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Why do fiscal multipliers depend on fiscal Positions? ☆

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ABSTRACT

The fiscal position can affect fiscal multipliers through two channels. Through the Ricardian channel, households reduce consumption in anticipation of future fiscal adjustments when fiscal stimulus is implemented from a weak fiscal position. Through the interest rate channel, fiscal stimulus from a weak fiscal position heightens investors' concerns about sovereign credit risk, raises economy-wide borrowing cost, and reduces private domestic demand. We document empirically the relevance of these two channels using an Interactive Panel Vector Auto Regression model. We find that fiscal multipliers tend to be smaller when fiscal positions are weak than strong.

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1. Introduction

During the Great Recession of 2008–09, many countries deployed fiscal policy to support activity. As a result, government debt increased in a number of countries, and it remains elevated (Kose et al., 2017). There is mounting empirical evidence that weak fiscal positions erode the effectiveness of fiscal policy in stimulating the economy, although the channels through which this mechanism operates have not yet been systematically explored. The objective of this paper is to fill this gap in the literature by answering the question: why do fiscal multipliers depend on fiscal positions?

In theory, the fiscal position can affect the size of fiscal multipliers through two specific channels. First, a Ricardian channel: when a government with a weak fiscal position implements fiscal stimulus, households expect tax increases sooner than

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in an economy with a strong fiscal position (Blanchard 1990a, 1990b; Sutherland 1997). The perceived negative wealth effect leads households to cut consumption and save more, thereby weakening the impact of the stimulus on output. Thus, the net effect of fiscal policy on output—the size of the fiscal multiplier—may be smaller in an economy with a weaker fiscal position. Second, an interest rate channel: when the fiscal position is weak, fiscal stimulus can increase lenders' concerns about sovereign credit risk. This raises sovereign bond yields and hence, borrowing costs across the whole economy (Corsetti et al., 2013). This, in turn, crowds out private investment and consumption, reducing the size of the fiscal multiplier. Therefore, in theory, both channels imply that fiscal policy is less effective when fiscal stimulus is implemented from a weak initial fiscal position.[1]

To analyze the relevance of the channels through which the fiscal position affects fiscal multipliers, we use an Interacted Panel Vector Autoregressive (IPVAR) model. The model is essentially an extension of an otherwise standard panel structural VAR (SVAR), with the distinction that the VAR coefficients interact with (observable) state variables. Consequently, these coefficients become time-varying, and evolve endogenously according to these states. This results in a framework where the VAR dynamics and hence, the fiscal multipliers are conditional on the state variables which we take to be the fiscal position.[2] Since the state-dependency is captured by making use of the full sample, the model allows us to maintain sufficient degrees of freedom to draw sharp inferences. It also allows us to trace out the fiscal multipliers as a function of a continuum of government debt, rather than relative to *ad hoc* debt thresholds. In addition, our framework extends the suite of models – from Smooth Transition Regressions (Auerbach and Gorodnichenko 2012) or local projections (Auerbach and Gorodnichenko 2013; Riera-Crichton et al., 2015) – that are used in the literature to estimate state-dependent multipliers.

Applying our empirical methodology to a large dataset that covers 34 countries (19 advanced and 15 developing), at the quarterly frequency over the period 1980:1 to 2014:1, we first establish that the fiscal position helps determine the size of the fiscal multipliers: estimated multipliers are systematically smaller when the fiscal position is weak (i.e. government debt is high). We then employ a model that includes both the Ricardian and interest rate channels to provide evidence that such state-dependent effects operate through these two channels. In particular, we show that when a government with weak public finances conducts expansionary fiscal policy, the private sector scales back on consumption in anticipation of future tax pressures (Ricardian channel) and risk premia rise on mounting concerns about sovereign risk (interest rate channel).

Our paper presents the first systematic empirical study on the relevance of the two theoretical channels through which the fiscal position affects the size of fiscal multipliers. It builds on two interrelated branches of the literature. The first branch focuses on the importance of fiscal positions for fiscal multipliers. Ilzetzki et al. (2013), Nickel and Tudyka (2014), and Auerbach and Gorodnichenko (2012, 2013) estimate multipliers that depend on the fiscal position and find that weaker fiscal positions are associated with smaller fiscal multipliers. However, none of these studies examines jointly the two channels through which the fiscal position affects multipliers.

The other branch of the literature considers the relevance of the two channels. Blanchard (1990a) sketches out a theoretical model of Ricardian consumers who, after a fiscal stimulus, cut back consumption in anticipation of future tax hikes. Others document empirically that the effect of government spending shocks on private consumption depends on government debt (Perotti 1999; Giavazzi and Pagano 1990, 1996). However, none of these studies present a systematic empirical assessment of implications for the channels as well as output.

Our paper extends the limited set of studies on the Ricardian channel in several dimensions. First, the IPVAR, unlike panel regressions, is a multivariate model that allows us to trace the dynamic effects of fiscal shocks not only on private consumption—as a *mechanism* for a government's fiscal position to matter for multipliers—but also on output. Second, we employ a model that allows us to examine the relevance of the Ricardian and interest rate channels together in a much larger sample of countries and longer series.

A couple of recent studies examine the interest rate channel. Corsetti et al. (2013) model the role of investor perceptions of sovereign risks and, calibrating their dynamic stochastic general equilibrium model to the United States, illustrate smaller fiscal multipliers when government debt is high. Bocola (2016), using a structural model, estimates that a higher probability of sovereign default raised risk premia for corporate lending and reduced credit to firms in Italy during the sovereign debt crisis. These studies illustrate the workings of the interest rate channel, i.e. how output effects of fiscal stimulus could be eroded during times of high debt. Our reduced-form approach contributes to this literature by providing an empirical assessment of the interest rate channel for a wide range of countries in a model that also includes the Ricardian channel.

Auerbach and Gorodnichenko (2017) take the first step towards exploring the interest rate channel by estimating the impact of fiscal policy shocks on activity and credit default swap spreads (not on private consumption) in a local projections model for a sample of 20 OECD countries. They report no statistically significant difference between fiscal multipliers depending on government debt. Nor do they find a statistically significant effect of fiscal stimulus on credit risk premia but

[1] In a theoretical model, Sutherland (1997) formalizes the Ricardian channel by postulating that there exists a debt threshold at which the government makes fiscal adjustments, via increasing taxes, to remain solvent. Thus, households expect higher taxes to be more imminent when the government conducts an expansionary fiscal policy from a high initial level of debt. In Perotti (1999), such expectations of higher taxes can also result in increased tax distortions which are an additional source of negative wealth effects. With regard to the interest rate channel, Bi, Shen, and Yang (2014) theoretically establish that sovereign risk premia can increase nonlinearly as government indebtedness rises. Corsetti et al. (2013) highlight that the interest rate is particularly relevant for the effectiveness of fiscal policy when monetary policy is constrained, for instance during a zero lower bound episode.

[2] The model was originally used to estimate the impact of exchange rate fluctuations on output conditioning on foreign currency debt and import structure (Towbin and Weber 2013) or to estimate the impact of capital flows on OECD housing markets conditioning on mortgage market characteristics (Sa, Towbin, and Wieladek 2014).

rather a statistically significant decline in short-term interest rates. They interpret this as evidence that fiscal stimulus remains an effective tool for boosting growth and that the penalty from rising borrowing cost is small. The divergence in the results of Auerbach and Gorodnichenko (2017) from those in Auerbach and Gorodnichenko (2013) may reflect two factors. First, Auerbach and Gorodnichenko (2017) add a number of control variables, such as interest rates, that may reduce degrees of freedom, introduce multicollinearity with credit spreads and lower the statistical significance of the estimated response of credit spreads. Second, they redefine the conditioning variable as demeaned government debt (instead of government debt) and, thus, remove all cross-country variation from a variable that, to begin with, has limited across-time variation.

The rest of the paper is organized as follows. Section 2 presents the econometric methodology, identification strategy, and database. We present estimates of state-dependent multipliers in Section 3.1 and analyze the roles of the Ricardian and the interest rate channels in Section 3.2. Section 4 discusses a rich menu of robustness exercises. Section 5 concludes.

2. Empirical methodology and database

Our empirical approach requires several choices that may affect the results. These are explained in this section, together with a discussion of our database.

2.1. Econometric model

We use an Interacted Panel Vector Autoregressive (IPVAR) model where the main innovation, with respect to a standard panel SVAR, is that the model coefficients vary deterministically according to conditioning (state) variables. By choosing the conditioning variable to be a measure of fiscal position in the IPVAR, we estimate multipliers that depend on the fiscal position. The IPVAR model, in its structural form, is represented by:

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ \alpha_{0,it}^{21} & 1 & 0 & 0 \\ \alpha_{0,it}^{31} & \alpha_{0,it}^{32} & 1 & 0 \\ \alpha_{0,it}^{41} & \alpha_{0,it}^{42} & \alpha_{0,it}^{43} & 1 \end{bmatrix} \begin{bmatrix} gc_{it} \\ gdp_{it} \\ ca_{it} \\ reer_{it} \end{bmatrix} = \sum_{l=1}^{L} \begin{bmatrix} \alpha_{l,it}^{11} & \alpha_{l,it}^{12} & \cdots & \alpha_{l,it}^{14} \\ \alpha_{l,it}^{21} & \alpha_{l,it}^{22} & \cdots & \alpha_{l,it}^{24} \\ \vdots & \vdots & \ddots & \alpha_{l,it}^{34} \\ \alpha_{l,it}^{41} & \alpha_{l,it}^{42} & \cdots & \alpha_{l,it}^{44} \end{bmatrix} \begin{bmatrix} gc_{it-l} \\ gdp_{it-l} \\ ca_{it-l} \\ reer_{it-l} \end{bmatrix} + X_{it}F + U_{it}, \tag{1}$$

where for a given country i in period t, gc represents real government consumption, gdp real gross domestic product (GDP), $reer$ the real effective exchange rate, and ca the current account balance (as a share of GDP).

