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Size of Fiscal Multipliers

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12.1 Introduction

The Great Recession has refocused attention on the effectiveness of fiscal policy. In the economic policy paradigm prevalent before the crisis, there was little room for fiscal policy activism. Monetary policy was considered more effective in managing short-run fluctuations, with fiscal policy contributing through automatic stabilizers. This implied that fiscal policy focused mainly on the medium and longer terms, enhancing potential growth through structural reforms, including reducing distortions in the economy, ensuring debt sustainability, and safeguarding the most vulnerable.

The reasons why fiscal policy took a backseat as a stabilization tool during the pre-crisis era are manifold.[1] First, there was wide skepticism about the effectiveness of fiscal policy, largely based on Ricardian equivalence arguments. Second, financial market developments increased the effectiveness of monetary policy, reducing incentives for politicians to use fiscal policy for economic stabilization. Third, in advanced economies, priority was given to stabilize and possibly decrease typically high debt levels; while in emerging market countries, the lack of depth of the domestic bond market limited the scope for countercyclical policy. Fourth, lags in the design and the implementation of fiscal policy, together with the short length of recessions, implied that fiscal measures were likely to come too late.[2] Fifth, fiscal policy, much more than monetary policy, was likely to be distorted by political constraints.

As the crisis deepened, nominal interest rates reached the "zero lower bound" in many advanced economies as a result of aggressive monetary easing. This, combined with a weakened transmission mechanism caused by an impaired financial system, limited scope for further maneuvering monetary policy. Attention thereby naturally shifted to the effectiveness of fiscal policy as a key crisis response. A number of countries passed fiscal stimulus bills aimed to fasten the economic recovery and ease the pain for their hardest hit citizens, although the size and composition of packages had considerable variations.[3] Once the global economy hit bottom, attention turned to the pace and the modalities of fiscal consolidation to reduced elevated public debt

at unsustainable levels. These exceptional circumstances triggered a new wave of research on fiscal policy activism and fiscal multipliers.

Broad consensus about the size of fiscal multipliers can be summarized as follows. First, there is no "the" fiscal multiplier, or a unique size for fiscal multipliers. The size can be below or above unity, most likely depending on the country analyzed and the state of the economy. Second, fiscal multipliers tend to be materially larger during economic downturns than expansions and could exceed unity during recessions. The state dependency of fiscal multipliers is intuitive and supported by recent studies, including the empirical analysis in this chapter explicitly incorporating nonlinearities. During economic expansions, when employment and output are above potential levels, the crowding-out effects of a fiscal expansion tend to offset the direct impact of fiscal stimulus on aggregate demand, whereas during economic downturns, government spending better utilizes idle resources (i.e., unemployed labor and capital), further augmenting private consumption and/or investment.

The finding that fiscal multipliers tend to be larger during economic downturns gives support to the idea that governments could implement fiscal stimulus if the economy is in a deep recession and if there is the necessary fiscal space. The state dependency of multipliers also has an implication for the timing and pace of fiscal adjustment to unwind fiscal stimulus.

The structure of the chapter is as follows. Section 12.2 provides an overview of the evidence on the size of fiscal multipliers in the theoretical and empirical literature. Section 12.3 introduces recent empirical work exploring differences in the size of multipliers depending on the state of the economy. Section 12.4 concludes with policy implications coming out of the analysis in this chapter.

12.2 Debate on the Magnitude of Fiscal Multipliers

Fiscal multipliers are typically defined as the ratio of a change in output to an exogenous change in the fiscal deficit with respect to their respective baselines.[4]

The literature survey in this chapter indicates there is no unique size for fiscal multipliers. A plausible range of first-year multipliers, however, would comprise values around 0.5 to 0.9 for government spending and around 0.1 to 0.3 for revenue using linear models, although there are notable differences between the United States and European countries, as well as between the techniques used (table 12.1).[5] Linear models denote empirical and model-based approaches that do not distinguish between multipliers based on the underlying characteristics of the economy, such as whether the economy is at the zero lower bound or undergoing a recession. The range for spending multipliers is close to the findings of other literature surveys, such as Hall (2009), 0.5 to 1 with vector autoregressive approaches, and Boussard et al. (2012), 0.4 to 1.2, but is slightly lower than Ramey (2011b), 0.8 to 1.5. The differ-

Table 12.1
First-year fiscal multipliers: Summary of findings from previous literature (linear models)

a. Size of government spending fiscal multipliers

	All samples		United States		Europe	
	VAR	DSGE	VAR	DSGE	VAR	DSGE
Mean	0.8	0.7	1.0	0.7	0.8	0.6
Median	0.8	0.6	1.2	0.8	0.8	0.5
Maximum	2.1	1.7	2.1	1.6	1.8	1.2
Minimum	0.1	0.0	0.3	0.0	0.3	0.2
Plausible range[a]	0.5–0.9		0.7–1.1		0.5–0.7	

b. Size of government revenue fiscal multipliers

	All samples		United States		Europe	
	VAR	DSGE	VAR	DSGE	VAR	DSGE
Mean	0.2	0.3	0.7	0.5	0.1	0.2
Median	0.1	0.2	0.9	0.3	0.1	0.1
Maximum	1.4	1.3	1.4	1.3	0.7	0.7
Minimum	–1.5	0.0	–0.7	0.0	–0.5	0.0
Plausible range[a]	0.1–0.3		0.3–0.7		0.1–0.2	

Sources: Literature survey in the appendix; IMF staff estimates.
Note: Government spending excludes transfers for empirical models. VAR denotes summary statistics from linear vector autoregressive models, and DSGE denotes results from dynamic stochastic general equilibrium models. The summary statistics are calculated with the 20 studies that include estimated first-year multipliers, out of the total 41 studies shown in the appendix. The summary includes the maximum multipliers estimated with linear models from Auerbach and Gorodnichenko (2012b) because the study indicates the maximum values are observed between the first and fourth quarters after shocks. The summary excludes results from the DSGE studies that simulated the sizes of fiscal multipliers with zero lower bound of interest rates, and some outliers.
a. The upper and lower values of the mid 30 percent ranges, including VAR and DSGE, from box 12.1.

ence with respect to the latter could be partly explained by the fact that Ramey uses either cumulative multipliers for longer time horizons than one year or their peak values. Our range of revenue multipliers is broadly consistent with Boussard et al. (2012), who find that the size of first-year tax multipliers lies quite often below 0.7 and is frequently negative.

12.2.1 Estimation Techniques Used for Fiscal Multipliers

Multiplier estimates differ depending on the estimation techniques used as shown in table 12.1. The vector autoregressive (VAR) and dynamic stochastic equilibrium (DSGE) models are indeed very different, and both are subject to caveats as explained below.

12.2.2 Econometric Approaches

VAR models are widely used to quantify the size of fiscal multipliers. The key challenge relates to the difficulty of isolating exogenous movements in fiscal variables (endogeneity problem).[6] Since the seminal paper by Blanchard and Perotti (2002), a common approach has been to use a structural identification approach. This assumes that changes in fiscal variables could be due to (1) the automatic response of the fiscal balance to macroeconomic variables, (2) the discretionary response of fiscal policy to news in macroeconomic variables, and (3) truly exogenous shifts in fiscal policy, which are the shocks that need to be identified. The literature has typically used quarterly data, assuming that discretionary adjustment to fiscal policy in response to unexpected events is unlikely to be implemented within the same quarter.[7] Elasticities of revenue and expenditure items with respect to output can then be used to identify the automatic response of the fiscal balance to macroeconomic variables, namely point 1 above.

VAR models have been subject to various criticisms. First, the structural identification approach may fail to capture exogenous policy changes correctly because, for example, changes in revenues are not only due to cyclical developments and discretionary policy but also to asset and commodity price movements (IMF 2010). Other challenges for the VAR approach, like any other econometric analysis, relate to omitted variables,[8] limited identifying information (Romer 2011), and the elasticities used (Caldara and Kamps 2012). Moreover quarterly data, which are needed for the structural identification approach, are often not available for a long enough time span. For multicountry studies, using panel data also calls for caution as there is significant country heterogeneity in the effect of fiscal policy on output—with different debt dynamics, degree of openness, and fiscal reaction functions (Favero et al. 2011).

The "narrative" and "action-based" approaches are alternative methods to identify exogenous fiscal shocks. They seek to overcome the endogeneity and antici-

patory biases through identifying policy shocks from government documents (e.g., budget documents) rather than data.[9] So far the narrative approach has only been applied using quarterly data for Germany (Hayo and Uhl 2014), the United Kingdom (Cloyne 2011), and the United States (Romer and Romer 2010). The IMF (2010) created a multiple country data sample based on this approach (see also Devries et al. 2011) but it only covers annual data.

12.2.3 Macroeconomic Model Approaches

New Keynesian macroeconomic models, particularly DSGE models, are commonly used for simulating the fiscal policy impact on growth. Analyzing fiscal multipliers with DSGE models also presents challenges, including the difficulty in modeling fiscal policy and incorporating nonlinearity. For example, unlike the Taylor rule for monetary policy, there is no widely accepted fiscal rule to be included in a DSGE model. In addition results of simulations using DSGE models tend to be sensitive to the size of parameters (e.g., degree of price and wage rigidities, habit persistence, investment adjustment cost), as well as structural features.[10] Furthermore incorporating nonlinearities, such as measuring the size of multipliers depending on the state of economy or when the zero lower bound is binding, in DSGE models is challenging. Fernández-Villaverde et al. (2012) discuss that the existing solutions have made simplifying assumptions that could have unexpected implications. For example, linearizing equilibrium conditions, such as the Euler equations, may hide nonlinear interactions between the zero lower bound and the policy functions of the agents, and linear approximations provide a poor description of the economy during deep recessions, such as the Great Recession. Furthermore they argue that in order to analyze the dynamics of the economy near or at the zero lower bound, models should allow time-varying expectations and variance of the number of additional periods at the zero lower bound.

12.2.4 Key Factors Influencing the Size of the Fiscal Multipliers

Multipliers not only differ across estimation techniques, but there are also a number of well-known factors influencing the size of multipliers, which are listed below.

Automatic Stabilizers

Automatic stabilizers tend to dampen the effect of a discretionary fiscal stimulus through the growth channel: a fiscal stimulus increases growth, which leads to higher taxes and lower transfers, hence reducing the fiscal multiplier (figure 12.1). The size of the automatic stabilizers is smaller for the United States than for Europe,[11] which could explain (at least partially) why the United States typically has larger fiscal multipliers.

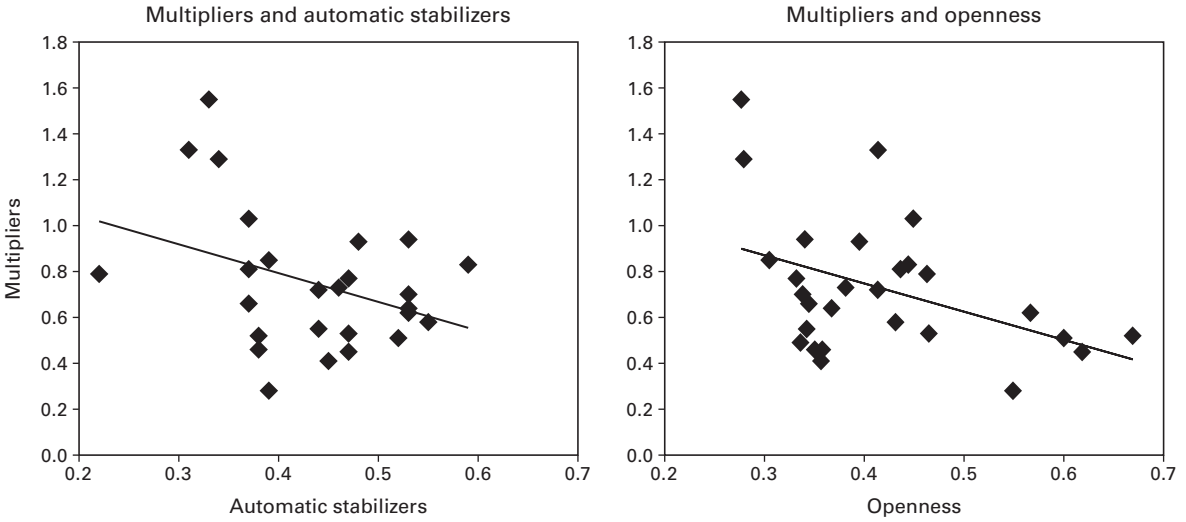


Figure 12.1
Fiscal multipliers relative to the automatic stabilizers and openness. Multipliers are based on the OECD (2009). Openness is measured by import penetration, that is the 2008 to 2011 average of Imports/(GDP – Exports + Imports) ×100. Automatic stabilizers are measured as the semielasticity of the budget balance and are extracted from Girouard and André (2005). The negative correlations in the panel are robust to outliers being removed using an automated Stata procedure.
Sources: IMF, Fiscal Affairs Department Fiscal Rules database and Fiscal Transparency database; Organisation for Economic Co-operation and Development (OECD); IMF staff estimates

Trade Openness

A country with a smaller propensity to import (i.e., large countries and/or countries only partially open to trade) has larger fiscal multipliers (Ilzetzki et al. 2011; IMF 2008; Barrell et al. 2012) (figure 12.1). This is because less of the additional demand generated by the stimulus will "leak" through imports, and this is probably another reason for why Europe has smaller fiscal multipliers than does the United States.

