are limited.

Taking a simple analytical framework, Ivanova and Weber (2011) simulate the effect of actual fiscal consolidation plans in 20 countries for years 2011 and 2012, using estimates of fiscal multipliers and import elasticities from other studies. They find that aggregate spillovers through trade channels from synchronized consolidation plans are quite small compared to the impact of domestic fiscal policy. However, for small open economies such as Ireland, Belgium, Netherlands and Austria, spillovers are rather substantial.

4.2. Fiscal Spillovers and the State of Business Cycle

Just as fiscal multipliers vary over recessions and expansion, fiscal spillovers are also found to be state-dependent. Using a local projection approach, Auerbach and Gorodnichenko (2013b) consider the state-dependence of fiscal spillovers among OECD countries, where foreign government spending shocks are weighted by the strength of trade-linkages as measured by the ratio of imports from domestic country to government purchases in the foreign countries. They find that the strength of fiscal spillovers varies over business cycles. In particular, recessions feature a strong positive effect of output spillovers from a foreign fiscal shock, whereas expansions generally have lower, in fact, negative (though insignificant) output multipliers in response to the same foreign fiscal shock. Furthermore, the estimated spillover effects are much more pronounced when domestic and foreign countries are both in recessions. In a more recent study using daily series of U.S defense spending, Auerbach and Gorodnichenko (2016) document a state-dependent response of the exchange rate to fiscal shocks over business cycles, where

⁶ The fall in real interest rate is statistically significant for all countries except Canada.

the exchange rate strongly appreciates in recessions compared to expansions. Insofar as exchange rate appreciation leads to a trade balance deterioration, the result suggests a stronger positive spillover of a domestic spending shock in recessions. Looking at the cross-country spillovers of fiscal consolidations among OECD countries, Goujard (2013) find that the estimated effect of fiscal spillovers is marginally larger during domestic downturns, but the difference is not significant. In contrast, when the foreign economy is experiencing downturns as measured by a large negative output gap, fiscal spillover is significantly more negative compared to when the foreign economy is in normal times. The state-dependence of fiscal spillovers, however is not confirmed by Faccini et al. (2016). Using a dynamic regime-change factor model with a set of sign restrictions, they estimate international fiscal spillovers from US government spending shocks. They find that foreign output (Canada, Japan, France, Germany, UK) response to US government spending shocks do not differ over business cycles; neither the state of U.S economy nor the state of foreign economy has an influence on effect of fiscal spillovers.

4.3. Heterogeneity in Fiscal Spillovers

Favero (2011) examine the effects of fiscal policy among OECD countries controlling for country heterogeneity in the styles of fiscal policy (tax-based v.s. expenditure-based), fiscal reaction functions (implied debt-deficit dynamics) and degrees of openness. Using a Global VAR model, they find that international fiscal spillovers are important but the output response to fiscal consolidations differ significantly across countries, ranging from expansionary to contractionary. Similarly, Hebous and Zimmermann (2013a) also report notable heterogeneity in output dynamics across member countries in the euro area following a fiscal shock.

Theoretically, Corsetti et al. (2010) show that the stance of monetary policy plays a vital role in determining the size/sign of fiscal spillovers. In the case of strongly anti-inflationary monetary policy, domestic government spending can potentially induce a negative spillover effect on foreign output through a rise in long-term real rates. Moreover, spillovers vary positively with the trade price elasticity, openness and size of domestic economy.

In a standard new open economy macroeconomics model, Fujiwara and Ueda (2013) show that the fiscal spillover in a global liquidity trap is positive if the intertemporal elasticity of substitution is greater than one and negative if it is less than one. In addition, under local currency pricing, the fiscal spillover in a global liquidity trap is positive regardless of the size of the intertemporal elasticity of substitution. Cook and Devereux (2011a) examine the nature of fiscal spillovers in a two country model where one or both countries may be constrained by the ZLB, and find that spillovers are negative if the spending shock originates in the country constrained by the ZLB.

The dynamics of spillovers can also depend on which measure of fiscal policy is implemented. Attinasi et al. (2017) show that expenditure-based spillovers are less persistent but larger on impact whereas revenue-based spillovers are associated with a more gradual response.

Using a multi-country model to evaluate the spillover effect of German fiscal stimulus plan for 2009 and 2010 on France and Italy, Cwik and Wieland (2011) find that spillover effects are negligible. For Italy, the effect actually turns negative after one year. They argue that the negative effect is due to the appreciation of the common currency euro following the fiscal expansion in Germany, which reduces the competitiveness of member countries with respect to the rest of the world. In a counterfactual analysis assuming flexible exchange rates and independent monetary policies, Cwik and Wieland (2011) find that while the domestic effect of German government expenditure falls, the spillover effects to France and Italy increase.

Goujard (2013) find that the short-term effect of fiscal consolidation within a currency union is more negative than between countries with flexible exchange rates. However, in the medium term, negative spillovers become larger between countries with flexible exchange rates.