We take government consumption as the fiscal instrument and track the effects of fiscal policy in terms of GDP. The real effective exchange rate and the current account are also included in the model to account for open-economy features that characterize most of the countries in our sample. The matrix X captures additional controls, which include time-invariant country fixed effects, and U is a vector of uncorrelated, *i.i.d.* (structural) shocks. The shock corresponding to government consumption is the fiscal shock. We set the lag length as $L=4$ which is standard for VAR models with quarterly data but we also test for robustness to different lag lengths in Section 4.

The impact matrix A_0 (matrix of coefficients on the left-hand side of Eq. (1)) is lower triangular. This, along with the ordering of the variables in the VAR, is related to our identification scheme (discussed below). Both the impact matrix A_0 and the coefficient matrices $A_l,\ l=1,\ldots,L$ (on the right-hand side of Eq. (1)) comprise time-varying model coefficients that, for any given entry in row j and column, evolve deterministically according to:

$$\alpha_{l,it}^{jk} = \beta_{1,l}^{jk} + \beta_{2,l}^{jk} fs_{it}, \tag{2}$$

fs refers to the fiscal position.[3] Our measure of the fiscal position is the government debt-to-GDP ratio. While the literature has used a variety of measures, our choice is in line with theoretical models, where government debt is the modal state variable (as discussed below).[4] Since measures of the fiscal position are endogenous and move in tandem with the business cycle, we take lagged moving averages of our fiscal measures to control for business cycle effects.[5]

The matrices $A_l,\ l=0,\ldots,L$ determine the effects of structural shocks on the dynamics of endogenous variables in the VAR system. By conditioning the law of motion of the coefficients in these matrices on the fiscal position, as in Eq. (2), we are allowing those effects to depend on the fiscal position. This scheme allows us to calculate impulse responses and hence estimates of fiscal multipliers conditional on a specific fiscal position.

As standard in the literature, we compute the cumulative fiscal multiplier at horizon T as the discounted cumulative change in output until horizon T, as the discounted cumulative government consumption increases by one unit. That is,

$$Multiplier\ (T) = \frac{\sum_{t=0}^{T}(1+r)^{-t}\Delta gdp_t}{\sum_{t=0}^{T}(1+r)^{-t}\Delta gc_t} \tag{3}$$

[3] Including the fiscal position in the law of motion in Eq. (2) is tantamount to having interaction terms with the fiscal position in the regressors of Eq. (1). For this reason, we do not separately include the fiscal position as an endogenous variable in the IPVAR.

[4] For instance, while Riera-Crichton, Vegh, and Vuletin (2015) condition multipliers on fiscal balances, Auerbach and Gorodnichenko (2013), Ilzetzki, Mendoza, and Vegh (2013), and Nickel and Tudyka (2014) condition on government debt.

[5] In particular, we take the 5-quarter moving average of the fiscal position, and then lag it by 2 quarters. Given the average length of the business cycle, this effectively allows us to abstract from changes in the fiscal state that may potentially be contaminated by cyclical movements. We allay any residual endogeneity concerns by jointly conditioning on the fiscal position and the phase of the business cycle below.

where r denotes the interest rate. We utilize the median short-term rate in the sample.

From (3), the impact multiplier is obtained by setting $T = 0$ and the long-run multiplier by setting T at an arbitrarily large number, which is taken to be $T = 20$ (5 years). To calculate the fiscal multiplier using the coefficient estimates from the IPVAR, we first cumulate the discounted impulses of output and government consumption at different horizons and compute the ratio of the two impulses. That ratio is then multiplied by the average government consumption-to-GDP ratio in the sample to yield multipliers. Since the conditional multipliers are estimated from the panel of countries, they reflect an average estimate across those countries included in the panel. Thus, we use the average government consumption-to-GDP ratio in the sample to calculate the multipliers rather than country-specific government consumption-to-GDP ratios.

Eqs. (1) and (2) jointly denote the IPVAR system that is estimated with ordinary least squares (OLS) applied separately to each equation.[6] This yields model coefficients that depend on the fiscal position such that a given level of the fiscal position maps out to a set of model coefficients. For presenting the results, we evaluate model coefficients at specific values of the fiscal position which are mostly taken to be the 10th and 90th percentiles within the sample. Confidence bands are calculated by bootstrapping over 300 iterations. We report median estimates, along with the 16–84 % confidence bands.

2.2. Choice of fiscal instrument and fiscal position

Our selection of government consumption as the fiscal instrument reflects several considerations. Government consumption is a subset of the much broader measure of government spending that strips out the automatic stabilizers component, and hence represents discretionary fiscal policy. We recognize, however, that government consumption plays a modest role in large discretionary fiscal stimulus programs, such as those implemented in 2008–10, or discretionary consolidation packages. Such large packages, on the spending side, are often predominantly based on government investment and transfers (OECD 2009). Government investment could be an ideal fiscal instrument, in principle, to model large discretionary policies but, in practice, available quarterly data is insufficient to establish robust results. In addition, in our sample, government investment is relatively small, averaging only about one-quarter of government consumption. Hence, we choose government consumption as a fiscal instrument that is quantitatively large over the full sample period and available for many economies.[7] On the tax side, the ideal measure to represent discretionary fiscal policy would be tax rates. However, consistent measures of tax rates across countries are not readily available. Tax revenues, even though they are easily available, are highly procyclical and less suitable for our study.

Our selection of government debt as the conditioning state of fiscal position is motivated by the fact that in theoretical dynamic models that feature a fiscal sector, government debt is a state variable that enters as a lagged variable due to the flow budget constraint of the government (Galí et al., 2007; Forni et al., 2009; Davig and Leeper 2011). Moreover, in these models, nonlinear dynamics would depend on the initial state of government debt (and other state variables in the model). By conditioning on debt, our empirical approach attempts to match this theoretical aspect, and measures the effects of fiscal shocks conditional on the initial level of government debt.

The IPVAR model does not allow for endogenous feedback loops *after* the fiscal shock. Such feedback loops could be an important consideration because debt dynamics can feed into government spending, especially during times of unstable debt (Favero and Giavazzi 2007). Thus, the omission of such endogenous feedback loops could bias multipliers, even though the direction and the size of the bias is hard to pin down since multipliers are a function of both government spending and output. That said, any bias is likely to be larger over longer time horizons because debt stocks move slowly. Hence, we focus our analysis on shorter-run multipliers, i.e. multipliers up to two years. We also conduct a robustness exercise in Section 4 to analyze the impact of debt dynamics on our findings.

2.3. Identification

Given the challenges associated with identification of fiscal shocks, we consider a multi-pronged approach to identification. First, we carefully motivate our baseline identification that follows the standard Blanchard-Perotti scheme. Second, we consider an alternative identification following Auerbach and Gorodnichenko (2013) to check the robustness of our headline findings. Third, we consider alternative identifications and explain why we are unable to employ them in our exercise.

2.3.1. Baseline identification

Our baseline estimation relies on the standard recursive identification scheme of Blanchard and Perotti (2002). The key timing assumption in this scheme is that discretionary fiscal policy does not respond to macroeconomic conditions within the same quarter. Such a timing assumption can be motivated by implementation lags typically associated with discretionary fiscal policy. In the VAR model, this timing assumption is achieved by ordering government consumption first in Eq. (1), before GDP.

[6] Because the error terms are uncorrelated across equations by construction, estimating the IPVAR equation by equation does not result in loss of efficiency. See Towbin and Weber (2013) for a discussion.

[7] Government consumption is also chosen by Ilzetzki, Mendoza and Vegh (2013), Nickell and Tudyka (2014), and Corsetti et al. (2012) whereas Auerbach and Gorodnichenko (2013 and 2017) use the sum of government consumption and investment, but for a smaller sample of countries.

Since the IPVAR model conditions its dynamics on government debt, it is important to understand how debt dynamics could perturb the identifying assumption for government consumption and output. There are two key issues in this context. First, we are implicitly assuming that the lagged response of government consumption to macroeconomic conditions does not depend on the initial level of government debt.[8] Second, debt dynamics, as mentioned earlier, can feed into government consumption and output and hence can affect the timing assumption. However, given the slow-moving nature of debt and given that Blanchard and Perotti (2002) is essentially a short-run identification, concerns about misidentification due to the absence of feedback loops are limited, at least in the short run.

The timing assumption for the remaining variables is the following. Output is assumed to be, contemporaneously, independent from real exchange rates and current account balances in the same quarter. We assume that the output impact of current account balances and real effective exchange rates takes at least one quarter to occur. We order current account balances before exchange rates but the relative ordering of these two is immaterial for the results as we show in Section 4.

To assess the relevance of the Ricardian and the interest rate channels, we augment the baseline model with private consumption and CDS spreads. In the augmented model, we order private consumption between government consumption and output, and CDS spreads last. This ordering scheme preserves the lagged response of government consumption to output which is the key identifying assumption of Blanchard-Perotti scheme. Ordering private consumption before output assumes that private consumption contemporaneously affects output, while output affects private consumption only with a lag of one quarter. The former is consistent with simple national account identities, and the latter may be justified in terms of households adjusting their consumption gradually to changes in incomes. Regarding CDS spreads, it is standard in the literature to order interest rates and spreads last since they typically respond fastest (e.g. Gilchrist and Zakrajšek 2012).