Exchange Rate Regimes

A country with a flexible exchange rate regime tends to have smaller fiscal multipliers than a country with a fixed regime because of the different monetary policy responses to a fiscal expansion.[12] Under a flexible exchange rate regime, the central bank does not change its monetary policy stance in response to a fiscal expansion—which increases output, raises interest rates, and attracts foreign capital—resulting in an appreciation of the real exchange rate and a reduction of net exports (leakages).[13] Under a fixed exchange rate regime, the central bank would have to expand the money supply to mitigate the appreciation pressures, resulting in a new equilibrium

with larger output and unchanged interest rates.[14] Ilzetzki et al. (2011) show the fiscal multipliers are positive for countries with fixed exchange rate regimes while they are negative on impact and around zero in the long run for countries with flexible exchange rate regimes.

The discussion on the size of fiscal multipliers in a currency union is akin to that in a country with a fixed exchange rate regime. Nakamura and Steinsson (2011) argue that the relative monetary policy within a currency union—fixed relative nominal interest rate and exchange rate—is more accommodative than "normal" monetary policy of a country, which raises the real interest rate in response to inflationary shocks. Using state-level data for the United States, they find the "open economy relative multiplier"[15] to be roughly 1.5.[16] One caveat here is a possible spillover effect of fiscal stimulus. If the country in a currency union undertaking fiscal stimulus is large and not a price taker, and the stimulus is accompanied by monetary tightening to mitigate the inflationary pressures, other countries in the union are forced to follow suit and tighten monetary policy, negatively affecting their economic performance (Farhi and Werning 2012).

Fiscal Instruments

As shown in table 12.1, spending multipliers are usually larger than revenue multipliers in the short run.[17] This is largely because spending has a direct impact on aggregate demand while revenue has only an indirect impact on demand.[18] In this context, it is critical to make a distinction between the spending items that have a direct impact on aggregate demand (i.e., government investment and consumption) and those that have an indirect impact on aggregate demand. An example of the latter is a transfer to households, which impacts aggregate demand through its effects on household income and labor supply incentives. In other words, an increase in transfers to households plays a similar role as a reduction in taxes. Therefore much of the empirical literature excludes such transfers from government spending.

The size of multipliers for tax- and transfer-based stimulus tends to be highly dependent on the share of liquidity-constrained (hand-to-mouth) households and the relative distortions caused by fiscal instruments. Therefore short-run multipliers tend to become large if transfers are targeted to hand-to-mouth households, or if tax measures provide incentives to bring forward consumption or investment. Oh and Reis (2011) show that increases in targeted transfers are expansionary, raising both employment and output, through both a neoclassical wealth effect and a Keynesian aggregate demand effect. And although their gross impact is smaller than that of government purchases, the net impact on private consumption and investment is found significantly larger. Distortionary taxes to influence the timing of consumption or investment could also impact output, but they could exacerbate the crowding-out effects through increasing real interest rates.[19] In addition the longer term impact of

distortionary tax measures should be carefully taken into account when a government decides on a tax-based economic stimulus.

Moreover the output implication of a deficit-financed temporary fiscal measure is likely different from that of a permanent fiscal measure. In general, a temporary measure tends to have a stronger effect than a permanent measure.[20] This is because a permanent measure, which would require a future increase in taxes, typically has a larger negative effect on households' lifetime wealth compared with a temporary measure, resulting in crowding out of private demand.

Debt Level

An increase in government spending in countries with high debt levels may act as a signal that fiscal tightening will be required in the near future, and the anticipation of such adjustment could have a contractionary effect that would offset any short-term expansionary effects. Ilzetzki et al. (2011) show that multipliers become lower, and eventually negative, as debt levels exceed a certain threshold.[21] Kirchner et al. (2010) also find that in the euro area, spending multipliers tend to be lower the higher is the level of public debt.

Financial Market Development

The degree of financial market development influences the size of fiscal multipliers through household liquidity constraints and the government's ability to finance the fiscal deficit. For example, Kirchner et al. (2010) indicate with time-varying parameter VAR models applied to the euro area that short-run spending multipliers decreased since the 1980s driven partly by increased access to credit during the period, which reduced household liquidity constraints and enhanced its behavior in line with the Ricardian equivalence.[22] However, the net impact of the degree of financial market development is ambiguous. Spilimbergo et al. (2009) suggest that, on the one hand, shallow financial markets limit the ability of the private sector to smooth consumption (and investment), thereby increasing the size of fiscal multipliers. On the other hand, governments with limited access to financial markets tend to face higher interest rates for their debt financing, thereby reducing the size of fiscal multipliers.

Development Stage and Size of Economy

The fiscal multipliers tend to be smaller in emerging economies than in advanced economies (IMF 2008; Ilzetzki et al. 2011). This could be due to credibility issues, especially related to debt concerns, triggering an adverse interest rate response. IMF (2008) also finds that revenue-based stimulus measures are more effective at boosting output than expenditure-based measures in emerging economies, perhaps reflecting concerns that increases in expenditures are politically difficult to reverse.

For advanced economies, fiscal multipliers tend to increase with the size of the economy. Barrell et al. (2012) argue that country size is an important distinguishing factor across multipliers, because changes in the real interest rate of a large economy triggered by discretionary fiscal policy actions have spillover effects to global interest rates. If an economy is a price taker, a relative decline in the real interest rate in the economy would cause depreciation pressures to the exchange rate, which in turn increases net exports and mitigates the adverse impact of the fiscal consolidation on the economy (the fiscal multiplier becomes smaller). However, because a large economy, such as the United States, is not a price taker, a decline in its real interest rate lowers global real interest rates, resulting in less impact on its relative real interest rates, exchange rates, and net exports, suggesting fiscal consolidation has large negative impact on its economy (the fiscal multiplier is large).[23]

Monetary Policy Stance

The monetary policy stance and coordination with fiscal policy are also key determinants of the size of fiscal multipliers. For example, if a central bank follows a Taylor rule, the nominal interest rate rises in response to an expansionary fiscal policy shock that puts upward pressures on output and inflation, which dampens the impact of the fiscal expansion (Christiano et al. 2009; DeLong and Summers 2012). However, if a central bank maintains accommodative monetary policy during a temporary fiscal expansion, the efficacy of such discretionary fiscal policy increases. Conversely, if the government proceeds with fiscal consolidation when the central bank operates a Taylor rule, the nominal interest rate declines to offset the contractionary impact of such adjustment. However, if the central bank keeps the nominal interest rate unchanged during fiscal consolidation, the adverse impact of fiscal contraction on output becomes larger (Barrell et al. 2012).

Role of Nonlinearities

More recent advances in the literature have explicitly incorporated nonlinearities when estimating fiscal multipliers. A first strand of research examined the impact of monetary policy on multipliers when monetary policy is constrained by the zero lower bound. A second and later strand of the literature has been investigating whether the impact of fiscal policy on growth differs in economic downturns and expansions. We look at the literature addressing both of these underlying nonlinearities in turn.

Zero Lower Bound

DeLong and Summers (2012) argue that in normal times central banks offset the effects of fiscal policy, which keeps the policy-relevant multiplier near zero. However, when interest rates are constrained by the zero lower bound, discretionary fiscal policy can be highly efficacious as a stabilization policy tool. Conversely, the existence

Table 12.2
Fiscal Multipliers and the Monetary Policy Stance

	Country	Methodology	No zero bound	Zero bound
Christiano et al. (2009)	United States	DSGE	0.8	3.4
Eggertsson (2006)	United States	DSGE	0.8	3.8

Note: For further details, see table A12.2.

of the zero lower bound deepens the contractionary impact of fiscal consolidation (Erceg and Lindé 2012a).

Several studies demonstrate government spending multipliers could be substantially larger than unity when the monetary policy stance is accommodative (see some examples in table 12.2). Eggertsson (2006) finds that government consumption multipliers are notably larger than unity (exceed 3) when monetary policy and fiscal policy are coordinated and the zero lower bound is binding. Christiano et al. (2009) also demonstrate with a DSGE model that fiscal multipliers become much larger than unity (sometimes over 3) whenever the zero bound on nominal interest rates is binding. Erceg and Lindé (2010) show with a DSGE model that the size of the fiscal multipliers increases with the duration of the liquidity trap.[24] Only a few empirical studies investigate fiscal multipliers under such conditions because episodes of nominal interest rates reaching the zero bound have been rare. Alumnia et al. (2010) analyzed with 1930s data for 27 economies, when interest rates were at or near the zero lower bound, and find that fiscal multipliers were about 1.6.

State of Economy

Several studies have investigated the dependency of fiscal multipliers on the state of the economy since the onset of the Great Recession. They found that the size of spending multipliers could be substantially larger than unity during economic recessions (table 12.3). IMF's (2012a) own analysis based on data for 28 advanced and emerging economies concludes that actual fiscal multipliers during the Great Recession might have been in the range of 0.9 to 1.7, significantly higher than previously thought. The IMF study suggests that multipliers may be well above unity given the environment of substantial economic slack, monetary policy constrained by the zero lower bound, and synchronized fiscal adjustment across numerous economies.[25] In a similar vein, Rendahl (2012) demonstrates with a DSGE model that the fiscal multiplier increases to 1.5 when unemployment exceeds the natural rate by 3 percentage points, but falls below one when the unemployment rate is below the natural rate plus two percentage points.[26]

The finding that multipliers are larger in downturns than expansions is in line with the prediction of the Keynesian theory. This is partly because during recessions

Table 12.3
Fiscal multipliers in economic recessions versus expansions

	Country	Methodology	Expansion	Recession
Auerbach–Gorodnichenko (2012b)	United States	VAR	0.6	2.5
Batini et al. (2012)	United States	VAR	0.3	2.2
	Euro area	VAR	0.4	2.6
Baum–Koester (2011)	Germany	VAR	0.3–0.4	1–1.3
Canzoneri et al. (2011)	United States	DSGE	0.9	2.2

Note: For further details, see tables A12.1 and A12.2.

government spending is less likely to cause an increase in interest rates and crowd out private consumption or investment.[27] In addition the proportion of hand-to-mouth households and firms is higher during recessions. Galí et al. (2007) find that the size of fiscal multipliers reflects the share of hand-to-mouth consumers in the economy and the degree of price stickiness.[28] In light of the recent Economic Stimulus Act of 2008, Parker et al. (2011) also find that responses to the 2008 tax rebates were larger for house holds with liquidity constraints or low income.

12.3 Fiscal Multipliers and State of the Economy[29]

As shown in the previous section, the crisis has renewed interest in the estimation of fiscal multipliers, which spurred a rapidly expanding body of literature in this area. As discussed above, fiscal multipliers may be significantly higher during periods of large negative output gaps, which is particularly relevant in the current global context.

This section explores how the effects of fiscal policy on output depend on whether the economy is in an expansion or a downturn. Country-by-country estimation allows the explanatory variables (government spending and revenue) to have differing regression slopes, depending on whether the chosen threshold variable—the output gap—is above or below a particular level, which is chosen to maximize the fit of the model.

Expansions and downturns are defined by the sign of the output gap (positive and negative, respectively). The choice of using the output gap as the threshold variable is motivated by several factors, including that under a negative output gap—independently of the sign of the GDP growth rate—excess capacities are available in the economy, reducing the crowding out of private investment following expansionary fiscal policy.

The section shows that the position in the business cycle affects the impact of fiscal policy on output: for an average of G7 economies, government spending and revenue multipliers tend to be larger in downturns than in expansions. Thus, depending on the phase of the business cycle, the size of multipliers (particularly on spending) is larger than the average estimated if one does not control for the cycle.

However, the value of the multipliers is found to differ significantly across countries, calling for a tailored use of fiscal policies and a country-by-country assessment of their effects. In those countries where spending impact multipliers are found to be statistically significant and sizable (Germany, Japan, and the United States), spending shocks have a significantly larger effect on output when the output gap is negative than when it is positive.

The results are generally less conclusive for revenue multipliers. The impact is more significant for Canada, France, Germany, and Japan. In Germany, revenue multipliers are slightly higher in "good times" than in "bad times," which could suggest that individuals and firms are more willing to spend additional income when market sentiment is positive, thereby becoming less Ricardian. In Canada and Japan, revenue measures work as a countercyclical tool only when the output gap is negative.

12.3.1 Methodology and Data

The econometric analysis conducts a nonlinear time-series estimation for six G7 countries (excluding Italy), applying a threshold vector autoregression (TVAR) methodology that closely follows Baum and Koester (2011). The threshold value is determined endogenously, allowing the data to find the value of the output gap that maximizes the fit of the model in both regimes.

