# What drives the short-run costs of fiscal consolidation? Evidence from OECD countries

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Abstract

In a panel of OECD countries we investigate the short-term effects of fiscal consolidation on output and employment, and how these vary with the state of the business cycle, monetary policy, the level of public debt, the current account, and the strength of the financial cycle. The estimation makes use of local projection methods and fiscal consolidation shocks identified through the narrative approach. Our main finding is that short-term fiscal multipliers remain for the most part below unity, even in bad states, suggesting that important offsetting factors had been at play in past consolidation episodes. In particular, we do not find evidence that fiscal multipliers are above unity when the output gap is negative or monetary policy is tight. Instead, we find evidence of lower than average multipliers when the current account is in deficit and public debt is high (although in the latter case employment costs tend to be larger). One factor found to raise the costs of fiscal consolidation is weak private credit growth. Even in this case, however, point estimates indicate that fiscal multipliers are not larger than one. Our results suggest that fiscal consolidation multipliers are not necessarily, or everywhere, larger than average in the aftermath of the global financial crisis.

Keywords: fiscal consolidation; fiscal multipliers; narrative approach; panel data; local projections.

JEL classification: E6

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# 1 Introduction

Since the onset of the global financial crisis fiscal policy has been hotly debated. After the collapse of Lehman Brothers in September 2008, G20 governments decided to deploy large discretionary fiscal packages to minimise the risk of another 1930s-style Great Depression. The effects were a source of significant disagreement among economists, with estimates varying greatly across studies.[1] With the recovery underway, policymakers' attention quickly turned to the risks of high and rising public debt as well as huge unfunded liabilities (e.g. Cecchetti et al, 2011). Fiscal consolidation measures were phased in as early as late 2010, even in countries such as, for example, the United States and Great Britain, which had no problem refinancing their debt at low cost. This quick turnaround was highly controversial. Critics argued that with a large degree of economic slack and policy rates constrained by the zero lower bound, fiscal multipliers were high; this allegedly made the timing of tightening premature and put the incipient recovery at risk.[2] Even in countries at risk of losing market access to funding, actual fiscal plans were criticised for being too front-loaded or insufficiently gradual.

These criticisms found some support in a new and growing literature on the state-dependency of fiscal multipliers. Based on pre-crisis historical evidence, Auerbach and Gorodnichenko (2012, 2013), Bachmann and Sims (2012), Baum et al (2012), Batini et al. (2012) and Fazzari et al (2012), among others, find that short-run government spending multipliers tend to be substantially larger when there is spare economic capacity or economic growth is weak.[3] Moreover, Corsetti, Meier and Müller (2012) find fiscal multipliers to be much larger during financial crises, when credit constraints are most likely to be binding (a finding that holds even when public finances are in no doubt). Sims and Wolff (2013, 2014) show that fiscal multipliers are strongly countercyclical in estimated conventional medium-scale DSGE models.[4] Christiano, Eichenbaum and Rebelo (2011), Eggertsson (2011) and Woodford (2011) have shown that a binding zero lower bound in standard New Keynesian models can lead to very high multipliers. A common feature of these studies is that fiscal multipliers are not only found to be countercyclical or larger than average in bad times, but also larger than one (and, in some cases, significantly so). This suggests the presence of strong Keynesian features in the economy, which make the short-run output

[1] See eg Ramey (2011) for a survey of government spending multipliers in the United States. Structural models that share similar features yield largely different estimates of fiscal multipliers: see eg Coenen et al (2010); Cogan et al (2010); Cwik and Wieland (2011); Leeper, Traum and Walker (2011); Drautzburg and Uhlig (2013).

[2] Some commentators even argued that in the presence of sufficiently large hysteresis effects and negative output gaps consolidation could not only be more costly, but also self-defeating. In this case, provided markets believe fiscal sustainability is in no doubt, the correct fiscal response is expansionary and would pay for itself (see eg DeLong and Summers (2012)).

[3] In an earlier study Tagkalakis (2008) finds that the responses of private consumption to fiscal policy changes differ significantly between expansions and recessions. Although not estimating fiscal multipliers, the analysis by Aghion, Hémous and Kharroubi (2014) suggests that firms that are more reliant on external finance may be hit disproportionately by a tightening of fiscal policy.

[4] See also Canzoneri, Collard, Dellas and Diba (2015), who obtain state-dependent fiscal multipliers by assuming state-contingent costs of banking intermediation in the model of Curdia and Woodford (2010). Michaillat (2014) shows that an increase in public sector employment tends to raise private sector employment significantly more when the unemployment rate is high. His model, however, does not apply to output.

costs of fiscal consolidation bigger (in some cases substantially so) than the direct effect of the fiscal correction.[5]

The evidence in favour of state-dependency of fiscal multipliers has, however, been challenged recently. In particular, using military spending news for the United States Ramey and Zubairy (2014) found no evidence that multipliers are significantly larger when the unemployment rate is high. Moreover, Ramey and Zubairy (2014) argue that the findings of Auerbach and Gorodnichencko (2012, 2013) are not robust to crucial aspects of their empirical model, the way non-linear impulse response functions are computed, and their chosen definition of multiplier. The extent to which the zero lower bound has been relevant in practice is also questionable. Fiscal consolidation has, in some countries, occurred against a backdrop of historically low and declining real yields, to which major central banks' unconventional policy measures appear to have contributed significantly.[6] Finally, at least two other factors may act to reduce fiscal multipliers in the aftermath of the global financial crisis, at least in some countries. One factor is heightened sovereign risk due to high public debt. This normally translates into higher borrowing costs and higher uncertainty, thus acting as a disincentive to current private spending.[7] Another factor is diminished competitiveness, which is reflected in higher price and wage costs as well as larger current account deficits. In both cases, fiscal consolidation may help improve financial conditions, reduce costs and rebalance aggregate demand.