One caveat of the recursive identification scheme is that the fiscal shocks identified using the Blanchard-Perotti scheme may be predicted by private forecasts (Ramey 2011). Born et al. (2013), in the context of OECD countries, investigate this aspect formally by explicitly controlling for anticipated changes in government spending using a panel VAR identified with a similar timing assumption. While their model does not include interaction terms with government debt, they find that explicitly controlling for anticipation effects has little bearing on fiscal multipliers. Arguably, fiscal policy is particularly erratic in developing economies, which are heavily represented in our sample; hence, our identified fiscal shocks are less likely to be affected by anticipation issues (Ilzetzki et al., 2013).

2.3.2. An alternative identification scheme

Auerbach and Gorodnichenko (2012, 2013) proxy exogenous fiscal shocks by forecast errors of government consumption for OECD countries. This alternative identification circumvents some of the caveats associated with recursive identification and one that is available for a broad sample of OECD countries. As a robustness check in Section 4, we use the same approach and find broadly consistent results.

2.3.3. Other possible identification approaches

For example, Favero and Giavazzi (2010) note that impact estimates of fiscal policy are larger when fiscal shocks are identified in a narrative approach than when they are identified in a VAR framework. Romer and Romer (2010) use a narrative approach to identify exogenous fiscal shocks for the United States. For a broader set of countries, Guajardo et al. (2014), Gupta et al. (2017) have compiled data for fiscal consolidation episodes. However, we would not necessarily expect the interest rate channel, especially, to operate during a fiscal consolidation if investors remain cautiously risk averse during consolidations, whereas their risk aversion may lead them to respond sharply to fiscal stimulus. Hence, a dataset of fiscal consolidations is less useful for our purposes.

2.4. Database

Our main database comprises an unbalanced panel that covers 34 countries (19 advanced and 15 developing), at the quarterly frequency over the period 1980:1 to 2014:1. Real government consumption and real GDP are based on the quarterly database in Ilzetzki et al. (2013) which are extended to 2014:1 by splicing data from the OECD and Haver Analytics. Real effective exchange rates are from the narrow (wherever available) and broad indices of the BIS, and current account balances are from Haver Analytics. The short-term rate used for discounting the multiplier is drawn mainly from the IMF-IFS database. We obtain quarterly real private consumption and private investment series from the OECD, Haver Analytics, and Eurostat. CDS spreads are in basis points and taken from Kose et al. (2017). We draw the conditioning variable (government debt as percentage of GDP) from the IMF-WEO database.[9] The government consumption, private consumption and GDP series are converted into logarithmic form, and detrended using a linear quadratic trend. The exchange rate is transformed into quarter-on-quarter growth rates, and the current account series is seasonally-adjusted using the X11 routine. All these series are detrended and demeaned on a country-by-country basis, which effectively controls for country fixed effects in the regressions.

[8] Auerbach and Gorodnochenko (2012) make a similar assumption: the lagged response of fiscal policy to macroeconomic conditions, i.e. Blanchard-Perotti identification, holds irrespective of the phase of the business cycle.

[9] Details on the sample are provided in Table 1. The sources and definitions of our data are provided in the Supplementary Appendix (Table A.1).

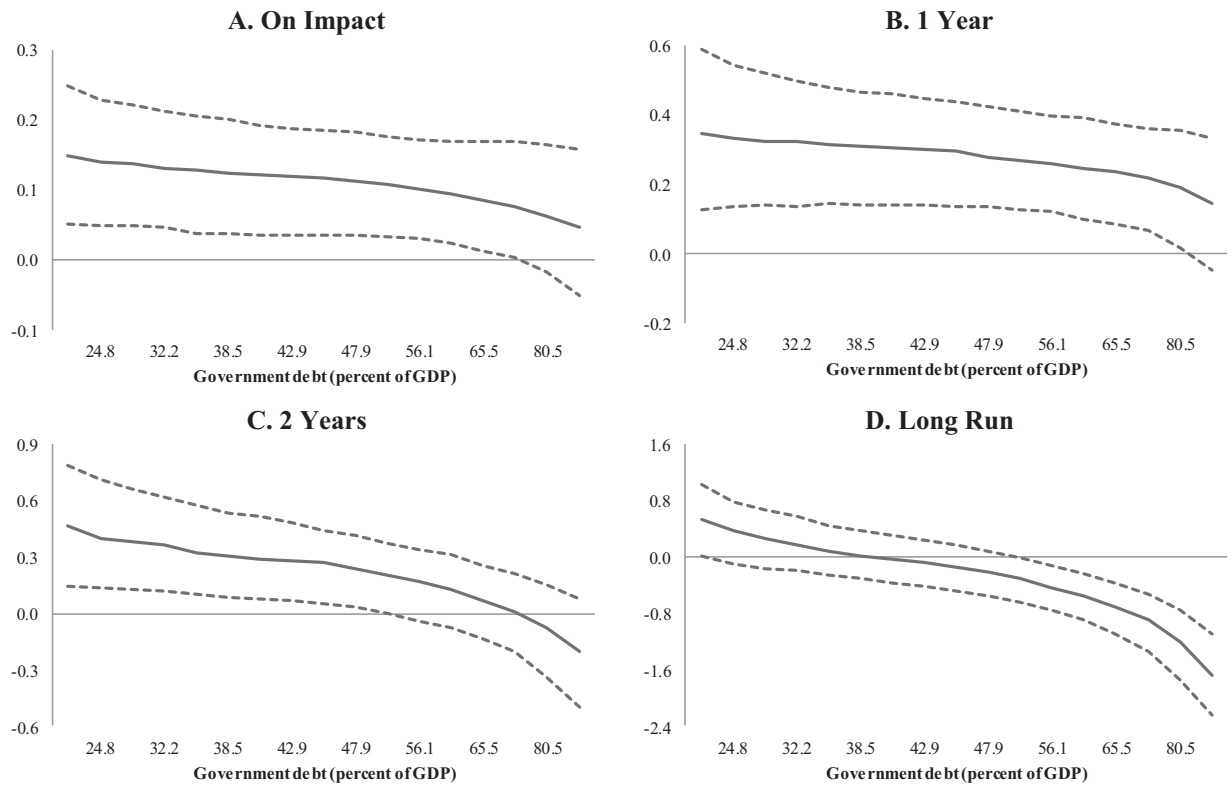

Fig. 1. Fiscal Position-Dependent Multipliers.
Note: The graphs show the conditional fiscal multipliers for different levels of fiscal position at select horizons. Fiscal multipliers are defined as cumulative change in output relative to cumulative change in government consumption in response to a 1 unit government consumption shock. They are based on estimates from the IPVAR model, where model coefficients are conditioned only on fiscal position. Government debt as a percentage of GDP is the measure of fiscal position and the values shown on the x-axis correspond to the 10th to 90th percentiles from the sample. Fiscal position is strong (weak) when government debt is low (high). Solid lines represent the median, and dotted bands are the 16–84 % confidence bands.

3. Results

This section presents the results of our empirical exercise. We first document our evidence for the presence of the Ricardian and interest rate channels. We also discuss the implications of these channels for fiscal multipliers that are contingent on the initial fiscal position.

3.1. Fiscal position-dependent multipliers

We first briefly present the set of estimated fiscal multipliers that depend on government debt—our measure of the fiscal position.[10] Fig. 1 shows that there is a systematic link between the size of the multiplier and the fiscal position: the median value of the multiplier decreases monotonically in debt, for all horizons reported. That is, the estimated multipliers for all the horizons are positive and significant for low levels of debt, but turn negative or insignificant when debt levels are high. For instance, the two-year multiplier is about 0.6 when debt is low (10th percentile in the sample, i.e. a "strong" fiscal position) and near-zero when debt is high (90th percentile in the sample, i.e. "weak" fiscal position). The difference in the estimated multipliers for low and high levels of debt remains significant at longer horizons. Our empirical results therefore lend support to the theoretical insights of earlier studies which show that a weak fiscal position can result in stronger crowding-out effects, blunting the stimulative effects of fiscal policy (Sutherland 1997; Perotti 1999; Corsetti et al., 2013; Bi et al., 2014).

We next examine the conditional impulse responses associated with expansionary fiscal policy in Fig. 2 to get a better understanding of the intuition behind these results. For the purpose of illustration, we consider impulse responses conditional on two levels of debt: one corresponding to the strong fiscal position and the other corresponds to the weak fiscal

[10] We also examine the unconditional multipliers using a standard panel SVAR. We provide details of these results in the Supplementary Appendix Figure A.1 and A.2. The estimates suggest that unconditional multipliers are, on average, insignificantly different from zero.