This methodology contrasts with Auerbach and Gorodnichenko (2012a), who use a regime-switching structural vector autoregression (SVAR) in which the threshold value has to be determined exogenously. Furthermore Auerbach and Gorodnichenko (2012a) use a moving average presentation of the GDP growth rate as the threshold variable. Compared to Batini, Callegari, and Melina (2012), the main difference is the country sample used, as well as the choice of the threshold variable: Batini and others use output growth as the threshold variable.

The reasons to employ the output gap instead of the GDP growth rate are manifold. The output gap is the most common measure to identify economic cycles, seen not only as a reliable ex post but also as a reliable real-time indicator for policy makers. It is thus an appropriate choice given our focus on downturns and expansions. More important, one argument for fiscal policy being more effective in downturns than in expansions is that under a negative output gap, excess capacities are available in the economy, making the crowding out of private investment lower. This argument is expected to hold as long as the output gap is negative, and can hardly be captured by low or negative growth rates. The GDP growth rate has also the disad-

vantage that it can be positive after output has reached its trough, while a downturn can prevail for various further quarters (see Woo, Kinda, and Poplawski-Ribeiro 2014). Further the usual presence of positive serial correlation in GDP growth rates plays a role in explaining business cycles length. Business cycles are often estimated to last shorter when one uses the GDP growth rates (Harding and Pagan 2002).[30]

The countries included in our sample are Canada, France, Germany, Japan, the United Kingdom, and the United States.[31] For most countries we construct quarterly datasets since at least the 1970s. Data sources include the Organization for Economic Cooperation and Development (OECD) Economic Outlook, The IMF's *International Financial Statistics*, and Eurostat as well as national account data. Fiscal data cover the general government. There are some caveats regarding the data sources, as in the cases of Japan and France, for which data were interpolated for some years (see also Perotti 2005).

Along the lines of Blanchard and Perotti (2002, hereafter "BP"), the VAR includes three variables (real GDP, real net revenue, and real expenditure). Net revenue consists of general government revenues minus net transfers, and government spending comprises general government investment and general government consumption (but excludes transfers and subsidies). All series are deflated with the GDP deflator. For most of the countries—except for Germany, for which the HP filter is used (see Baum and Koester 2011)—output gap data are obtained directly from the OECD. (for a detailed description of the data, see Baum, Poplawski-Ribeiro, and Weber 2012, app. A).

The TVAR models change dynamics of a set of variables over two or more distinct regimes. The regimes are determined by a transition variable, which is either endogenous or exogenous (Hansen 1996, 1997; Tsay 1998). For simplicity, the model focuses on two regimes only, which can be represented as

$$y_t = \delta_1 X_t + \delta_2 X_t I\left[z_{t-d} \geq z^*\right] + u_t, \tag{12.1}$$

where z_{t-d} is the threshold variable determining the prevailing regime of the system, with a possible lag d, and $I[\bullet]$ is an indicator function that equals 1 if the threshold variable z_{t-d} is above the threshold value z^*, and 0 otherwise. The coefficient matrices δ_1 and δ_2, as well as the contemporaneous error matrix u_t, are allowed to vary across regimes. The delay lag d and critical threshold value z^* are unknown parameters and are estimated alongside δ_1 and δ_2.

Whether or not system (12.1) offers threshold behavior is determined by means of the Tsay (1998) multivariate threshold approach. The method applies a white noise test to predictive residuals of an arranged regression.[32] A detailed description of the testing procedure can be found in Tsay (1998), as well as in Baum and Koester (2011). This analysis further employs the BP structural identification procedure to identify the shocks for impulse response functions (IRFs). Such procedure accounts

for the effect of automatic stabilization on revenues. Revenue elasticities with respect to GDP are obtained following OECD calculations (Girouard and André 2005). Subsequently the share of direct and indirect taxes, social security contributions, and social spending (transfers) in total net revenue are multiplied by their respective elasticities to construct quarterly weighted elasticities.

As discussed in section 12.2, the BP approach has been subject to criticisms, in particular that it fails to capture the exogenous policy changes correctly. However, the proposed alternative methods of the "narrative-" and "action-" based approaches have only been applied using quarterly data for the United Kingdom and the United States. The multiple country data sample based on the narrative approach created by IMF (2010) only covers annual data. Therefore, given the lack of quarterly data of comparable quality for the countries in our sample, the BP approach proved most useful in our study.[33]

In order to take previous criticism into account, the net revenue and expenditure series are corrected to eliminate, to the extent possible, those changes in government revenues and expenditure that are not necessarily linked to fiscal policy decisions and that cyclical adjustment methods may fail to capture (e.g., large movements in asset or commodity prices).[34] This removes the largest—but not all—measurement errors, as identified episodes in IMF (2010) refer to cases of fiscal consolidations and not expansions. Furthermore IMF (2010) only provides data on an annual basis (since the 1980s) and therefore covers only part of the dataset.[35] Hence especially the responses of output to revenue shocks have to be interpreted cautiously.

The IRFs reflect the nonlinearity of the model. They are computed using the method of generalized impulse response functions (GIRFs) developed by Koop, Pesaran, and Potter (1996), which are dependent on historical events . The GIRFs allow the shock impact to depend on the regime itself and the regime to switch after a shock has been implemented.[36] The latter is important, as output—and the output gap—evolves over time following a fiscal policy shock.

12.3.2 Country by Country Results

Figures 12.2 and 12.3 present four quarter cumulative multipliers for each country.[37]

Broad supportive evidence is obtained for a nonlinear impact of fiscal policy on output. Government spending shocks have a larger effect on output when the output gap is negative (Canada being the only exception). This is particularly true for those countries where spending multipliers are statistically significant on impact and sizable (Germany, Japan, and the United States).[38]

The results are generally less conclusive for revenue multipliers. The impact is statistically significant for Canada, France, Germany, and Japan. In Germany, revenue multipliers are slightly higher in "good times" than in "bad times," which could suggest that individuals and firms are more willing to spend additional income

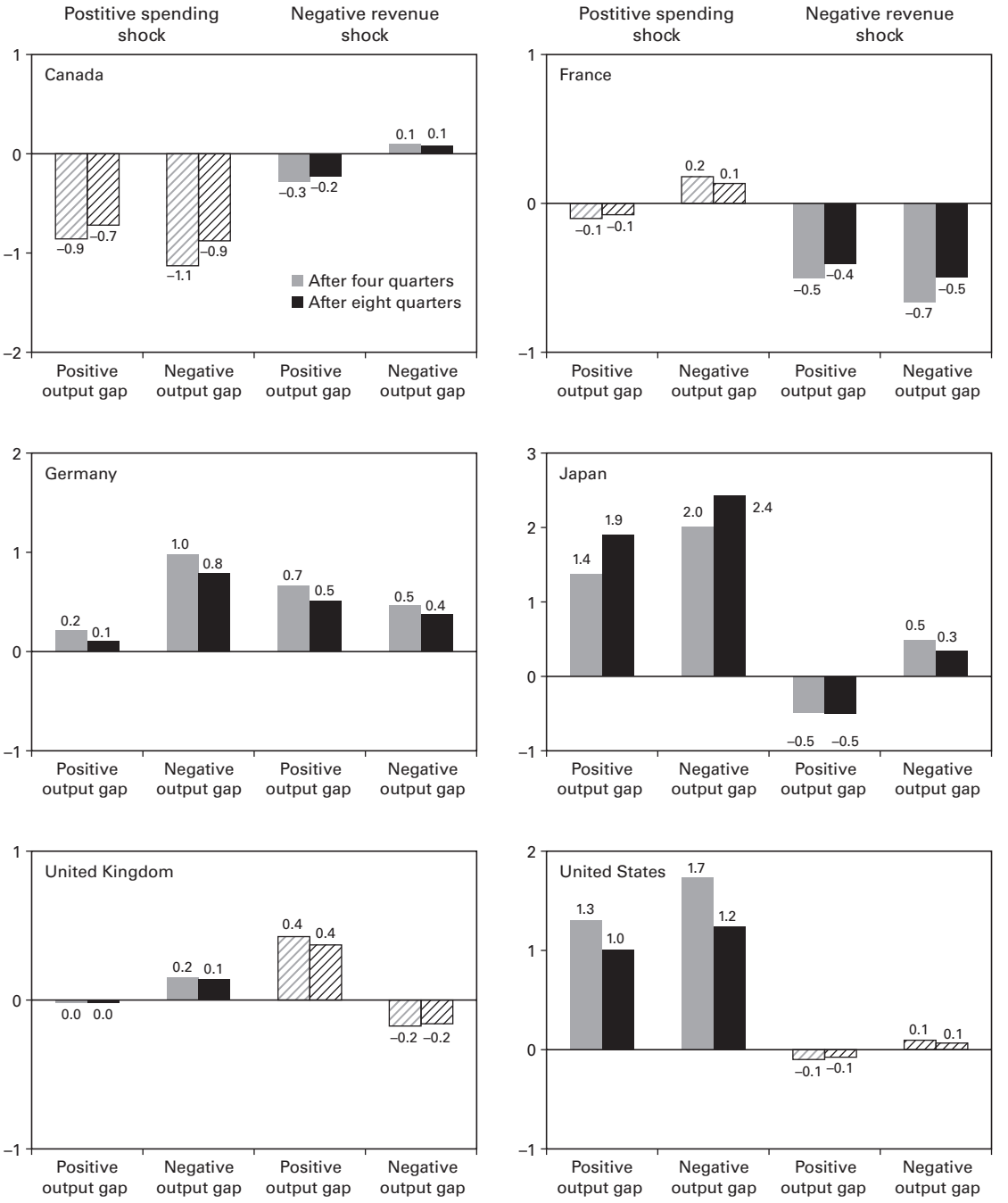


Figure 12.2
Cumulative fiscal multipliers: Fiscal expansion. The striped bars correspond to those measures for which no significant impact multiplier is found.
Source: IMF staff estimates

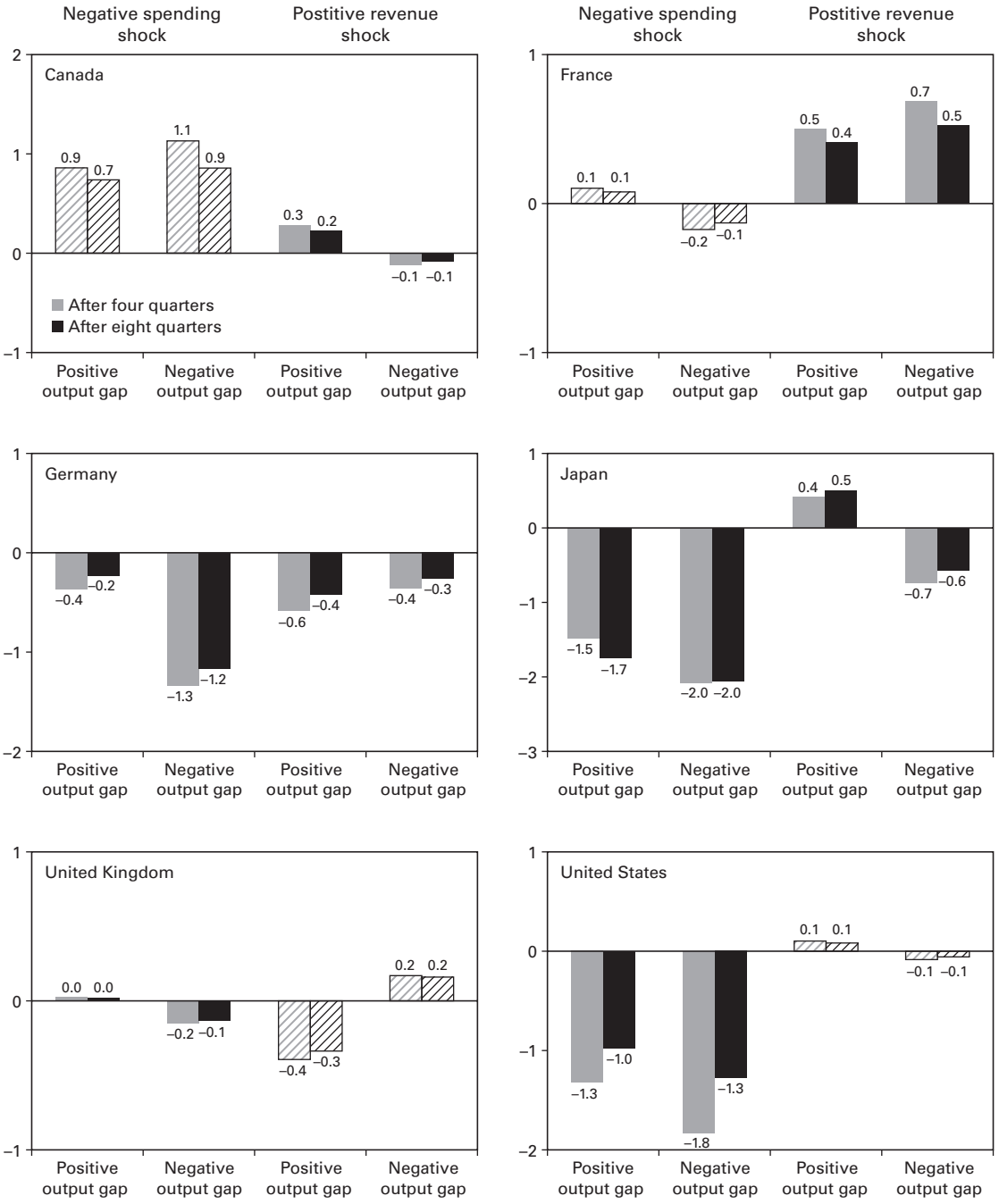


Figure 12.3
Cumulative fiscal multipliers: Fiscal contraction. The striped bars correspond to those measures for which no significant impact multiplier is found.
Source: IMF staff estimates