4.4. A Case for Fiscal Coordination?

In a model-based analysis of the cross-country spillover effects from fiscal consolidations in the euro area during 2011-2013, in't Veld (2013) finds that simultaneous consolidations add up to 1.6% to 2.6% additional fall in GDP compared to each country acting alone. Further, simulating a temporary two-year increase in government investment in Germany and the rest of the core EA of 1% GDP, they find that import leakages lead to positive spillovers to the other EA countries, boosting GDP by 0.2 to 0.3 percent. Empirically using a GVAR model, Hebous and Zimmermann (2013a) find that output of a member country in the euro area responds more positively to an area-wide shock than a similar sized domestic shock. Both studies appear to support the case for fiscal coordination at least euro area. However, practical implementation of coordinated fiscal policies can be extremely difficult. A design of ex-ante policy coordination in general does not allow for enough flexibility to deal with the unique situation governed by current economic conditions. Ex-post policy coordination however is complicated by political economy considerations, particularly when the uncertainty about state of the economy is high and the gains from coordination unclear (Alcidi et al. 2016).

In a theoretical analysis, Cook and Devereux (2011a, 2011b) identify gains from fiscal policy coordination in an environment where monetary policy is constrained by the ZLB. In their model, an optimal first best fiscal policy is one which supplies public goods. But at the ZLB, even if exchange rates are flexible, there is a strong case for a coordinated expansion of spending which exceeds the level that would

efficiently supply public goods in the absent of the lower bound constraint.

Table 1 lists some of the important empirical papers on fiscal spillovers, describing the estimation methods, the variables studied, and the main results.

[Table 1] A Summary of Studies on Fiscal Spillovers

Authors	Estimation method	Variables investigated	Results
Attinasi et al. (2017)	model-based	output	trade spillovers are negative from fiscal consolidation output effects are heterogeneous across countries
Alper and Forni (2011)	OLS and IV	long-term real interest	increase in debt levels of advanced economies spills over to other advanced economies and emerging economies' long-term real rates.
Auerbach & Gorodnichenko (2013b)	local projection OECD	output	state-dependent fiscal spillovers: output response is higher when recipient and source countries are in recessions
Auerbach & Gorodnichenko (2016)	local projection U.S (high frequency data)	exchange rate	exchange rate strongly appreciates in recessions than in expansions
Beetsma et al. (2006)	two-block approach: fiscal block (panel VAR) trade block (OLS) EU	output	positive spillovers via trade
Bénassy-Quéré and Cimadomo (2006)	factor augmented VAR recursive estimation OECD	tax v.s spending shocks	expansionary fiscal policies in Germany has a positive effect on neighbouring countries
Caporale & Girardi (2013)	GVAR EMU	long-term rates debt/GDP ratio real output inflation	variability in long-term rates is largely accounted by foreign factors financial market discriminate new debt issuers
Cwik & Wieland (2011)	model-based	output	limited spillovers
Faccini et al. (2016)	dynamic regime-change factor model	real GDP inflation short-term rates long-term rates Consumption REER	no evidence of state-dependent spillovers highlight importance of interest channel in fiscal spillovers
Faini et al. (2006)	least squares 10 EMU countries	interest rate	fiscal spillovers through interest rate channel
Favero et al. (2011)	GVAR OECD	tax hike v.s spending cut output response	heterogeneity in spillovers
Goujard (2013)	local projection OECD	output	state-dependent spillovers: spillover of fiscal consolidation is more negative when foreign economy is in downturns
Hebous & Zimmermann (2013a)	GVAR euro area	output	output response to area-wide shock is larger than same-sized domestic shock
Hebous & Zimmerman (2013b)	narrative record	export/import long-term rates short-term rates exchange-rates	spillovers mainly work through trade
Ivanova & Webber (2011)	simulation based on estimates of multipliers and import elasticities	output	limited spillovers unless for small open economies
in't Veld (2013)	model-based euro area	GDP, C, I,E,M CPI, REER nominal E	simultaneous consolidation more detrimental

V. Conclusions

This paper has reviewed the empirical literature on fiscal multipliers and international fiscal spillovers. We have discussed the main channels of spillovers, the degree to which spillovers may be contingent on the cycle, the stance of monetary policy, the exchange rate regime, and other factors. We highlighted a tension between the small spillovers that are predicted by theoretical models and some of the empirical findings of large spillovers. A major task for future work on fiscal spillovers will be to reconcile this discrepancy. A likely area in which to make progress in this respect is the further development of large scale estimated DSGE models incorporating more realistic trade and financial linkages among national economies. A further area of interest will be to integrate political economy considerations into models of fiscal policy design, particularly in the case of international fiscal policy coordination. As we noted in the introduction, while the literature on optimal monetary policy and monetary policy coordination is very well developed, there is much less work done on optimal fiscal policy at the international level. A recent paper by Cook and Devereux (2017) represents a first attempt along these lines, exploring the design of ‘optimal fiscal spillovers’ in a monetary union, which may or may not be constrained by the zero lower bound on interest rates.

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