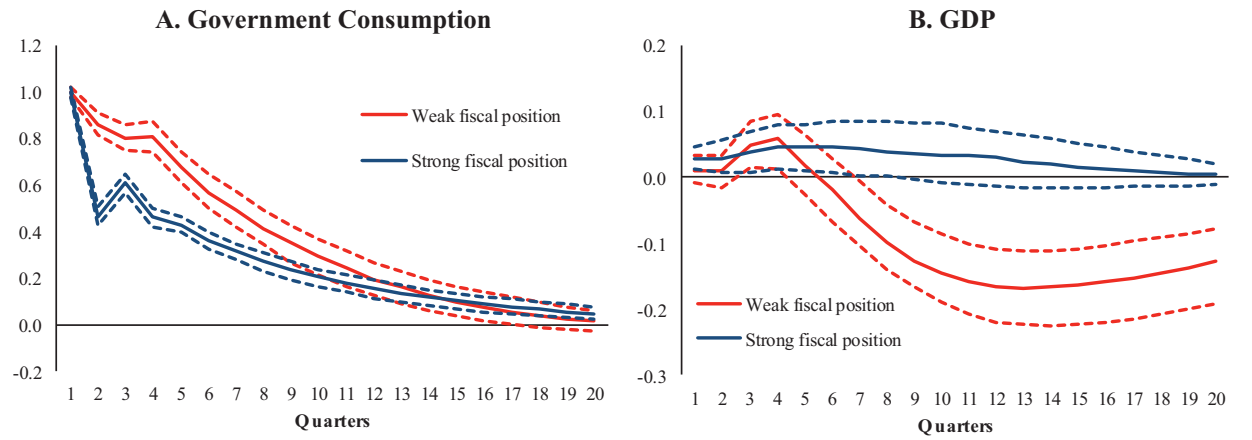

Fig. 2. Conditional Impulse Responses.
Note: The graphs show the conditional impulse responses (deviation from baseline in percentage points) for strong (blue) and weak (red) fiscal positions. These are based on estimates from the IPVAR model, where model coefficients are conditioned only on fiscal position. Government debt as a percentage of GDP is the measure of fiscal position. The strong fiscal position corresponds to the 10th percentile of debt-to-GDP ratio from the sample, while the weak fiscal position corresponds to the 90th percentile. Solid lines represent the median, and dotted bands are the 16–84 % confidence bands.

position.[11] For comparability, the shock size in each case is normalized such that government consumption rises by 1 % point on impact. While output increases on impact and remains significantly positive for around 2 years when the fiscal position is strong, such stimulative effects dissipate after about a year when the fiscal position is weak. In the case of government consumption, the conditional impulses for both strong and weak fiscal positions exhibit some persistence in response to the positive fiscal shock. However, fiscal expansion is more quickly unwound when the fiscal position is strong than weak. In other words, relative to the strong fiscal position, the government in fact spends more, especially initially, when the fiscal position is weak. Despite this, output falls more when the fiscal position is weak. These results are consistent with findings of several other empirical studies. For example, Ilzetzki et al. (2013) find that fiscal multipliers are lower in countries with debt levels above 60 % of GDP. Nickell and Tudyka (2014), using a similar methodology to ours but with annual data, find that fiscal multipliers are larger in advanced economies with lower debt. Using a local projections model for OECD countries, Auerbach and Gorodnichenko (2013) also find that, pre-crisis, fiscal multipliers from aggregate government consumption and investment shocks diminished, even in deep recessions, when government debt rose.[12] While these studies document the importance of fiscal positions for fiscal multipliers, they are silent about the empirical relevance of the theoretical channels through which the fiscal position affects multipliers. In the next section, we extend our model to study the relevance of the two channels in a unified framework.

3.2. Why does the fiscal position matter? Ricardian channel and interest rate channel

We explore the empirical relevance of the two channels through which fiscal positions may impact fiscal multipliers: a Ricardian channel and an interest rate channel. The Ricardian channel has been explored in an older literature on the impact of fiscal policy on private consumption (Giavazzi and Pagano 1990; Blanchard 1990a, 1990b; Bertola and Drazen 1993; Perotti 1999). For example, Giavazzi and Pagano (1990) argue that unexpectedly high consumption in Ireland and Denmark in the late 1980s can partially be attributed to households' response to government spending cuts that signaled lower future tax burdens. Conversely, the decline in private consumption following the large fiscal expansion in Sweden in the early 1990s may reflect similar Ricardian considerations (Giavazzi and Pagano 1996). Perotti (1999), using a single-equation framework with measures of fiscal position as interaction terms, estimates the impact of government expenditures on private consumption in OECD countries during the three decades ending in the mid-1990s, and finds that the impact varies with the initial level of government debt. Compared to his work, the multivariate framework of the IPVAR allows us to evaluate how fiscal position determines not only the fiscal impact on private consumption but also on output. We use the framework to bridge the response of consumption and output to fiscal shocks, thereby explicitly establishing the relevance of Ricardian considerations (i.e. private consumption effects) as a *mechanism* for a government's fiscal position to matter for

[11] Figure A.3 in the Supplementary Appendix provides the distribution of government debt-to-GDP ratio in our sample. Table A.2 provides the specific percentile values from the sample.

[12] As noted earlier, Auerbach and Gorodnichenko (2017) report no statistically significant difference between fiscal multipliers depending on government debt in their sample of OECD countries. Similarly, using annual data, Corsetti, Meier, and Muller (2012) find only statistically insignificant differences between fiscal multipliers depending on different levels of debt (and a number of other conditioning variables). Their generally weak results may reflect the challenges of using the timing assumption of Blanchard and Perotti (2002) for identifying fiscal shocks in annual data as discussed in Perotti (2008).

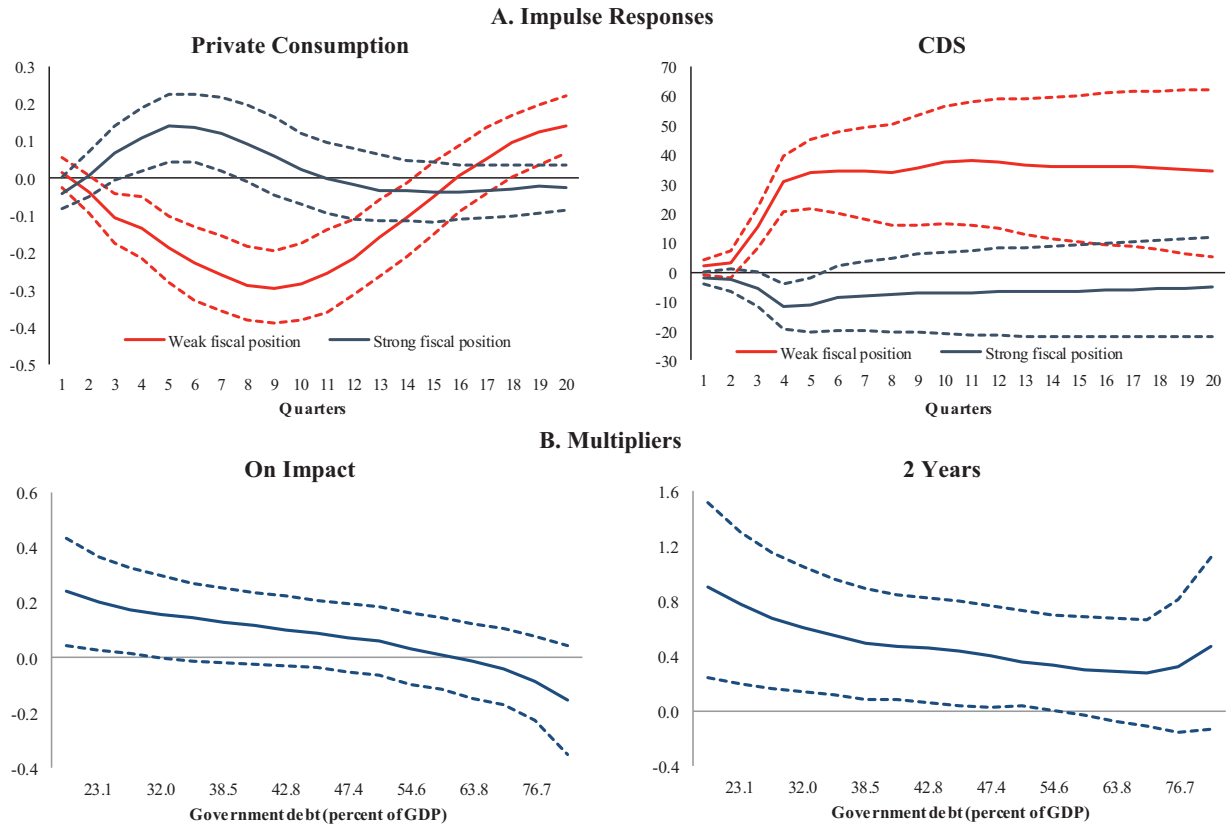

Fig. 3. Ricardian and Interest Rate Channels: Joint Model.
Note: The upper graphs show the conditional impulse responses (deviation from baseline in percentage points) for strong (blue) and weak (red) fiscal positions. The lower graphs show the fiscal multipliers on impact and after two years (cumulative change in output relative to cumulative change in government consumption after a fiscal shock) by government debt, ranging from the 10th to the 90th percentile of government debt in the sample. These are based on estimates from the IPVAR model, where model coefficients are conditioned only on fiscal position. Government debt as a percentage of GDP is the measure of fiscal position. The strong fiscal position corresponds to the 10th percentile of debt-to-GDP ratio from the sample, while the weak fiscal position corresponds to the 90th percentile. Solid lines represent the median, and dotted bands are the 16–84 % confidence bands.

fiscal multipliers (i.e. output effects). Moreover, we use a much broader sample of countries and cover more recent data than Perotti (1999).

In theory, the interest rate channel operates through risk premia charged by risk averse investors. For example, Corsetti et al. (2013) employ a DSGE model in which sovereign risk premia rise (i.e. rising CDS spreads), in response to a deteriorating fiscal outlook of an economy (i.e. rising government debt) which then raises the economy's overall borrowing costs. The closer to sovereign default, the greater the likelihood of tax increases and expenditure cuts that will erode firms' profitability and households' incomes. The resulting decline in private sector aggregate demand reduces the size of the multiplier. Given these theoretical insights, our main contribution is to provide an empirical assessment of the interest rate channel.[13]

To show the relevance of the Ricardian and interest rate channels, we augment the baseline model with private consumption and CDS spreads. As discussed in Section 2, we order private consumption between government consumption and output, and CDS spreads last in the model. Including both variables allows us to assess the relevance of the two channels together in a "joint" model. However, the inclusion of CDS spreads significantly limits the sample: it removes observations before 2003 and those for 5 countries. To assess the relevance of the Ricardian channel, which can be studied using a larger sample, we also estimate the model with each channel separately. In fact, the model with only the Ricardian channel results in about twice the number of observations from the joint model that includes both channels. For these "separate" models, we retain the respective ordering of private consumption and CDS spreads as in the joint model.