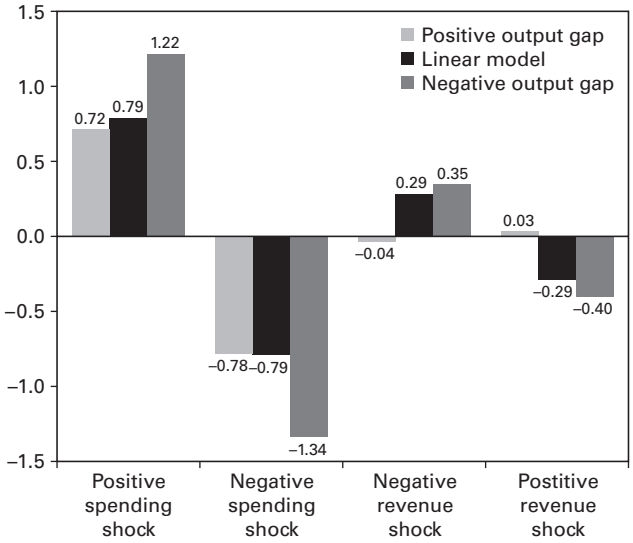


Figure 12.4
Fiscal multipliers in G7 economies. Cumulative multipliers are standardized multipliers over four quarters. Only statistically significant multipliers are included in the average. Average revenue multipliers exclude France, for which the outliers are large and data limitations are particularly severe. Italy is not included in the G7 average.
Source: IMF staff calculations

when market sentiment is positive, thereby becoming less Ricardian. In Canada and Japan revenue measures work as a countercyclical tool only when the output gap is negative.[39]

12.3.3 Results for the G7 Economies

Based on the country-by-country results, multipliers for an average of the G7 economies are shown in figure 12.4. They broadly support the above findings, with both consumption and revenue multipliers being significantly larger in times of negative output gaps than when the output gap is positive. Across countries, revenue multipliers are small (on average well below 0.5); whereas government purchases shocks, with the only exception of the United Kingdom, have sizable effects on real output.

Figure 12.4 also shows average multipliers estimated with a standard linear SVAR (based on the same BP identification as the TVAR). These multipliers from the linear model lie on average between the positive and negative regime multipliers and they are very much in line with averages identified in the literature discussed in the previous section.[40]

The linear model underestimates especially the effect of spending measures during downturns. In case of revenue measures, the linear model overestimates the

discretionary impact in times of expansions. Assuming, consistent with recent fiscal adjustment packages in advanced economies, that two-thirds of the adjustment comes from spending measures, a weighted average of spending and revenue multipliers in downturns yields an overall fiscal multiplier of about unity.

12.3.4 Discussion and Caveats

The results indicate that multipliers vary by a large amount between and within countries. This calls for a tailored use of fiscal policies and a country-by-country assessment of their effects, which is in accordance with the other recent empirical literature (see Favero et al. 2011; Perotti 2005). The results also confirm the sizable spending multipliers found in the previous literature for the United States. For Canada and the United Kingdom, the low-expenditure multipliers are in line with Perotti (2005), who, using a structural identification à la Blanchard and Perotti (2002), finds that spending multipliers have decreased significantly since the 1980s.

The results are also mostly in line with the analyses that control for the state of the economic cycle (Auerbach and Gorodnichenko 2012a; Batini et al. 2012). They confirm the state dependency of fiscal multipliers and show that, especially for spending, multipliers are significantly larger in downturns than in expansions. Spending multipliers in the United States are found to be significantly above unity during downturns.

We find revenue multipliers are significantly smaller than spending multipliers, which is also broadly in line with the other literature. Revenue multipliers in the United States and the United Kingdom are found to be small and not statistically significant. This could be due to a change in the impact of revenue measures on output over time. Perotti (2005) shows that prior to the 1980s, tax cuts had a significant positive impact on GDP, but in the period after 1980, this effect became negative. These results contradict the findings of Romer and Romer (2010) and Cloyne (2011), who find significant and large revenue multipliers for the United States and the United Kingdom, respectively. However, recent work by Favero and Giavazzi (2012), as well as Perotti (2011), demonstrate that the estimation in Romer and Romer (2010) is subject to upward biases concerning the revenue multipliers.

Several important caveats apply to the analysis, as well as to most of the literature on fiscal multipliers. First, the model includes only three variables and does not take into account possible interactions with monetary policy and public debt. For instance, Auerbach and Gorodnichenko (2012b) find that the size of government debt reduces the response of output to government spending shocks. Thus the analysis could have overestimated fiscal multipliers, especially in high debt countries.[41] Second, some of the country heterogeneities may be the result of different data sources. Data limitations are particularly serious for France where true quarterly data are available only since the 1990s.

12.4 Conclusions and Policy Implications

This chapter has shown that there is no unique single size of fiscal multipliers: the size depends on various factors, including the state of the economy, monetary policy stance, fiscal leakages, and the types of fiscal instruments used. A comprehensive review of the studies covering mainly advanced economies provides guidance on the main factors that influence fiscal multipliers.

- Government spending has a higher multiplier while the tax multiplier is smaller in the short run.
- The United States tends to have larger multipliers than Europe, partly offsetting differences in the automatic stabilizers.
- Spending multipliers tend to be larger when the economy has large output gaps and when monetary policy is accommodative or ineffective (at the zero interest rate bound).
- Although the estimates are fewer, the multipliers for emerging markets and low-income countries tend to be lower than in advanced economies.

The original empirical work presented in this chapter explored in detail how fiscal multipliers differ depending on the state of the economy. The multipliers are nonlinear and vary over the business cycle: short-term spending multipliers are generally higher in economic downturns than in expansions. The size of spending multipliers during recessions could exceed unity, particularly for the United States, compared with the common range of spending multipliers around or below unity during normal times. This is in line with economic intuition: during expansions, or when unemployment and output are above potential levels, crowding-out effects of a fiscal expansion tends to offset the direct impact of fiscal stimulus on aggregate demand. The analysis also shows that first-year revenue multipliers are lower than spending multipliers, but the size of the multiplier varies significantly from country to country. This calls for a tailored approach when analyzing the impact of fiscal policy across countries.

The finding that the impact of fiscal policy on output depends on the underlying state of the economy has also important policy implications.

- Given that spending multipliers are large during economic recessions—they could exceed unity—it may make sense for a government to implement economic stimulus when the economy has a large negative output gap and the fiscal space.
- The pace of fiscal adjustment when an economy has a negative output gap should be carefully decided. As shown by the analysis in box 12.3, gradual fiscal adjustment may in some cases be preferable to a more upfront approach. For

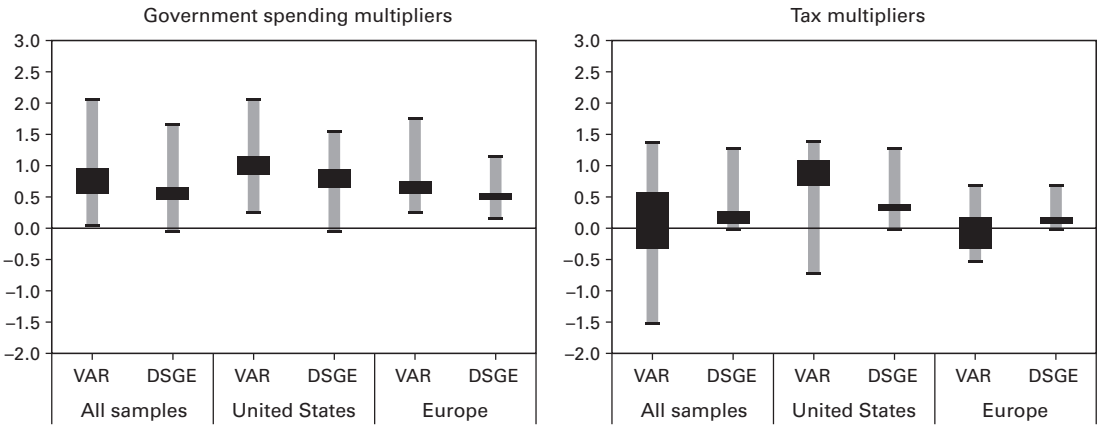
example, when the output gap is negative initially, at the time the fiscal shock is implemented, a gradual negative spending adjustment will have a lower negative impact on output in the short term than an upfront reduction.[42] As Romer (2012) and DeLong and Summers (2012) argue, a dragged economic recovery could damage the economy permanently through lowering potential output and increasing the natural rate of unemployment (the hysteresis effects).[43] Furthermore, if the zero lower bound is binding, a scope for monetary policy to accommodate fiscal adjustment is limited, making the adverse impact of fiscal adjustment on the economy worse.[44] This suggests that when feasible, a more gradual fiscal consolidation is likely to prove preferable to an approach that aims at "getting it over quickly." More generally, policy makers should choose consolidation measures that are growth friendly and minimize the burden on the most vulnerable groups. A proper policy mix should be considered, including monetary policy and structural measures, in order to support growth as fiscal deficits go down.

- Designing a fiscal package calls for other factors in addition to the size of multipliers. Notably, consolidation measures should be underpinned by a credible medium-term plan up front, taking into account the long-term effects of specific fiscal adjustments. The measures should also take into account that the efficiency of tax and purchases changes depend on their preexisting levels and structure. For example, the current high tax pressures in some countries (particularly in Europe) suggest that the bulk of the fiscal adjustment should focus on the expenditure side (although revenue increases may be inevitable when the targeted adjustment is large).
- The trajectory of public-debt-GDP ratios in course of fiscal adjustment depends on several factors, including the initial debt level and the size of fiscal multiplier. In countries where the debt ratio is high and/or the fiscal multiplier is above average—both are likely in economic downturns—fiscal adjustment measures are unlikely to lower the public debt-to-GDP ratio initially as the direct effect of fiscal consolidation is likely to be offset by the indirect effect of a lower GDP.

Box 12.1
Sizes of fiscal multipliers—Literature survey

This box summarizes findings from a comprehensive survey of fiscal multipliers in the empirical literature, extending earlier work by Spilimbergo et al. (2009). The multipliers found in the literature using linear approaches are summarized in two categories based on the methodologies (i.e., VAR and DSGE). The main findings from the survey are as follows:

- Government spending multipliers are estimated to be positive, with a plausible range of 0.5 to 0.9, based on the mid 30 percent range of all samples. The spending multipliers for the whole sample range from 0.0 to 2.1, with the mean and median of 0.8 and 0.7, respectively.
- Tax multipliers are on average smaller than the spending multipliers, with a plausible range of 0.1 to 0.3, based on the mid 30 percent range of all samples. Some multipliers are negative with the tax multipliers for the whole sample ranging from –1.5 to 1.4, with mean and median of 0.2 and 0.2, respectively.
- The United States tends to have larger fiscal multipliers than Europe. The spending multipliers for the United States range from 0 to 2.1 with mean and median of 0.9 and 1, respectively, which are on average larger than the spending multipliers in Europe (ranging from 0.2 to 1.8 with mean and median of 0.6 and 0.5). As indicated by Coenen et al. (2012), this is probably because (1) Europe is more open, and therefore the leakage to imports is larger; (2) the degree of nominal rigidities is larger in Europe, and therefore the effect of expansionary fiscal actions on the rate of inflation is lower in Europe; and (3) automatic stabilizers play a larger role in Europe. Among these factors, Coenen et al. (2012) conclude that the higher nominal rigidity in Europe explains most of the difference in multipliers in Europe and in the United States.



First-year fiscal multipliers from literature survey (linear approaches): DSGE includes New Keynesian models. Dark areas represent the mid-30 percent ranges (excluding top 35 percent and bottom 35 percent of the samples).
Sources: Literature survey in the appendix; IMF staff estimates

Box 12.2
What do economic theories predict about the size of fiscal multipliers?

Traditional Keynesian Approach
In the traditional Keynesian view, changes in aggregate demand, whether anticipated or unanticipated, have a positive short-run effect on real output and employment. The size of fiscal multipliers is dependent on the propensity to consume. The multiplier for government spending is calculated as$1/(1 - mpc)$ and that for taxes as $-mpc/(1 - mpc)$, where *mpc* indicates the marginal propensity to consume, under the assumption of a closed economy and constant interest rates. The *mpc* is assumed to be constant regardless of change in income, and is normally between 0 and 1; therefore the government spending multiplier is larger than unity. The criticism of the approach centers on the lack of microeconomic foundations of rational and optimizing agents.