We find statistically significant evidence that both channels operate in our sample. The upper two panels of Fig. 3 show the impulse responses of private consumption and CDS spreads in response to a positive government consumption shock.

[13] There is a rich literature on the link between sovereign defaults and fiscal position, i.e. the level of debt (e.g. Arellano 2008; Mendoza and Yue 2012). Our paper studies how such linkages matter for the transmission of fiscal policy.

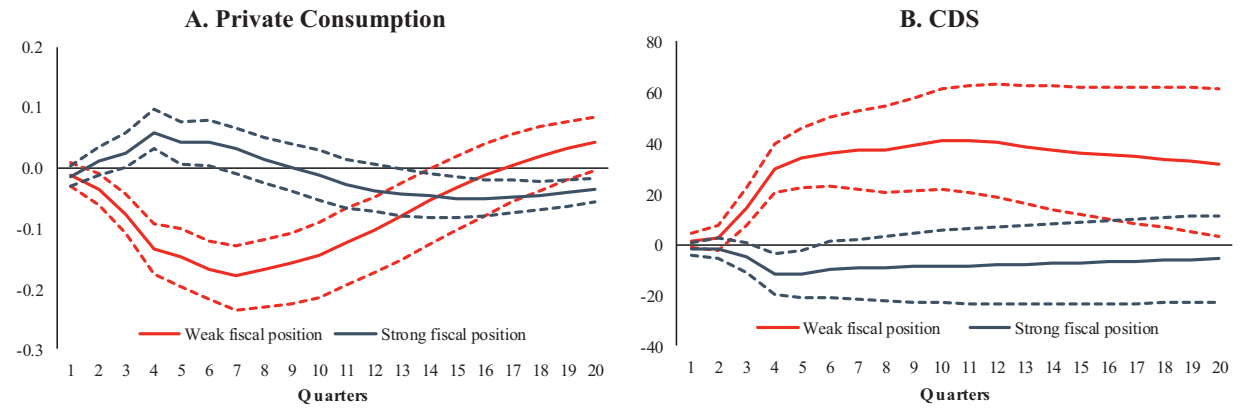

Fig. 4. Ricardian and Interest Rate Channels: Impulse Responses in Separate Models.
Note: The graphs show the conditional impulse responses (deviation from baseline in percentage points) for strong (blue) and weak (red) fiscal positions. These are based on estimates from the IPVAR model, where model coefficients are conditioned only on fiscal position. Government debt as a percentage of GDP is the measure of fiscal position. The strong fiscal position corresponds to the 10th percentile of debt-to-GDP ratio from the sample, while the weak fiscal position corresponds to the 90th percentile. Solid lines represent the median, and dotted bands are the 16–84 % confidence bands. Multipliers can be found in the supplementary annex.

Again, economies with weak fiscal positions are those with government debt in the 90th percentile in the sample; those with strong fiscal positions are economies with government debt in the 10th percentile. A fiscal stimulus in an economy with weak fiscal positions is associated with significantly lower private consumption for up to four years whereas a stimulus in an economy with strong fiscal positions significantly lifts private consumption for up to two years. The difference in the responses of private consumption is statistically significant, in the second and third year after the fiscal stimulus. A fiscal stimulus also raises CDS spreads significantly in an economy with weak fiscal positions for several years after the stimulus. In contrast, in economies with strong fiscal positions, CDS spreads typically do not respond statistically significantly to fiscal stimulus. Again, the difference between the responses of CDS spreads across two fiscal positions is statistically significant.

The lower two panels of Fig. 3 illustrate fiscal multipliers, on impact and after two years, conditional on government debt. Impact fiscal multipliers range from about 0.2 for low government debt to virtually nil when government debt is high. Over time, after two years, these multipliers rise to 0.9 when government debt is low (in the 10th percentile) but about half as large (0.5) when debt is high (in the 90th percentile). Allowing for feedback loops with government consumption and CDS spreads has resulted in slightly larger fiscal multipliers when debt is low compared to the model that does not include them (Fig. 1). This reflects the boost to private consumption that fiscal stimulus provides: when debt is low, there is limited need for precautionary household savings (the Ricardian channel) and for rising sovereign risk premia (the interest rate channel). The differential impulse responses of private consumption and CDS spreads during times of high and low debt, and the corresponding multiplier estimates together highlight the relevance of the Ricardian and interest rate channels in explaining why government debt matters for the magnitude of fiscal multipliers.

We then analyze the relevance of the Ricardian and the interest rate channels in models that are separately estimated. The left panel of Fig. 4 shows the impulse responses of private consumption to a positive fiscal shock in a model that only includes private consumption (in addition to the baseline variables). The right panel shows the corresponding impact on CDS spreads in the model that only includes CDS spreads (in addition to the baseline variables). The responses of private consumption and CDS spreads from separate models are strikingly similar to those from the joint model (Fig. 3). Private consumption falls when fiscal stimulus is implemented amid weak fiscal positions and rises otherwise; CDS spreads rise following stimulus amid weak fiscal positions and remain broadly constant otherwise. Compared with the response from the joint model (in Fig. 3), the response of CDS spreads to a fiscal shock is almost identical in the separate model that excludes private consumption. In the broader sample that is unconstrained by data requirements for CDS spreads, the responses of private consumption are somewhat more muted but still statistically significantly different between strong and weak fiscal positions.[14]

4. Robustness exercises

We consider a number of exercises to check the robustness of our headline findings about the empirical relevance of the Ricardian and the interest rate channels: (i) alternative samples of countries and time periods; (ii) changes in lag length; (iii)

[14] The corresponding impacts on output, i.e. fiscal multipliers, as estimated separately from the Ricardian model and the interest rate model are also quite similar to the ones estimated from the joint model (Fig. 3, panel (B)). More importantly, fiscal multipliers remain dependent on government debt. See Figure A.4 in the Supplementary Appendix.

alternative ordering of some variables in the IPVAR; (iv) alternative definition of fiscal position; (v) alternative identification scheme; (vi) controlling for the phases of business cycles, financial crises, and exchange rate regimes; and (vii) controlling for debt dynamics. As mentioned earlier, data for CDS spreads are sparse and inclusion of CDS spreads in the joint model results in a significant loss of degrees of freedom. For the subsamples, we employ the joint model but restrict our analysis to the advanced economies and the post-crisis period. In some other robustness exercises, we employ the model with only the Ricardian channel because of data limitations.

4.1. Alternative samples and changes in lag length

Fig. 5 present the impulse responses of private consumption and CDS spreads for weak and strong fiscal positions in different samples and lag structures using the joint model that includes both private consumption and CDS spreads.[15] Like before, weak and strong fiscal positions are taken to be government debt corresponding to the 10th (strong) and 90th (weak) percentiles from the sample.[16] By and large, our baseline results are qualitatively similar when the sample is restricted to advanced economies, the post-crisis years from 2009 onwards, and when shorter or longer lags are considered. That is, impulse responses of private consumption are systematically weaker and those of CDS spreads stronger for weak fiscal positions than for strong fiscal positions.[17]

4.2. Alternative ordering of variables and definition of fiscal position

The ordering of government consumption before output is key to the Blanchard and Perotti (2002) identification we used in Section 3. Ordering CDS spreads last in VAR models is standard as well. Keeping these orderings intact, we report results for alternative orderings among the rest of the model variables: ordering private consumption after output, and current accounts after exchange rates. In addition, we redefine the fiscal position of a country as the deviation of its government debt from the respective group-specific or country-specific average which reflects a notion of fiscal position that is relative to its peers or its historical average. The headline results hold for alternative orderings of model variables or when the alternative measure of fiscal position is used. That said, in some instances (except when restricting the sample to advanced economies and focusing on the post-crisis period), the statistical significance of the difference between fiscal multipliers across different fiscal positions naturally diminishes as degrees of freedom shrink.[18]

4.3. Alternative identification scheme

We consider an alternative identification scheme based on forecast errors as in Auerbach and Gorodnichenko (2013) and using the local projections model to trace the effects of fiscal shocks. Fiscal shocks are based on the one-year ahead forecast errors from the OECD's semi-annual Economic Outlook, available for 19 advanced and emerging market economies at semi-annual frequency during 2004H1-2011H2. We then trace the effects of these shocks on key model variables using the local projections framework as in Jorda (2005). Specifically, we estimate a single-equation model, using ordinary least squares, each for output, private consumption, and CDS spreads. The model for output is:

$$Y_{i,t+h} = \alpha_{\mathrm{ih}} + \Pi_{\mathrm{h}}(\mathrm{L})Y_{i,t-1} + \Psi_{\mathrm{h}}(\mathrm{L})G_{i,t-1} + \Phi_{\mathrm{h}}(\mathrm{L})FE_{it}{}^{G} + \mathbf{H}_{\mathrm{h}}(\mathrm{L})FE_{it}{}^{G}Q_{it-1} + \mu_{\mathrm{h}}Q_{it-1} + \Omega_{\mathrm{h}}(\mathrm{L})C_{i,t-1} + \Theta_{\mathrm{h}}(\mathrm{L})CDS_{i,t-1} + u_{it} \tag{5}$$

where Y is log real output, G is log real government consumption, C is real private consumption, CDS is CDS spreads, FE is the unpredicted forecast error from OECD, and Q is government debt. The model includes 2 lags (i.e. one year, since the data is semi-annual). The coefficients $(\mathbf{\Phi} + \mathbf{\Xi} * Q)$ represents an impulse response that traces out the impact of fiscal shocks on output over the horizon h, conditional on government debt. As in Auerbach and Gorodnichenko (2013), the forecast errors are defined as the unpredicted portion of the actual OECD forecast errors, i.e. the residuals from a regression of OECD forecast errors on the other independent variables of Eq. (5).