Neoclassical Approach
The neoclassical approach is built on microeconomic foundations. The size of the fiscal multipliers is determined by intertemporal substitution of labor supply and wealth effects, and therefore varies depending on the nature of spending and the modalities of taxation used for financing the higher deficit.[a] For example, if households anticipate that an increase in government spending will be financed by debt, the neoclassical approach assumes they reduce spending now in anticipation of an increase in future taxes ("Ricardian equivalence"). Of course, in reality this may not always hold as beneficiaries of tax cuts today may not be paying off the debt within their lifetime (Blanchard 1985), and liquidity-constrained households that cannot borrow and therefore do not consume according to their permanent income (hand-to-mouth individuals) may increase consumption or investment if the liquidity constraint is eased (Coenen et al. 2012). The size of fiscal multipliers is typically smaller than unity, or even negative.[b]

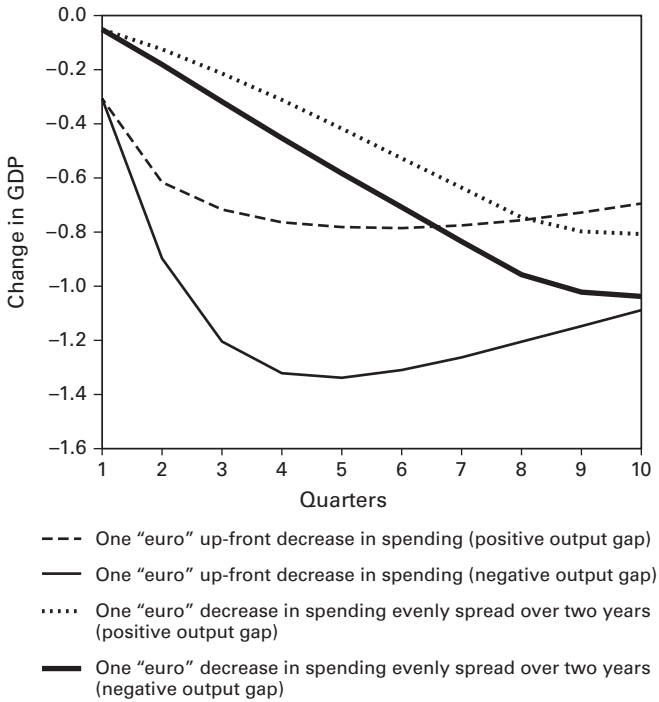
New Keynesian Approach
The New Keynesian approach builds on the neoclassical approach but incorporates assumptions of sticky prices and other frictions (e.g., financial friction). The approach assumes that individuals and firms hold forward-looking, or rational, expectations while operating under some form of price and wage rigidity and liquidity constraint (Cogan et al. 2009). Because of the sticky-price assumptions, monetary policy can impact real output. The size of the fiscal multiplier depends on a number of factors, the most important being the type of fiscal instrument used and the extent of monetary accommodation.

a. See Baxter and King (1993) and Aiyagari et al. (1990).
b. Ramey (2011b) notes that short-run multipliers can be as large as 1.2, or as small as –2.5. Nakamura and Steinsson (2011) and Parker (2011) indicate that simple neoclassical models generally imply fiscal multipliers smaller than 0.5.

Box 12.3
Fiscal multipliers, the speed of adjustment and the nexus between consolidation and debt reduction: Some policy implications

The empirical findings suggest that during downturns fiscal multipliers are larger than during expansions. In the current environment, this has important implications for the desired speed of fiscal adjustment and the effect of fiscal consolidation on debt dynamics.

When the output gap is negative initially, at the time the fiscal shock is implemented a gradual negative spending adjustment will have a lower negative impact on output in the short term than an up-front spending reduction. The figure besides illustrates this for an average of the G7 economies in the sample. It shows the impact of a one



G7 economies: Cumulative impact on output from a negative discretionary fiscal spending shock. Estimates are from a threshold vector autoregression, with the output gap as the regime switching variable. A threshold of zero is endogenously determined within the model. Quarterly data from the 1970s are used. The figure shows average multipliers for G7 countries with significant impact multipliers.
Sources: Baum, Poplawski-Ribeiro, and Weber (2012); national sources; IMF staff estimates

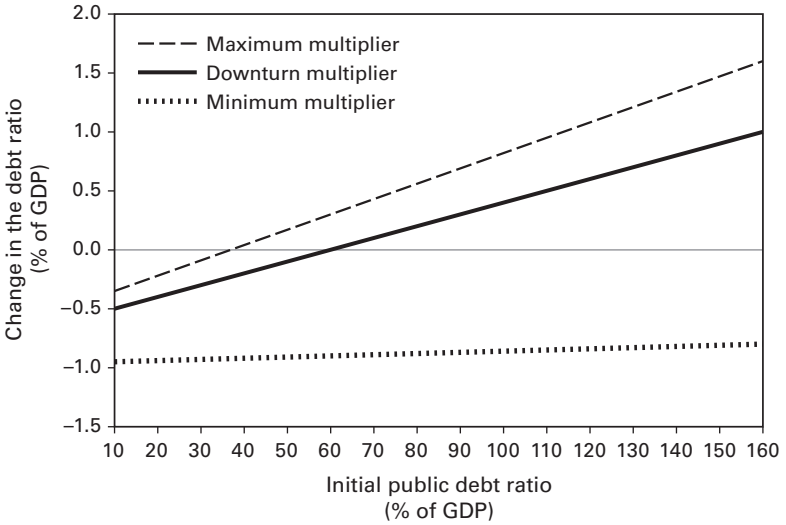
(*continued*)

euro (or the relevant national currency) front-loaded improvement in the fiscal deficit versus a gradual improvement that is spread evenly over two years. When the output gap is negative initially, a more gradual fiscal adjustment hurts growth less in the first two and a half years of the simulation period.

Conversely, when the output gap is initially positive, a more front-loaded shock has a smaller cumulative impact on growth than under a negative regime (see IMF 2012b, annex 3). Accordingly, more front-loaded consolidation is preferable to a gradual deficit reduction approach after already around two years of gradual reduction (of the same amount spread out over two years).

An explanation for this finding lies in the nonlinear nature of the impulse response functions. They allow the regime to switch after the impact of the shock. Thus, if the shock initially occurs in a negative output gap regime, over the course of the tightening there is some probability of moving into a positive output gap regime in which multipliers are lower. With a longer fiscal consolidation period, the probability of this occurring is higher. Conversely, if the impact of the shock initially occurs in a positive output gap regime, then policy makers should use the favorable conditions (lower multipliers) and tighten upfront.

The discussion of up-front versus gradual adjustment is subject to some caveats. First, our results do not include anticipation effects. Especially in case of a gradual



Impact on the debt ratio of a 1 percent of GDP discretionary tightening in the first year (relative to baseline). Multipliers are weighted averages of spending and revenue multipliers based on the previous literature and the observation that about two-thirds of recent fiscal adjustments in advanced economies rely on spending measures. The downturn multiplier is the weighted average of G7 multipliers in negative output gaps based on Baum, Poplawski-Ribeiro, and Weber (2012). The calculations assume that other factors remain constant, in particular interest rates.[a] For instance, with a multiplier of 0.6, the debt threshold would lie at about 120 percent of GDP. Source: Eyraud and Weber (2013)

adjustment, such effects could alter the growth forecast significantly. Second, a sharp up-front fiscal adjustment might be accompanied by further negative growth effects, which our model does not capture in the current specification (e.g., a further downward pressure on employment, human capital, and financial markets). Third, a sharp up-front adjustment may increase market confidence. Fiscal consolidation can in general calm markets, in which case the results of the up-front adjustment might be biased downward. However, in the current sovereign debt crisis the bond spreads seem largely driven by GDP growth prospects (Cottarelli and Jaramillo 2012).

Moreover, in countries where the debt ratio is high and/or the fiscal multiplier is above average, fiscal adjustment measures are unlikely to lower the public debt-to-GDP ratio initially as the direct effect of fiscal consolidation is likely to be offset by the indirect effect of a lower GDP. When the fiscal multiplier is 1 (a likely level in downturns), fiscal consolidation leads to an increase in the debt ratio in the first year in countries where the debt ratio initially lies above 60 percent. This debt threshold varies with the multiplier, which itself depends on the composition of the adjustment (spending vs. revenue) and other country-specific factors.[a]

a. The discussion here is based on Blanchard, Dell'Ariccia, and Mauro (2010).

Appendix

This appendix provides a summary of key papers that have estimated fiscal multipliers. It extends the earlier survey in Spilimbergo et al. (2009) with G indicating government spending, T indicating taxes, and Z indicating government investment.

Table A12.1
Literature survey on the size of fiscal multipliers: VAR approaches

Source	Methodology	Data sample	Country	Fiscal shock[a]			Fiscal multipliers			
							4 quarters	8 quarters	12 quarters	Cumulative
Afonso, Baxa, Slavik (2011)	Threshold VAR: measure the effects of fiscal developments associated with periods of financial crises. Results shown are for large fiscal shocks (2SD), which are normalized to the size of the initial fiscal shock set to 1% of GDP.	Quarterly data 1980:4–2009:4	United States	Debt-to-GDP ratio	Positive shock	High financial stress	0.1	0.2	0.2	0.4
						Low financial stress	0.1	0.2	0.2	0.5
					Negative shock	High financial stress	–0.1	–0.2	–0.2	–0.4
						Low financial stress	–0.1	–0.2	–0.2	–0.5
			United Kingdom		Positive shock	High financial stress	–0.1	0.1	0.3	0.3
						Low financial stress	0.1	0.2	0.2	0.5
					Negative shock	High financial stress	0.1	–0.1	–0.2	–0.2
						Low financial stress	–0.1	–0.2	–0.2	–0.5
			Germany		Positive shock	High financial stress	0.1	0.1	0.1	0.3
						Low financial stress	0.0	0.0	0.1	0.1
					Negative shock	High financial stress	–0.1	–0.1	–0.1	–0.2
						Low financial stress	0.0	–0.1	–0.1	–0.2
			Italy		Positive shock	High financial stress	0.5	0.3	0.1	0.8
						Low financial stress	0.2	0.2	0.1	0.5
					Negative shock	High financial stress	–0.5	–0.3	0.0	–0.9
						Low financial stress	–0.2	–0.2	0.0	–0.5
							1 year (mean)	1 year (max)		

Auerbach–Gorodnichenko (2012a)	Smooth-transition VAR	Semiannual data Old members: 1985–2010 Newer members: mid-1990s-2010	OECD	G	Recession	w/o year fixed effects	0.4	0.5
		1985-			Expansion	w/o year fixed effects	–0.1	0.0
					Linear	w/o year fixed effects	0.1	0.2
					Recession	w/ year fixed effects	0.3	0.5
					Expansion	w/ year fixed effects	–0.1	0.1
					Linear	w/ year fixed effects	0.2	0.2
							Max	Cumulative (20 quarters)
Auerbach–Gorodnichenko (2012b)	Smooth-transition VAR	Quarterly data 1947:1–2008:4	United States	G		Linear	1.0	0.6
						Expansion	0.6	–0.3
						Recession	2.5	2.2
				Defense spending		Linear	1.2	–0.2
						Expansion	0.8	–0.4
						Recession	3.6	1.7
				Nondefense spending		Linear	1.2	1.6
						Expansion	1.3	1.0
						Recession	1.1	1.1
				Consumption spending		Linear	1.2	0.2
						Expansion	0.2	–0.3
						Recession	2.1	1.5
				Investment spending		Linear	2.1	2.4
						Expansion	3.0	2.3
						Recession	2.9	3.4

(*continued*)

Table A12.1
(*continued*)

Source	Methodology	Data sample	Country	Fiscal shock[a]			Fiscal multipliers			
				Total spending	Controlling for expectations with Ramey (2011a) news shocks.	Expansion	0.7	–0.5		
						Recession	4.9	3.8		
							Impact	Max		
Bachmann and Sims (2011)	(i) Structural linear VAR models, taking into account "confidence" of households and businesses. (ii) Structural nonlinear VAR models with specifications to allow for differential impacts of government spending in "normal" times versus recessions.	Quarterly data	United States	G	Normal times	With consumer confidence	0.7	0.8		
						Without consumer confidence	0.8	0.8		
						With CEO confidence	1.0	1.2		
						Without CEO confidence	1.0	1.0		
					Recessions	With consumer confidence	0.4	3.1		
						Without consumer confidence	0.3	0.3		
						With CEO confidence	1.0	2.5		
						Without CEO confidence	0.8	0.8		
							1 quarter	4 quarters	8 quarters	(cumulative)

Batini, Callegari, Melina (2012)	Nonlinear threshold VAR (TVAR), which separates observations into different regimes based on a threshold variable.	Quarterly Data1975:1–2010:2	United States	G	Linear	1.0	0.5	0.0
					Expansion	1.0	0.3	–0.5
					Recession	2.0	2.2	2.2
				T	Linear	0.0	0.0	0.3
					Expansion	0.0	0.2	0.7
					Recession	0.0	0.2	0.7
		Quarterly Data 1981:1–2009:4	Japan	G	Linear	0.7	1.2	1.5
					Expansion	0.7	1.4	1.1
					Recession	1.3	2.0	2.0
				T	Linear	–0.3	–0.3	–0.2
					Expansion	–0.3	–0.3	–0.1
					Recession	–0.3	–0.2	0.2
		Quarterly Data 1981:1–2007:4	Italy	G	Linear	0.6	0.8	0.9
					Expansion	0.3	0.4	0.5
					Recession	1.4	1.6	1.8
				T	Linear	0.1	0.1	0.0
					Expansion	0.1	0.1	0.1
					Recession	0.1	0.2	0.2
		Quarterly Data 1970:1–2010:4	France	G	Linear	1.5	1.8	2.1
					Expansion	1.4	1.6	1.9
					Recession	2.6	2.1	1.8
				T	Linear	0.0	0.0	–0.1
					Expansion	–0.1	–0.1	–0.2
					Recession	0.0	0.0	–0.3
		Quarterly Data 1985:1–2009:4	Euro area	G	Linear	0.3	0.3	0.3
					Expansion	0.4	0.4	0.1
					Recession	2.1	2.6	2.5
				T	Linear	–0.2	–0.5	–0.6
					Expansion	–0.1	–0.2	–0.1
					Recession	–0.2	–0.4	–0.4
						4 quarters	10 quarters	

(*continued*)

Table A12.1
(*continued*)

Source	Methodology	Data sample	Country	Fiscal shock[a]			Fiscal multipliers		
Baum and Koester (2011)	Threshold structural VAR	Quarterly Data 1976:1–2009:4	Germany	G	Positive shock (2% of GDP)	Linear	0.7	0.7	
						Recession	1.0	1.0	
						Expansion	0.4	0.3	
					Positive shock (5% of GDP)	Linear	…	…	
						Recession	1.3	1.3	
						Expansion	0.3	0.3	
					Negative shock (2% of GDP)	Linear	…	…	
						Recession	−0.9	−0.8	
						Expansion	−0.6	−0.6	
					Negative shock (5% of GDP)	Linear	…	…	
						Recession	−0.8	−0.8	
						Expansion	−0.8	−0.8	
				T	Positive shock (2% of GDP)	Linear	−0.7	−0.7	
						Recession	−0.5	−0.5	
						Expansion	−0.6	−0.5	
					Positive shock (5% of GDP)	Linear	…	…	
						Recession	−0.5	−0.5	
						Expansion	−0.6	−0.5	
					Negative shock (2% of GDP)	Linear	…	…	
						Recession	0.5	0.5	
						Expansion	0.6	0.5	
					Negative shock (5% of GDP)	Linear	…	…	
						Recession	0.5	0.5	
						Expansion	0.6	0.6	
							4 quarters	8 quarters	(cumulative)

Baum, Poplawski-Ribeiro, Weber (2012)	Regime-switching VARs with output growth as the threshold variable.	Quarterly Data 1965:2–2011:2	United States	G	Expansion (positive output gap)	1.3	1.0
					Recession (negative output gap)	1.8	1.3
				T	Expansion (positive output gap)	–0.1	–0.1
					Recession (negative output gap)	0.1	0.1
		Quarterly Data1970:1–2011:2	United Kingdom	G	Expansion (positive output gap)	0.0	0.0
					Recession (negative output gap)	0.2	0.1
				T	Expansion (positive output gap)	0.4	0.3
					Recession (negative output gap)	–0.2	–0.2
		Quarterly Data 1970:1–2011:2	Japan	G	Expansion (positive output gap)	1.5	1.7
					Recession (negative output gap)	2.0	2.0
				T	Expansion (positive output gap)	-0.4	-0.5
					Recession (negative output gap)	0.7	0.6

(*continued*)

Table A12.1
(*continued*)

Source	Methodology	Data sample	Country	Fiscal shock[a]		Fiscal multipliers			
		Quarterly Data 1976:1–2009:4	Germany	G	Expansion (positive output gap)	0.4	0.2		
					Recession (negative output gap)	1.3	1.2		
				T	Expansion (positive output gap)	0.6	0.4		
					Recession (negative output gap)	0.4	0.3		
		Quarterly Data 1970:1–2010:4	France	G	Expansion (positive output gap)	−0.1	−0.1		
					Recession (negative output gap)	0.2	0.1		
				T	Expansion (positive output gap)	−0.5	−0.4		
					Recession (negative output gap)	−0.7	−0.5		
		Quarterly Data 1970:1–2011:2	Canada	G	Expansion (positive output gap)	−0.9	−0.7		
					Recession (negative output gap)	−1.1	−0.9		
				T	Expansion (positive output gap)	−0.3	−0.2		
					Recession (negative output gap)	0.1	0.1		
						Impact	1 year	3 years	5 year

Beetsma and Giuliodori (2011)	Panel Structural VAR	Annual data 1970–2004	14 EU countries	G	Baseline	1.2	1.5	1.2	0.7
		1970–2004			w/o time effects	1.1	1.5	1.2	0.5
					w/ qiadratic time trends	1.2	1.4	0.8	0.3
					In first difference—no trends	1.1	1.5	1.7	1.7
						1 quarter	1 year	2 years	3 years
Blanchard and Perotti (2002)	Structural VAR. No explicit control for interest rates or money supply.	Quarterly data 1960:1–1997:4	United States	G, DT		0.8	0.5	0.5	1.1
				G, ST		0.9	0.6	0.7	0.7
				T, DT		0.7	0.7	0.7	0.4
				T, ST		0.7	1.1	1.3	1.3
						1 year	2 years	3 years	
Bryant et al. (1988)	Comparison of various frameworks (econometric, VAR and model- simulations). Varying assumptions about the interest rate response.		United States	G		0.6–2	0.5–2.1	0.5–1.7	
						1 quarter	4 quarters	8 quarters	
Burriel et al. (2009)	Structural VAR, following Blanchard and Perotti (2002) and Perotti (2004) allowing for nonlinearity.	Quarterly data 1981:1–2007:4	United States	G	Baseline	0.8	0.9	0.7	
					With financial stress	0.8	1.1	0.8	
					With fiscal stress	0.8	1.3	1.3	
				T	Baseline	0.0	0.1	0.4	
					With financial stress	0.3	0.6	0.9	
					With fiscal stress	0.0	0.3	0.7	
			EMU	G	Baseline	0.8	0.9	0.9	
					With financial stress	0.7	0.8	0.7	

(*continued*)

Table A12.1
(*continued*)

Source	Methodology	Data sample	Country	Fiscal shock[a]		Fiscal multipliers		
					With fiscal stress	0.9	1.2	1.5
				T	Baseline	0.8	0.6	0.5
					With financial stress	0.9	0.8	0.7
					With fiscal stress	1.5	1.4	1.9
						1 quarter	8 quarters	
Cimadomo and Bénassy-Quéré (2012)	Structural VAR for the United States, and factor-augmented VAR (FAVAR), augmented by "global factors" representing developments in the world economy, for Germany and the United Kingdom (the FAVAR was proposed for monetary policy analysis by Bernanke et al. 2005).	Quarterly data 1971:1–2009:4	Germany	G		0.5	0.1	
				T		0.7	0.7	
			United Kingdom	G		0.3	-0.1	
				T		0.1	–0.1	
			United States	G		1.3	–0.7	
				T		–0.1	–0.2	
						Cumulative for 5 years		
Fisher and Peters (2010)	VAR: estimate the dynamic responses of output to a government military spending shock using the information on surprises in the returns of top three military contractors to identify government spending shocks.	Quarterly data 1957:3–2007:4	United States	Government military spending		1.5		
				G		0.6		
						1940:2–1941:2	1940:2–1941:4	

Gordon and Krenn (2010)	VAR with Cholesky factorization. Fiscal multipliers are calculated as the marginal effect of G innovations on GDP relative to the marginal effect of G innovations on G itself.	Quarterly data 1920:2–1941:4	United States	G			1.8	0.9		
							1 quarter	1 year	2 years	3 years
Ilzetzki and Végh (2008)	Panel VAR: applied to 27 developing and 22 high-income countries. No explicit control for (country-specific) interest rates (only US interest rate included).		High-inc.	G			0.4	0.7	0.9	0.8
			Developing	G			0.6	0.4	0.1	–0.1
							Impact	Cumulative for 20 quarters		
Ilzetzki, Mendoza, Végh (2011)	Bivariate panel structural VAR	Quarterly data 1960:1–2007:4	44 countries (20 high-income; 24 developing)	Government consumption	Income level	High-income	0.4	0.8		
						Developing	–0.2	0.2		
					Exchange rate regime	Fixed	0.1	1.5		
						Flexible	–0.3	–0.4		
					Trade openness	Total trades (IM+EX) over 60% of GDP	–0.3	–0.8		
						Total trades (IM+EX) below 60% of GDP	0.0	1.3		

(*continued*)

Table A12.1
(*continued*)

Source	Methodology	Data sample	Country	Fiscal shock[a]			Fiscal multipliers	
					Financial Fragility	Total central gov. debt over 60% of GDP	−0.2	−2.3
						Total central gov. debt below 60% of GDP (high-income)	0.7	0.4
						Total central gov. debt below 60% of GDP (developing)	0.1	0.3
				Z	Income level	High-income	0.4	1.2
						Developing	0.6	0.8
					Exchange rate regime	Fixed	0.4	1.4
						Flexible	0.5	0.2
					Trade openness	Total trades (IM+EX) over 60% of GDP	−0.2	0.5
						Total trades (IM+EX) below 60% of GDP	0.5	0.7
	Multivariate panel structural VAR			Government consumption	Income level	High-income	0.4	0.9
						Developing	−0.1	0.5
					Exchange rate regime	Fixed	0.0	1.3
						Flexible	−0.1	0.0
					Trade openness	Total trades (IM+EX) over 60% of GDP	−0.1	−0.3

						Total trades (IM+EX) below 60% of GDP	0.1	1.3		
					Financial Fragility	Total central gov. debt over 60% of GDP	–0.2	–4.7		
							4 quarters	8 quarters	12 quarters	Max
Mountford-Uhlig (2009)	Quarterly VAR with the method of identifying policy shocks using sign restrictions on impulse responses, which has been introduced and applied to monetary policy in Uhlig (2005).	Quarterly data 1955:1–2000:4	United States	Deficit-financed tax cut			0.9	2.1	3.4	3.6 (qrt 13)
				Deficit-financed spending			0.3	–0.7	–1.2	0.65 (qrt 1)
							1 year	2 years	3 years	
Perotti (2004)	Quarterly VAR. 10-year nominal interest rate included in the VAR. Multipliers reported are cumulative.	Australia: 1960:1 2001:2, Canada: 1961:1–2001:4, Germany: 1960:1–1989:4, UK: 1963:1–2001:2, US: 1960:1–2001:4.	Australia	G			0.6	0.9	0.9	
				Z			–0.3	0.0	0.5	
			Canada	G			0.6	0.7	0.9	
				Z			0.4	–0.2	–0.7	
			Germany	G			0.8	0.8	0.9	
				Z			5.1	4.4	3.8	
			United Kingdom	G			0.6	0.9	1.0	
				Z			0.0	–0.1	–0.1	
			United States	G			1.4	1.9	2.2	
				Z			1.2	0.5	0.2	

(*continued*)

Table A12.1
(*continued*)

Source	Methodology	Data sample	Country	Fiscal shock[a]		Fiscal multipliers		
						1 year	3 years	
Perotti (2005)	Quarterly VAR. 10-year nominal interest rate included in the VAR. Multipliers reported are cumulative.	Australia: 1960:1–2001:2, Canada: 1961:1–2001:4, Germany: 1960:1–1989:4, UK: 1963:1–2001:2, US: 1960:1–2001:4.	Australia	G		–0.1/0.4	1.4 / 0.7	
				T		–1.5/–0.6	–1.7/–0.9	
			Canada	G		1.0/–0.3	0.6 /–1.1	
				T		–0.4/0.4	–0.2/1.6	
			Germany	G		0.6/0.5	–0.8/–1.1	
				T		–0.3/0.0	0.1/–0.6	
			United Kingdom	G		0.5/–0.3	0.0 /–0.9	
				T		0.2/–0.4	0.2/–0.7	
			United States	G		1.3/0.4	1.7 / 0.1	
				T		1.4/–0.7	23.9/–1.6	
						Peak		
Ramey (2011a)	VAR: measure fiscal multipliers by controlling for anticipation effects using a narrative method to construct richer government spending (particularly military spending) news.	1939:1–2008:4	United States	G	Post-WWII	0.6–0.8		
						1 year	2 years	3 years
Romer and Romer (2010)	Narrative, single equations, and VARs. Explicit control for interest (federal funds) rates in some specifications.	1945–2007	United States	T		1.2	2.8	2.7

a. G: government spending; T: taxes; and Z: government investment.