Fig. 6 shows the impact of fiscal shocks on fiscal multipliers and on private consumption conditional on fiscal positions, when fiscal shocks are identified as forecast errors of government consumption. A weak fiscal position is defined as government debt in the 90th percentile of the sample while a strong fiscal position is defined as government debt in the 10th percentile. As before, the output response of fiscal shocks is smaller when fiscal positions are weaker. This is partly attributable to a contraction in private consumption when a fiscal shock is implemented in a country with a weak fiscal position. Our results also indicate that impulse responses of CDS spreads are not meaningfully different when fiscal positions are weak or strong.

[15] Figure A.5 in the Supplementary Appendix present additional findings.

[16] To ensure that we are not reporting outliers, we also present results (in Figure A.5 in the Supplementary Appendix) for alternative cut-offs: 25th percentile for low debt and 75$^{\mathrm{th}}$ percentile for high debt.

[17] Figure A.6 in the Supplementary Appendix summarizes the estimates of fiscal multipliers that correspond to Fig. 5 and Figure A.5 of the Supplementary Appendix. Again, the multipliers are systematically larger for low government debt (strong fiscal position) than high government debt (weak fiscal position).

[18] Results are shown in Figure A.7 of the Supplementary Appendix.

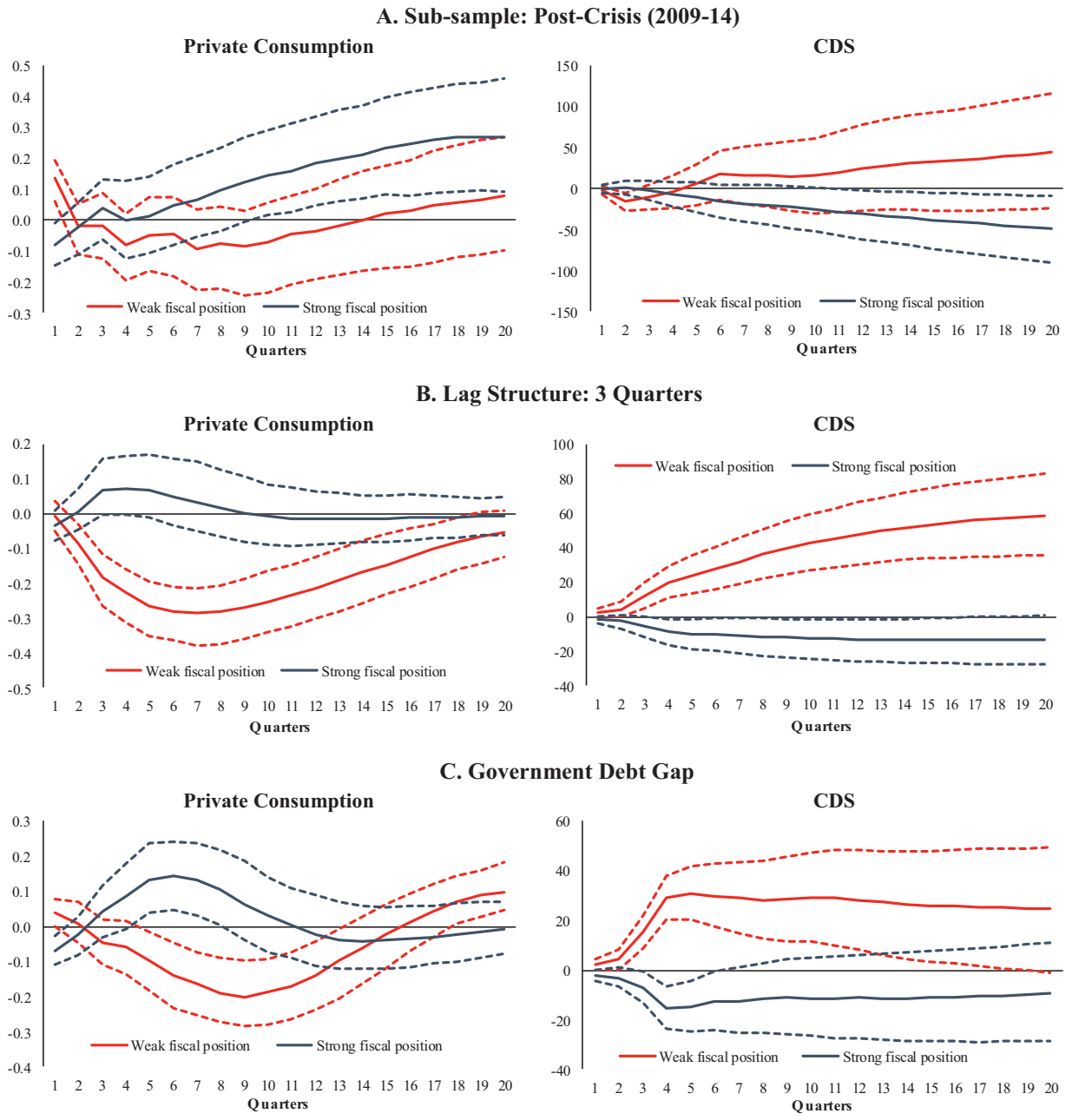

Fig. 5. Ricardian and Interest Rate Channels: Impulses Responses.
Note: The panel C is based on government debt gap (deviation from group mean) as conditioning variable. Strong fiscal positions are defined as government debt in the 10th percentile and weak fiscal positions are defined as government debt in the 90th percentile in the sample. These are based on estimates from the IPVAR model, where model coefficients are conditioned on fiscal position, with government debt as a percentage of GDP is the measure of fiscal position.

4.4. Business cycle phases, financial crises, and exchange rate regimes

Given theoretical and empirical grounds that multipliers can be different across the phases of business cycles, during financial crises, and across exchange rate regimes, we conduct additional exercises to check whether our results are robust to controlling for these aspects. The fiscal position could be systematically weaker during recessions than expansions. In that case, the effects we attribute to the fiscal position would merely reflect well-established effects of business cycles on fiscal multipliers (Auerbach and Gorodnichenko 2012, 2013). For financial crises, specifically, previous studies suggest that the correlation between financial crises and high debt episodes could strengthen or weaken our results. The presence of

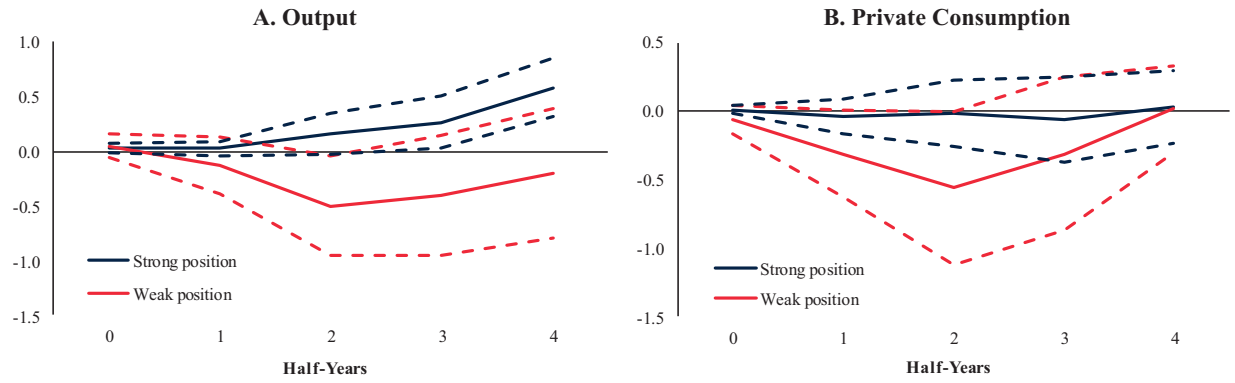

Fig. 6. Conditional Impulse Responses Based on Local Projections Model.
Note: The graphs show the impulse responses for strong (blue) and weak (red) fiscal positions, as a cumulative percent change. These are defined as the coefficient estimates from a regression of h-period-ahead real output and real private consumption on lagged output, private consumption, CDS spreads, and unpredicted OECD forecast errors, in which all coefficients are interacted with government debt in percent of GDP. The strong fiscal position corresponds to the 10th percentile of debt-to-GDP ratio from the sample, while the weak fiscal position corresponds to the 90th percentile. Solid lines represent the coefficient estimates, and dotted bands are the 85 % confidence bands.

credit constrained households and firms, caused by disruptions in access to credit during crises, could be expected to raise fiscal multipliers.[19] In this case, *prima facie*, financial crisis episodes should be episodes of large fiscal multipliers. On the other hand, the presence of highly risk averse households that build precautionary savings in financial crises could reduce fiscal multipliers (de Paoli and Zabcyk 2013). This would argue for financial crises episodes being episodes of smaller fiscal multipliers. In flexible exchange rate regimes, the exchange rate may act as a buffer to dampen output effects of fiscal shocks compared with fixed exchange rate regimes.