Table A12.2
Literature survey on the size of fiscal multipliers: Macroeconomic model-based (New Keynesian/DSGE) approaches

Source	Methodology	Country	Fiscal shock[a]	Fiscal multipliers	
				1 year	2 years
Al-Eyd and Barrell (2005)	NiGEM model with one-year shock. Taylor interest rate rule assumed to meet domestic inflation targets.	France	Indirect tax	0.3	0.2
			Corporate tax lump	0.0	0.2
			Corporate tax rate	0.2	0.4
			Direct tax	0.3	0.2
			Transfers	0.2	0.1
		Germany	Indirect tax	0.5	0.2
			Corporate tax lump	0.1	0.6
			Corporate tax rate	0.2	0.7
			Direct tax	0.7	0.2
			Transfers	0.5	0.1
		Italy	Indirect tax	0.2	0.2
			Corporate tax lump	0.0	0.2
			Corporate tax rate	0.2	0.4
			Direct tax	0.2	0.2
			Transfers	0.1	0.1
		Spain	Indirect tax	0.2	0.1
			Corporate tax lump	0.0	0.1
			Corporate tax rate	0.2	0.2
			Direct tax	0.2	0.1
			Transfers	0.1	0.1
				1 year	

(*continued*)

Table A12.2
(*continued*)

Source	Methodology	Country	Fiscal shock[a]	Fiscal multipliers
Barrell, Holland, and Hurst (2012)	NiGEM model with one-year shock. Taylor interest rate rule assumed to meet domestic inflation targets.	Australia	Consumption	0.8
			Benefits	0.3
			Indirect tax	0.3
			Direct tax	0.2
		Austria	Consumption	0.5
			Benefits	0.2
			Indirect tax	0.1
			Direct tax	0.1
		Belgium	Consumption	0.2
			Benefits	0.0
			Indirect tax	0.1
			Direct tax	0.0
		Canada	Consumption	0.5
			Benefits	0.2
			Indirect tax	0.1
			Direct tax	0.1
		Denmark	Consumption	0.5
			Benefits	0.1
			Indirect tax	0.1
			Direct tax	0.0
		Finland	Consumption	0.6
			Benefits	0.1
			Indirect tax	0.1
			Direct tax	0.1
		France	Consumption	0.7
			Benefits	0.3
			Indirect tax	0.1
			Direct tax	0.3
		Germany	Consumption	0.5
			Benefits	0.3
			Indirect tax	0.1
			Direct tax	0.3
		Greece	Consumption	1.1
			Benefits	0.4
			Indirect tax	0.2
			Direct tax	0.3

Ireland	Consumption	0.3
	Benefits	0.1
	Indirect tax	0.1
	Direct tax	0.1
Italy	Consumption	0.6
	Benefits	0.2
	Indirect tax	0.1
	Direct tax	0.1
Japan	Consumption	1.3
	Benefits	0.7
	Indirect tax	0.3
	Direct tax	0.6
Netherlands	Consumption	0.5
	Benefits	0.2
	Indirect tax	0.1
	Direct tax	0.2
Portugal	Consumption	0.7
	Benefits	0.2
	Indirect tax	0.1
	Direct tax	0.1
Sweden	Consumption	0.4
	Benefits	0.2
	Indirect tax	0.1
	Direct tax	0.2
Spain	Consumption	0.7
	Benefits	0.2
	Indirect tax	0.2
	Direct tax	0.1
United Kingdom	Consumption	0.7
	Benefits	0.2
	Indirect tax	0.2
	Direct tax	0.2
United States	Consumption	1.1
	Benefits	0.4
	Indirect tax	0.4
	Direct tax	0.3

(*continued*)

Table A12.2
(*continued*)

Source	Methodology	Country	Fiscal shock[a]			Fiscal multipliers			
						Impact	1 year	2 years	5 years
Canzoneri et al. (2011)	Cúrdia-Woodford New Keynesian model with costly financial intermediation. Credit market frictions are assumed to be countercyclical.	United States	G	Recession	The size of intervention of 1 % of GDP	2.3			
					The size of intervention of 5 % of GDP	1.9			
					The size of intervention of 10 % of GDP	1.7			
				Expansion (origin: financial shock)	The size of intervention of 2.5 % of GDP	0.9	0.7	0.6	0.5
				Recession (origin: financial shock)	The size of intervention of 2.5 % of GDP	2.2	0.9	0.7	0.6
						Impact			
Christiano, Eichenbaum, and Rebelo (2009)	DSGE model with Calve-style pricing frictions and no capital, incorporating the nonlinearity of nominal interest rates.	United States	G	Standard model without capital	No zero bound is binding	1.1			
					Zero interest bound is binding	3.7			
				Medium-size DSGE based on Altig, Christiano, Eichenbaum, and Lindé (2005)	No zero bound is binding after the discount rate moves from 4% to -10.5% on an annual basis for 10 periods.	0.8			
					Zero bound is binding between 2-10 periods after the discount rate moves from 4% to -10.5% on an annual basis for 10 periods.	3.4			
					No zero bound after the neutral technology shock fall by 4.5 percent for 10 periods.	0.7			
					Zero bound between 3-9 quarters after the neutral technology shock fall by 4.5 percent for ten periods.	1.3			

					1 year			
Coenen et al. (2012)	DSGE: seven structural DSGE models used by policy-making institutions.	United States	Government consumption (2 years)	Fiscal stimulus is assumed to last for 2 years, unless otherwise indicated, with 2-year monetary accommodation.	1.6			
			Government consumption (1 year)		1.2			
			Government investment		1.6			
			Targeted transfers		1.3			
			Consumption taxes		0.6			
			General transfers		0.4			
			Corporate income taxes		0.2			
			Labor income taxes		0.2			
		European Union	Government consumption (2 years)	Fiscal stimulus is assumed to last for 2 years, unless otherwise indicated, with 2-year monetary accommodation.	1.5			
			Government consumption (1 year)		0.9			
			Government investment		1.5			
			Targeted transfers		1.1			
			Consumption taxes		0.7			
			General transfers		0.3			
			Corporate income taxes		0.2			
			Labor income taxes		0.5			
					1 quarter	1 year	2 years	3 years
Cogan, Cwik, Taylor, and Wieland (2009)	New Keynesian simulation exercise, based on the model in Smets and Wouters (2007). Varying assumptions about the interest rate response.	United States	T, G		0.96-1.03	0.67-0.89	0.48-0.61	0.41-0.44

(*continued*)

Table A12.2
(*continued*)

Source	Methodology	Country	Fiscal shock[a]			Fiscal multipliers		
						1 year	2 years	3 years
Dalsgaard et al. (2001)	Based on the OECD INTERLINK model. No monetary policy response (nominal interest rate held constant).	United States	G, country specific			1.1	1	0.5
			G, global shock			1.5	1.3	0.7
		Japan	G, country specific			1.7	1.1	0.4
			G, global shock			2.6	1.9	0.6
		Euro area	G, country specific			1.2	0.9	0.5
			G, global shock			1.9	1.5	0.7
						PV		
Eggertsson (2006)	DSGE model with assumptions of sticky prices, rational expectations, and the government that cannot commit to future policy.	United States	Real government consumption (hold the budget balanced)	Coordinated policy	Interest rate=0	3.4		
					Interest rate>0	0.5		
				Uncoordinated policy	Interest rate=0	3.4		
					Interest rate>0	0.5		
			Deficit spending (tax cuts and accumulate debts)	Coordinated policy	Interest rate=0	3.8		
					Interest rate>0	0.8		
				Uncoordinated policy	Interest rate=0	0.0		
					Interest rate>0	0.0		
						1 quarter	1 year	
Elmendorf and Furman (2008)	Based on model in Elmendorf and Reifschneider (2002). Interest rates adjust based on a Taylor rule. For rebates: low: 20 percent of rebate spent; high: 50 percent spent.	United States	Income taxes reduction			0.2	0.3 / 0.4	
			Investment tax credit			0.2	0.1 / 0.2	
			G			1.0	1.0 / 1.0	
			Tax rebate (low)			0.3	0.0 / 0.0	
			Tax rebate (high)			1.0	1.0 / 0.2	

				1 quarter	1 year	2 years	3 years
Freedman et al. (2008)	Annual GIMF model simulations. Varying assumptions about the monetary policy response.	United States	Z and transfers	0.5	0.3	-0.1	0.8
			Lump-sum transfer	0.2	0.0	-0.2	0.2
		Euro area	Z and transfers	0.5	0.3	-0.1	0.8
			Lump-sum transfer	0.2	0.0	-0.2	0.2
		Japan	Z and transfers	0.5	0.3	-0.1	0.8
			Lump-sum transfer	0.2	0.0	-0.2	0.2
		Emerging Asia	Z and transfers	0.7	0.4	-0.3	1.1
			Lump-sum transfer	0.4	0.1	-0.3	0.5
		Other	Z and transfers	0.7	0.4	-0.2	1.1
			Lump-sum transfer	0.3	0.1	-0.3	0.4
				1 quarter			
Heathcote (2005)	Calibrated (real) model with distortionary taxation and capital market imperfections. No modeling of monetary policy.	United States	T (temporary proportional income tax reduction)	0.4			
				1 year			
Her Majesty's Treasury (2003)	European Commission's QUEST model. Interest rates respond to meet EU area inflation targets (except Sweden and the UK, which are assumed to target their own inflation rates).	Germany	T	0.2			
			G	0.4			
		Spain	T	0.1			
			G	0.5			
		France	T	0.1			
			G	0.5			
		Ireland	T	0.1			
			G	0.4			
		Italy	T	0.1			
			G	0.5			
		Netherlands	T	0.1			
			G	0.4			
		Portugal	T	0.0 to 0.1			
			G	0.7			

(*continued*)

Table A12.2
(*continued*)

Source	Methodology	Country	Fiscal shock[a]			Fiscal multipliers			
		Sweden	T			0.3			
			G			0.4			
		United Kingdom	T			0.2			
			G			0.3			
						Impact	4 quarters	10 quarters	25 quarters
Leeper, Traum, and Walker (2011)	Five nested DSGE models.	United States	G	Real business cycle model	Lump-sum finance	0.1	0.0	0.0	-0.2
				Real business cycle model	Labor tax finance	0.1	0.1	-0.1	-0.3
				Real business cycle model	Distortionary finance	0.1	0.0	-0.1	-0.5
				Real business cycle model	Real frictions	0.6	0.4	0.2	-0.3
				New Keynesian	Sticky price & wage	1.0	0.7	0.5	0.2
				New Keynesian	Nonsavers	1.2	0.9	0.6	0.3
				Open New Keynesian	Financial integration: G nontraded	1.1	0.8	0.6	0.3
				Open New Keynesian	Financial integration: G traded	0.9	0.7	0.5	0.2
						Year 1	Year 2		
OECD (2009)	Various macro models surveyed for OECD countries (all studies, year 1)	10 OECD countries plus euro area	Purchases of goods and service		low/high/mean	0.6/1.9/1.1			
			Corporate tax cut		low/high/mean	0.1/0.5/0.3			
			Personal income tax cut		low/high/mean	0.1/1.1/0.5			
			Indirect tax cut		low/high/mean	0.0/1.4/0.5			
			Social security contribution cut		low/high/mean	0.0/1.2/0.4			

	Various macro models surveyed for OECD countries (studies with year 1 and year 2)		Purchases of goods and service	low/high/mean	0.9/1.9/1.2	0.5/2.2/1.3
			Corporate tax cut	low/high/mean	0.1/0.5/0.3	0.2/0.8/0.5
			Personal income tax cut	low/high/mean	0.1/1.1/0.5	0.2/1.4/0.8
			Indirect tax cut	low/high/mean	0.0/0.6/0.2	0.0/0.8/0.4
			Social security contribution cut	low/high/mean	0.0/0.5/0.3	0.2/1.0/0.6
	OECD global model		Government expenditure (consumption and investment)	Accommodative monetary policy	0.9	1.3
	OECD global model		Income tax cuts	Accommodative monetary policy	0.6	1.0
					1 year	
Zandi (2008)	Moody's Economy.com macro model. Details of the model are not specified. The two tax rebate multipliers are from nonrefundable and refundable rebates.	United States	Tax rebate		1.0 / 1.3	
			Payroll tax holiday		1.3	
			Tax cut		1.0	
			Accelerated depreciation		0.3	
			Extend alternative min. tax patch		0.5	
			Bush income tax cuts permanent		0.3	
			Dividend and capital gains tax cuts permanent		0.4	
			Cut corporate tax rate		0.3	
			Extend unemployment insurance benefits		1.6	
			Temporarily increase food stamps		1.7	
			General aid to state governments		1.4	
			Infrastructure spending		1.6	

a. G: government spending, T: taxes, and Z: government investment.