The sparse data for CDS spreads—delaying the sample's start to around 2003 (a period during which exchange rate regimes were largely unchanged), and the recessions and financial crises to the financial crisis and global recession of 2008–09—restricts our ability to conduct these additional robustness exercises using the joint model. To relieve these degrees-of-freedom constraints, the additional robustness tests were carried out by dropping CDS spreads from the model and including only private consumption—i.e. we focus only on the Ricardian channel.

To estimate fiscal multipliers conditional on the fiscal position while controlling for business cycle effects, we replace Eq. (2) by the following expression that jointly conditions the model coefficients on both the fiscal position and the business cycle state as follows:

$$\alpha_{l,it}^{jk} = \beta_{1,l}^{jk} + \beta_{2,l}^{jk} fs_{it} + \beta_{3,l}^{jk} bc_{it}, \tag{6}$$

where *bc* is an indicator variable that equals 1 for recessions and 0 for expansions as determined by the Harding-Pagan (2002) dating algorithm.[20] We undertake a similar approach to control for financial crises and exchange rate regimes, and include the respective dummies in the equation above. Financial crises are defined as in Laeven and Valencia (2013). The fixed exchange rate regime is defined as in Ilzetzki et al. (2013), extended using the IMF's *de facto* exchange rate classification.

Fig. 7 shows the impulse responses of private consumption in response to fiscal shocks in these exercises. Private consumption responds more negatively to positive fiscal shocks when fiscal positions are weak than when they are strong. The difference in private consumption response between strong and weak fiscal positions is statistically significant at some intermediate horizons. This suggests that the fiscal position genuinely represents a different conditioning state that determines fiscal multipliers rather than capturing other correlates such as business cycle effects, financial crises, and exchange rate regimes.[21] We also study the corresponding fiscal multipliers on impact and after two years, depending on fiscal positions, in these exercises.[22] Fiscal multipliers, especially at the two-year horizon, are larger in recessions than expansions, in crises than in non-crises, and in flexible exchange rate regimes than in fixed exchange rate regimes. These findings are consistent with others in the literature (Auerbach and Gorodnichenko 2013; Bachmann and Sims 2012; Candelon and Lieb

[19] See Spilimbergo, Symanski, and Schindler (2009); Zubairy (2014); and Eggertsson and Krugman (2012).

[20] In our sample, there is little overlap between recessions and high debt episodes. Recessions and weak fiscal positions coincide in only 2 percent of observations (Table A.3 of Supplementary Appendix). On average, debt ratios also do not differ meaningfully between economic expansions and recessions: The average debt-to-GDP ratio during economic expansion is 52 percent, compared to 54 percent during recessions.

[21] When the model with the Ricardian channel only is estimated with the restricted sample of the joint model in section 3,2 and Fig. 3, the results are broadly robust (see Supplementary Appendix Figure A.4).

[22] We present these results in Supplementary Appendix Figures A.8 and A.9. As a benchmark, the first two columns of Figure A.8 show the fiscal multipliers in the full sample, allowing only for Ricardian effects and disregarding the interest rate channel (as in the left chart of Fig. 4).

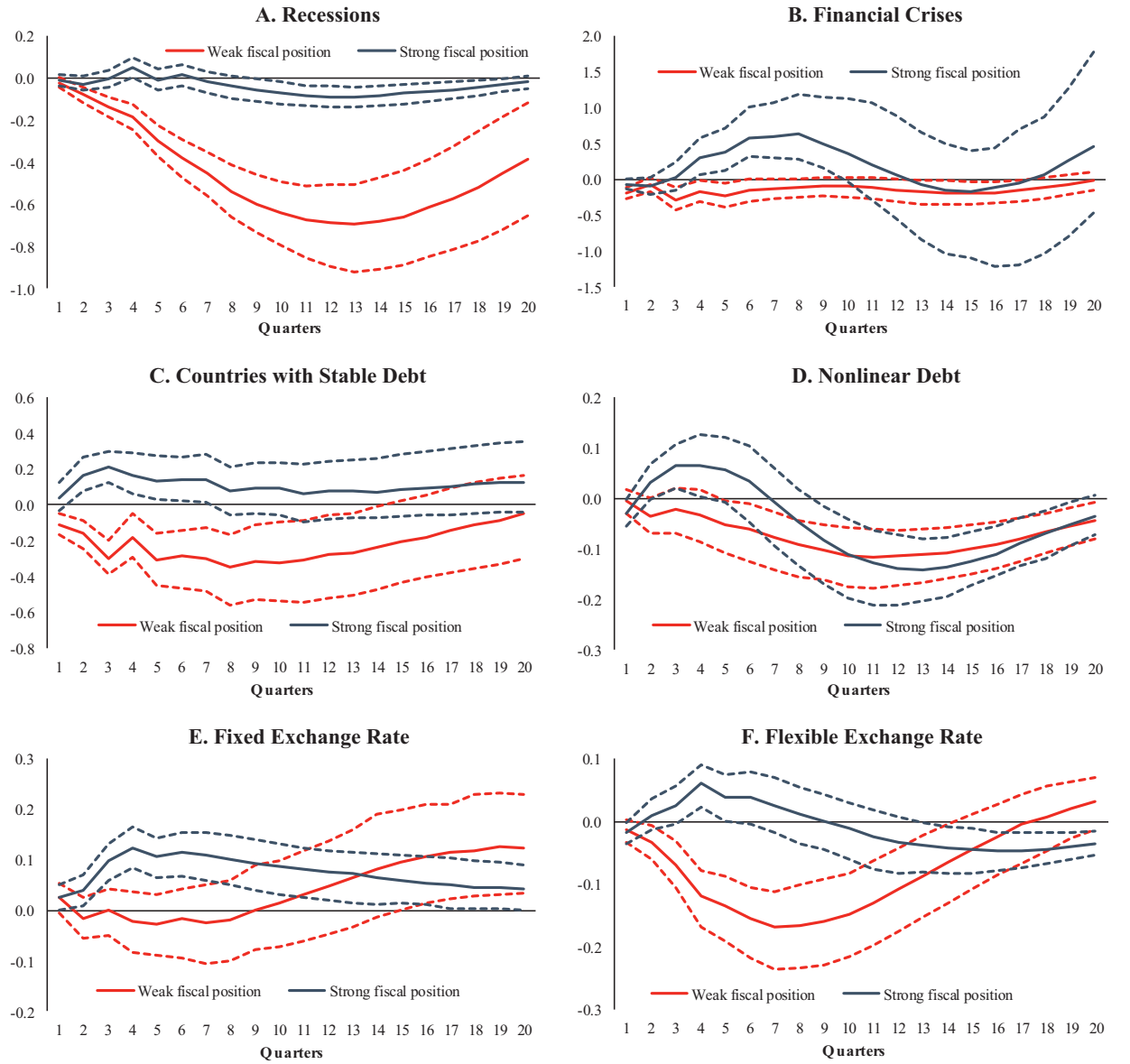

Fig. 7. Ricardian Channel Only: Impulse Responses of Private Consumption.
Note: The graphs show the impulse responses of private consumption over time by fiscal position. These are based on estimates from the IPVAR model, where model coefficients are conditioned on fiscal position for the samples of recessions (defined as in Harding and Pagan 2002), expansions, financial crises (defined as in Laeven and Valencia 2013), non-crises, countries with stable debt (advanced economies excluding Belgium, Canada, and Italy during 1980–2006), and nonlinear debt. "Nonlinear debt" are coefficients conditioned on a linear and a quadratic terms of government debt. Coefficients are jointly conditioned for fiscal position and recession, financial crises, and fixed exchange rates. The strong fiscal position corresponds to the 10th percentile of debt-to-GDP ratio from the sample, while the weak fiscal position corresponds to the 90th percentile. Dotted bands represent the 16–84 % confidence bands.

2013; Ilzetzki et al., 2013). The main takeaway from these exercises is that fiscal multipliers remain debt-dependent: they are larger when fiscal positions are strong, although sometimes not statistically significantly so.

4.5. Debt dynamics

As discussed in Section 2, our IPVAR framework considers the state-dependent effects of initial level of government debt, but it does not allow for endogenous feedback loops from government debt to model variables which could then result in biased estimates of multipliers. Such feedback loops are, however, expected to play a significant role during times of unstable debt. Thus, one way to guard against this potential bias is to estimate the model using a sample that exhibits relatively stable debt dynamics. Accordingly, we present estimates for a sub-sample of advanced economies during

Table 1
Country Coverage.

Advanced		*Developing*	
Country	Period	Country	Period
Australia	1980:Q1-2013:Q4	Argentina	1993:Q1-2013:Q4
Belgium	1991:Q1-2013:Q4	Bulgaria	1999:Q1-2013:Q4
Canada	1980:Q1-2013:Q4	Brazil	1995:Q1-2013:Q4
Germany	1991:Q1-2013:Q4	Chile	1989:Q1-2013:Q4
Denmark	1999:Q1-2013:Q4	Colombia	2000:Q1-2013:Q4
Spain	1995:Q1-2013:Q4	Czech Republic	1999:Q1-2013:Q4
Finland	1998:Q1-2013:Q4	Croatia	2000:Q1-2013:Q4
France	1980:Q1-2013:Q4	Hungary	1995:Q1-2013:Q4
United Kingdom	1980:Q1-2013:Q4	Israel	1999:Q1-2013:Q4
Iceland	1997:Q1-2013:Q4	Mexico	1991:Q1-2013:Q4
Italy	1999:Q1-2013:Q4	Poland	1999:Q1-2013:Q4
Lithuania	1995:Q1-2013:Q4	Romania	1998:Q1-2013:Q4
Netherlands	1988:Q1-2013:Q4	Slovak Republic	1999:Q1-2013:Q4
Norway	1996:Q1-2013:Q4	South Africa	1993:Q1-2013:Q4
Portugal	1980:Q1-2013:Q4	Turkey	1998:Q1-2013:Q4
Slovenia	1995:Q1-2013:Q4		
Sweden	1993:Q1-2013:Q4		
United States	1980:Q1-2013:Q4		

Note: The table shows the list of countries in the sample. Coverage corresponds to maximum temporal coverage for each country in the baseline specification of the IPVAR model. Coverage may differ for specifications used in the robustness exercises. The list of countries is presented in the Appendix. Our developing-country coverage comprises primarily emerging and frontier market economies that have some ability to tap into international financial markets, which renders the fiscal solvency risks that underpin our nonlinear crowding-out mechanisms relevant. We exclude low-income countries not only because of data reliability issues, but also because they primarily rely on concessional finance for government expenditure, which would not reflect the crowding-out mechanisms.

1980–2006.[23] Our results indicate that, mitigating concerns about potential biases caused by endogenous debt, multipliers are also larger when fiscal positions are strong in a sample of advanced economies with low and stable debt.[24] In addition, to check for potential nonlinearities in the role of government debt, we also estimate the joint model by including quadratic debt (in place of linear debt) in the law of motion of the coefficients (in Eq. (6)). Our headline result remains intact: fiscal multipliers are higher when fiscal positions are strong than when positions are weak.

5. Comparison with previously estimated fiscal multipliers

Our results from the benchmark model suggest that two-year fiscal multipliers can range from nil when government debt is high (in the 90th percentile, i.e. above 92 % of GDP) to 0.6 when government debt is low (in the 10th percentile, i.e. below 17 % of GDP). When controlling for both transmission channels, these multipliers rise somewhat to range from 0.5 when debt is high to 0.9 when debt is low. During recessions, two-year fiscal multipliers in low-debt countries can reach 1.5.

The magnitude of our estimated multipliers conditional on government debt is higher than previous estimates, which are typically negative, when government debt is high and somewhat lower when government debt is low (Table 2). Nickell and Tudyka (2014) estimate an impact multiplier around 1.2 that fades gradually to near-zero if government debt remains below 60 % of GDP. In contrast, at higher levels of government debt, the impact of stimulus on de-trended GDP turns statistically significantly negative over the longer-term. Ilzetzki et al. (2013) similarly estimate a negative cumulative longrun multiplier (of −3) when government debt exceeds 60 % of GDP and insignificantly different from zero when government debt is lower. The findings of Auerbach and Gorodnichenko (2017) contrast with these earlier studies that find significantly negative fiscal multipliers if government debt is high. Auerbach and Gorodnichenko (2017), while not providing explicit multiplier estimates, find that a 1 % increase in government spending raises real GDP statistically significantly over the long term when government debt is at its (country-specific) minimum and has only insignificant effects when government debt is at its (country-specific) maximum.

In general, these conditional multipliers suggested by our results as well as previous studies conditioning on government debt are somewhat smaller than those estimated in studies that condition on other factors (Table 2). Especially recent studies that condition on recessions have found at times very large multipliers in advanced economies. Several have estimated

[23] During 1980-2006, government debt in most advanced economies was on a broadly low and stable path. We remove we remove Canada, Italy and Belgium that exhibited high debt levels throughout the sample period.

[24] We present these results in Figure A.8 in the Supplementary Appendix.

Table 2
Fiscal Multiplier Estimates.

Conditioning on government debt				
Study	Sample	Methodology	Government debt	
			High	Low
Our results 1/	33 countries, 1980–2014	IPVAR	0–0.5	0.6–0.9
Ilzetzki et al. (2013) 2/	44 countries, 1960–2007	SVAR	−3	insignificant
Nickell and Tudyka (2014) 2/	17 EU countries, 1970–2010	IPVAR	<0	1.2
Auerbach and Gorodnichenko (2017) 3/	25 OECD countries, 2003–17	LPM	<0	>0

Conditioning on business cycles 4/				
Study	Sample	Methodology	Recession	Expansion
Favero et al. (2011) 5/	US, 1980–2009	GVAR	"close to 2"	
Bachmann and Sims (2012)	US, 1960–2011	VAR	2.13–3.35	1.04–1.1
Auerbach and Gorodnichenko (2012)	US, 1947–2008	LPM	1.12–3.85	0.17–3.02
Auerbach and Gorodnichenko (2013)	OECD, 1985–2008	LPM	3.5	0
Blanchard and Leigh (2013) 6/	26 European countries, 2009–12	Panel regression	"Substantially above 1"	…
Candelon and Lieb (2013)	US, 1968–2010	TVAR	1–2.4	0.5

Unconditional 7/			
Study	Sample	Methodology	Average
Blanchard and Perotti (2002)	US, 1947–97	VAR	0.9–2.67
Gali, Lopez-Salido and Valles (2007)	US, 1954–2003	DSGE	1.74–3.5
Perotti (2008)	US, AUS, CAN, UK, 1926–2003	VAR	0 (UK, Canada) −3.1 (US)
Fatas and Mihov (2009)	Not applicable	Survey	>1
Mountford and Uhlig (2009)	US, 1955–2000	VAR	0.65
Perotti (2011)	US 1939–2008	SVAR, EVAR	"in the neighbourhood of 1″
Ramey (2011)	US	Survey	0.6–1.8
Auerbach and Gorodnichenko (2012)	US, 1947–2008	LPM	1–2.12
Bachmann and Sims (2012)	US, 1960–2011	VAR	0.89–0.88
Alesina et al. (2015)	16 OECD countries, 1978–2009	SUR	negative to positive

Note: IPVAR stands for interacted panel vector autoregression, SVAR for structural vector autoregression, VAR for structural vector autoregression, TVAR for threshold vector autoregression, LPM for local projections model, EVAR stands for expectations-augmented vector autoregression.
1/ High government debt is defined as government debt above 60 % of GDP, low government debt is the remainder. Fiscal instrument is government consumption.
2/ High government debt is defined as debt in the 90th percentile of the sample (92 % of GDP). High government debt is defined as debt in the 10th percentile of the sample (17 % of GDP). Fiscal instrument is government consumption.
3/ Explicit multiplier estimates not available. Table shows longterm impulse response of real GDP. Fiscal instrument is government spending (consumption and investment).
4/ Fiscal instrument is government spending, except for Auerbach and Gorodnichenko (2012) who use a wide range of fiscal instruments.
5/ Fiscal shocks are consolidation episodes (tax and spending) as identified in Pescatori et al. (2011).
6/ Fiscal shocks are structural fiscal balance changes during 2009–10.
7/ Fiscal instrument is government spending, except when otherwise specified. Auerbach and Gorodnichenko (2012), Blanchard and Perotti (1999), Ramey (2011), and Gali, Lopez-Salido and Valles (2007) discuss a range of fiscal instruments.

peak fiscal multipliers during recessions in the range of 3–4 (Bachmann and Sims 2012; Auerbach and Gorodnichenko 2012, 2013; Candelon and Lieb 2013). In a literature survey of earlier U.S. evidence, Ramey (2011) puts multipliers during a severe recession "at the upper bound of this [0.8–1.5] range," notwithstanding considerable uncertainty about the estimates. Much of this evidence rests on U.S. data. However, in Europe as well, during the 2009–11 recessions in the wake of the global financial crisis, fiscal stimulus packages have been attributed with multipliers above 1 (Blanchard and Leigh 2014).[25] When we condition our multiplier estimates on recessions as well as government debt, we also find that multipliers can be above 1, at least for countries in the bottom quintile of government debt.[26]

6. Conclusion

A growing literature has documented how weaker government finances reduce the effectiveness of fiscal policy, i.e. fiscal multipliers. In this paper, we complement this literature by analyzing the empirical relevance of the two theoretical channels through which the fiscal position impacts the size of fiscal multipliers. Specifically, we study the Ricardian channel where

[25] Conversely, OECD fiscal consolidation packages have been estimated to have long-term multipliers close to 2 (Favero, Giavazzi and Perego 2011).
[26] Four EU countries in the sample entered the 2008-09 recession with general government debt in the bottom quintile of the sample.

households reduce consumption in anticipation of future fiscal adjustments during times of high debt; and the interest rate channel where increased investors' perception of credit risks, raises sovereign credit risk and economy-wide borrowing cost, thereby weakening private domestic demand. We deploy an empirical model that allows us to trace the effects of fiscal shocks not only on private consumption and CDS spreads (as a measure of risk premia) but also on output. By bridging the response of consumption, CDS spreads and output to fiscal shocks, we explicitly establish the relevance of Ricardian and interest rate considerations (i.e. private consumption and borrowing cost effects) as the two *channels* for a government's fiscal position to matter for fiscal multipliers (i.e. output effects). We also undertake a wide range of exercises to show the robustness of our findings with respect to the relevance of these channels.

Future research can usefully focus on three issues. First, while some earlier theoretical studies considered each channel separately, there has been no study exploring how the two channels operate jointly in a general equilibrium framework. This type of work could provide insights about the relative strength of each channel in response to different types of shocks. Second, one could study whether the two channels function differently in open economies in the context of a multi-country DSGE model. Finally, it would be useful to study the relevance of the two channels in a framework that allows fiscal-monetary policy interactions. In particular, one can assess how the use of monetary policy affects the roles of the two channels during periods of weak fiscal position.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jmoneco.2019.03.004.

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