Table A12.3
Literature survey on the size of fiscal multipliers: Other approaches

Source	Methodology	Data sample	Country	Fiscal shock		Fiscal multipliers	
						Contemporaneous	2 years
Barro and Redlick (2009)	Two-stage least-square regression	Annual data 1912–2006	United States	Government defense spending	Temporary increase in defense spending	0.4–0.5	0.6–0.7
					Permanent increase in defense spending	0.6	0.8
						1 quarter	
Broda and Parker (2008)	Econometric case study of the 2008 tax rebate. Implicit control for interest rates through fixed effects.	2008	United States	Tax rebate		0.2	
						1 quarter	1 year
Coronado et al. (2005)	Econometric case study of the 2003 Jobs and Growth Tax Relief Reconciliation Act, based on survey data. No explicit control for interest rates.	2003	United States	Increase child credit, reduce withholding T		0.3	0.3
						1 year	3 years
IMF (2008)	Dynamic panel regressions using the Arelloano-Bond estimator.	1970–2007	Advanced	T		0.4 / 0.0	0.6 / 0.4
			(21 countries)	G		–0.1 / 0.2	–0.3 / 0.5
			Emerging	T		0.2 / 0.1	0.2 / 0.2
			(20 countries)	G		0.2 / 0.1	–0.2 / –0.2
						1 quarter	1 year
Johnson et al. (2006)	Survey data used to study the effect of the 2001 tax rebate. Authors consider household impact responses. Any effect from interest rates would come through household expectations.	2001	United States	Tax rebates		0.2–0.4	0.7

Notes

We thank Thomas Baunsgaard for his contribution to an earlier version of this chapter.

1. The discussion here is based on Blanchard, Dell' Ariccia, and Mauro (2010).

2. There is a widespread perception that the government simply cannot react quickly enough to fine-tune the economy because of the following three types of lags: (1) a lag between the time a change in policy is required and the time that the government recognizes this, (2) a lag between when the government recognizes that a change in policy is required and when it takes action, and (3) a lag between policy is implemented and it actually affects the economy.

3. G20 (2009) indicates that by early 2009 the G20 countries adopted (or planned to adopt) fiscal stimulus measures amounting on average to around 0.5 percent of GDP in 2008, 1.5 percent of GDP in 2009, and about 1.25 percent of GDP in 2010. The stimulus consisted of one-third revenue measures and two-thirds expenditure measures. Revenue measures focused on cuts in personal income taxes and indirect taxes, such as VAT or excises, while increased spending for infrastructure was emphasized on the expenditure side.

4. See Spilimbergo, Symansky, and Schindler (2009) for more discussion.

5. The plausible range excludes the top and bottom 35 percentile in table 12.1 (see the table notes). Full results of the survey are presented in the appendix.

6. There are typically two channels that cause the resulting simultaneity bias: the automatic stabilizers and endogenous fiscal policy (i.e., systematic countercyclical policy).

7. Blanchard and Perotti (2002) indicate that direct evidence on the conduct of fiscal policy suggests that it takes policy makers and legislatures more than a quarter to learn about a GDP shock, decide what fiscal measures to take in response, pass these measures through the legislature, and actually implement them.

8. For example, Favero and Giavazzi (2007) argue that omitting feedbacks from changes in the level of public debt (as a ratio to GDP) in response to a fiscal shock (a tax reduction or a spending increase) to future taxes, spending, and interest rates (the cost of debt services) can result in incorrect estimates of the dynamic effects of fiscal shocks.

9. The approaches are based on the argument that it could be misleading to assume that changes in output in a given quarter are caused solely by actual changes in tax collections or government spending in the contemporaneous quarter. This is because information on fiscal policy, for example, changes in taxes, often becomes available more than a quarter before the implementation, and economic entities likely start adjusting their behavior based on this information, before taxes are actually changed. Regarding the timing of the announcement of changes in fiscal policy, some studies (e.g., Ramey 2011a; Mertens and Ravn 2011) find that changes in taxes tend to be known well in advance to the implementation. Blanchard and Perotti (2002) also indicate that most of the changes in tax and transfer programs are known at least a few quarters before they are implemented.

10. Coenen et al. (2010) indicate that there is no complete consensus on the appropriate structural features and calibration. Feve, Matheron, and Sahuc (2012) demonstrate with a DSGE model that an estimation bias could arise from omitting the combination of Edgeworth complementarity between private spending and government expenditures and endogenous government expenditures (automatic stabilizers), indicating the importance of appropriately structuring a DSGE model.

11. For example, see Dolls, Fuest, and Peichl (2010).

12. Corsetti, Kuester, and Müller (2011) argue that the short-run effect of fiscal measures does not only depend on the exchange rate regime and the monetary strategy more generally but hinges also on the future fiscal mix, therefore one cannot assess fiscal stimulus independently of the exchange rate regime.

13. Corsetti, Meier, and Müller (2012) conducting an empirical analysis using panel data comprised of 17 OECD countries find that net exports decrease in response to a fiscal expansion while the real exchange rate appreciates.

14. Contrary to this statement, Corsetti, Meier, and Müller (2012) emphasize that the typical textbook notion of monetary policy being more accommodative under a fixed exchange rate regime is not a general prediction of standard open economy models. With imperfect credibility about the currency peg, a government spending increase may generate tensions in the currency market, promoting the central bank to defend the currency with an increase in the interest rate.

15. The "open economy relative multiplier" is defined as the effect that an increase in government spending in one region of a currency union relative to another has on relative output and employment.

16. Contrary to this statement, Farhi and Werning (2012) demonstrate with a DSGE model that self-financed government spending multipliers tend to be small—smaller than unity—in a currency union because government spending leads to inflation in domestically produced goods, which lowers the competitiveness of the economy given, the fixed exchange rate, and depresses private consumption. However, they also find transfer-financed spending multipliers large in the short run (when prices have not fully adjusted), as positive transfers from the rest of the world increase the demand for home goods, thereby they argue that the overall government spending multipliers could be larger than unity.

17. This may be partly because compared to a change in government spending a change in taxes tends to take more time to build its impact. For example, Mountford and Uhlig (2009) and Zubairy (2012) suggest that the effects of tax shocks take 12 to 20 quarters to build. Zubairy (2012) indicates, with a DSGE model, that tax changes take time to build up because the primary driver of the buildup is investment, not consumption.

18. In contrast to this statement, IMF (2010) finds that fiscal consolidations based on spending are less contractionary than those based on tax increases. The IMF study explains that this finding is due to different monetary-policy reactions to fiscal consolidation: monetary policy tends to be more accommodative when a government implements a spending-based consolidation than a revenue-based consolidation. This is partly because many tax increases in past fiscal consolidation plans involve increases in the value-added tax, which increases inflation.

19. For example, a temporary cut in distortionary taxes that shifts private consumption from the future to the present would increase real interest rates and crowd out investment.

20. For example, Barrell, Holland, and Hurst (2012) quantitatively analyze the differences in the size of fiscal multipliers between temporary and permanent fiscal measures.

21. The study finds, with a sample of country episodes of high debt for advanced and emerging economies, that the impact fiscal multipliers are close to zero and long-run multi-

pliers become negative during episodes of debt-to-GDP ratios exceeding 60 percent for three or more consecutive years.

22. The study also indicates that the change in short-term fiscal multipliers could be explained by the change in spending composition; a lower share of government investment and a larger wage component in total spending.

23. Barrell et al. (2012) indicate the correlations between country size and the tax and spending multipliers are 40 to 50 percent. They discuss that the impact of a large economy on global interest rates are offset by other features of large economies, such as the less propensity to imports. Furceri and Poplawski-Ribeiro (2009), in turn, show that larger countries have less volatile discretionary and nondiscretionary government spending, which could also increase the spending effectiveness and multipliers.

24. Erceg and Lindé (2010) argue that the size of fiscal multipliers could decline with the level of government spending if the stimulus package is large enough to get the economy out of the liquidity trap, hence pushing interest rates upward. Similarly Fernández-Villaverde et al. (2012) and Rendahl (2012) also find with New Keynesian models that fiscal multipliers decline as the stimulus package expands and closes much of the output gap.

25. Dalsgaard, André, and Richardson (2001) also demonstrate with a multiregion DSGE macroeconomic model (LITERLINK) that a coordinated fiscal stimulus among all OECD countries has a larger impact than a noncoordinated one. Blanchard and Leigh (2013) revisit, extend, and examined the robustness of the analysis done in IMF (2012). They conclude that actual multipliers were substantially above 1 early in the crisis.

26. The simulation indicates that government spending partly crowds out private consumption under the scenario of unemployment is less than the natural rate plus 2 percentage points, while no crowding-out is observed when unemployment exceeds the natural rate by 3 percentage points or more.

27. In this context, several economists, including Parker (2011) and Seidman (2011), argue that it is incorrect to assume the size of multipliers during recessions would be the same as the size of multipliers estimated with data during World War II when the economy was at full employment ("the unemployment rate during 1942 averaged 4.7 percent and was steadily falling, reaching 0.7 percent by 1944"; Parker 2011).

28. A number of studies, including Drautzburg and Uhlig (2011) and Coenen et al. (2010), also indicate the size of fiscal multipliers is large if transfers are targeted to credit-constrained households.

29. This section is based on appendix 1 of the April 2012 IMF *Fiscal Monitor*, and on Baum, Poplawski-Ribeiro, and Weber (2012).

30. As a robustness check, we also compute the estimations using output growth as a threshold variable.

31. Quarterly fiscal data on Italy were not available for a comparable period. Therefore Italy is excluded from the analysis.

32. The data are arranged in increasing order on the basis of the threshold variable. Sequential estimation of linear VARs gives a sequence of OLS regressions, each using the first x ranked observations. For each of these regressions, the one-step-ahead predictive residuals are kept.

33. Caldara and Kamps (2012) show, moreover, that differences in estimates of fiscal multipliers documented in the literature by Blanchard and Perotti (2002), Mountford and Uhlig (2009), and Romer and Romer (2010) are due mostly to different restrictions on the output elasticities of tax revenue and government spending.

34. When large discrepancies are observed between the IMF (2010) "action-based" measure of policy changes and the cyclically adjusted primary balance, the component of revenue and expenditure changes unrelated to output developments and discretionary measures is removed from the quarterly net revenue and expenditure series. This yields a "clean" series, where changes in revenue mainly reflect changes related to output and policy measures.

35. A Cholesky decomposition is applied as a robustness check to account for the vulnerability of our results to the exact identification method; even though this identification methodology does not identify the revenue shocks correctly (it does not account for the effects of automatic stabilizers). The results with respect to spending multipliers, available upon request, remain robust.

36. GIRFs have been employed in several empirical applications. For example, in monetary economics they are applied in Balke (2000) and Atanasova (2003).

37. The results for the Tsay threshold approach can be found in Baum, Poplawski-Ribeiro, and Weber (2012, tab. 3). Apart from the United Kingdom, the threshold value is below the average output gap and negative for all other countries. For most of them, the majority of the observations lie in the upper output gap regime. The threshold values are significant at the 10 percent level for France, at 5 percent for the United Kingdom, and at 1 percent for Canada, Germany, Japan and the United States.

38. See Baum, Poplawski-Ribeiro, and Weber (2012, app. B) for the results using the GIRFs.

39. Using output growth as a threshold variable rather than the output gap yields results that are qualitatively similar. More details are available from the authors upon request.

40. Averages are taken over the fiscal multipliers that are estimated for each country separately. In case of the linear model, the multiplier is estimated in a linear VAR for the entire data sample for each country. The average is taken over the six individually estimated linear multipliers.

41. The effect of interactions between fiscal and monetary policy on multipliers is ambiguous. In periods in which fiscal and monetary policies were not coordinated, the effect of fiscal policy could have been even greater than our model suggests. Conversely, in periods in which there was policy coordination, multipliers might have been overestimated, since monetary policy could have contributed in the same direction to changes in output. However, more recently the zero lower bound on interest rates has been binding, and some studies have argued that fiscal multipliers became much larger than unity once this happened (Woodford 2010; Christiano, Eichenbaum, and Rebelo 2011).

42. There is an argument of "expansionary fiscal contraction." For example, Cogan et al. (2013) demonstrated with an example of the House Budget Resolution of the United States applied to a New Keynesian DSGE model with the assumptions of forward-looking households who adjust their behavior in response to expectations of future tax and spending policy, and price and wage rigidities, that a reduction in government spending increases GDP both in both the short run and the long run relative to the baseline. However, as Barrell et al. (2012) indicate, episodes of expansionary fiscal contractions are exceptionally rare.

43. Ball (1999) notes that countries that came out of the recession of the early 1980s more slowly, such as the United Kingdom and Germany, saw noticeable increase in their natural rates of unemployment, relative to countries that came out more quickly, notably the United States and Canada.

44. Erceg and Lindé (2012b) examine with a two-country DSGE model the effects of fiscal consolidation in a currency union and find the following: (1) given limited scope for monetary accommodation, tax-based consolidation (less inflationary) tends to have smaller adverse effects on output than expenditure-based consolidation in the near term, although it is more costly in the longer term; (2) a large expenditure-based consolidation may be counterproductive in the near term if the zero lower bound is binding, reflecting that output losses rise at the margin; and (3) a mixed strategy that combines a sharp but temporary rise in taxes with gradual spending cuts may be desirable in minimizing the output costs of fiscal consolidation.

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