In this paper we estimate the short-term effects of fiscal consolidation shocks on output and employment for a panel of 17 OECD countries over the period 1978-2007. Following Jordà and Taylor (2013) we use Local Projection (LP) methods (as popularised by Jordà (2005)) and we measure fiscal consolidation as changes in the primary balance adjusted for the cycle and one-off events (in brief, cyclically-adjusted primary balance or CAPB). Since the latter is not exogenous to current and prospective economic conditions, we use the narrative fiscal consolidation shocks constructed by Devries, Guajardo, Leigh and Pescatori (2013) as an instrument to obtain consistent estimates.[8] Our main contribution to the literature is twofold. First, we examine the state-dependency of fiscal multipliers across multiple dimensions. Not only do we look at how fiscal multipliers vary with the state of the business cycle (or the output gap), but we also look at how they vary with the monetary policy stance, the level of public debt, the sign of the current account and the strength of private credit growth.

[5] A number of recent studies (Guajardo et al, 2011; Perotti, 2011, Jordà and Taylor, 2013) have also laid to rest the notion that fiscal austerity can be expansionary contrary, in particular, to the findings of Alesina and Ardagna (2010).

[6] An increasing number of theoretical studies have also challenged the idea of large fiscal multipliers at the zero lower bound. Fahri and Werning (2012) show that fiscal multipliers can be smaller than one if fiscal consolidation leads to internal devaluation necessary to restore competitiveness. Their analysis highlights the need to take into account all initial conditions of a country, such as its degree of competitiveness, when assessing the magnitude of fiscal multipliers. Kiley (2014) shows that in a standard New Keynesian model the assumption about the price adjustment mechanism is key to the finding of large fiscal multipliers at the zero lower bound. Braun, Korber and Waki (2013) argue that the finding of very large multipliers in Christiano et al (2011) depends on the method used to approximate the solution as well as on a parameterisation that does not match the declines in output and employment observed during the Great Depression. See also Aruoba and Schorfheide (2013) and Mertens and Ravn (forthcoming).

[7] See eg Corsetti, Kuester, Meier and Müller (2013) for a theoretical model of fiscal policy incorporating sovereign risk.

[8] The narrative approach in fiscal policy consists in reading official documents to identify the size and time of changes in policy which are unrelated to current and prospective economic conditions (Romer and Romer, 2010).

Second, we also investigate the state-dependency of the transmission mechanism of fiscal consolidation shocks. Although our empirical approach is closely related to that of Jordà and Taylor (2013), our analysis has a broader scope. Jordà and Taylor (2013) look only at how fiscal multipliers vary with the sign of the output gap, concluding that the data do not support the hypothesis of expansionary fiscal austerity. In addition, they do not examine the fiscal transmission mechanism.[9] The use of narrative shocks also links our analysis to that of Guajardo, Leigh and Pescatori (2014), which neither finds evidence of expansionary austerity. Yet, their study does not rely on LP methods, nor investigate the state dependency of fiscal multipliers.

The Local projection (LP) method employed in our analysis has at least two main advantages over more standard VAR methods. One is that LP methods allow to estimate responses on a variable-by-variable basis, thus freeing degrees of freedom. This, in turn, allows to condition on a richer set of variables than in VAR analyses, which may help achieve identification (ie insuring that fiscal shocks are truly random or orthogonal); it also allows a much broader set of impulse response functions to be computed. The second advantage of LPs is that they are more robust to misspecification of the unknown data generation process (Jordà, 2005).[10] This feature is particularly convenient when conditioning the effects of fiscal policy on different states of the economy. By *directly* estimating impulse response functions, LP estimates implicitly reflect the natural tendency of a state to transition to another state and its interaction with policy.[11]

Our main finding is that estimates of fiscal multipliers are generally below one, even when multipliers are allowed to vary across a variety of states. That is, we do not find evidence of strong Keynesian effects even in states that a priori could be presumed to be associated with larger fiscal multipliers. In addition, we find that multipliers are generally lower when public debt is high or when countries face a current account deficit, consistent with the notion that fiscal consolidation contributes to improving broad financial conditions and competitiveness. One state in which the costs of fiscal consolidation tend to be larger and more persistent is when private credit growth is weak. Even in this case, however, point estimates are close but below one at various horizons. Our results, based on a

[9] One of the key findings of Jordà and Taylor (2013) is that earlier evidence in favour of the so-called "expansionary austerity" hypothesis in Alesina and Ardagna (2010) is probably due to the endogeneity of fiscal consolidation, as the latter tends to occur more often when economic conditions are weak. This fact biases estimates towards positive effects when fiscal policy is measured by changes in the CAPB. Jordà and Taylor (2013) use the same CAPB variable as constructed by Alesina and Ardagna (2010), which is corrected for cyclical fluctuations using the unemployment rate. Unlike them, however, our CAPB is the "underlying primary balance" estimated by the OECD. This variable is adjusted for the business cycle using a different method and it is also corrected for one-off major events.

[10] Jordà (2005) shows that if the data are not generated by a linear VAR, LPs give more accurate responses. If, instead, the data are generated by a linear VAR, LPs generate the same estimated responses as the VAR with a minimal loss of efficiency. LP methods also have downsides. One is that for the sample size normally used in macro-econometric studies, the direct estimation of the responses, along with a larger number of covariates, limits the time horizons of the response to a few periods. Another is that, compared with VARs, the estimated responses may be erratic or volatile as the time horizon increases. For these reasons, analyses employing LP methods are generally limited to a horizon of a few periods. In our case we limit our analysis to five years.

[11] In regime-dependent VARs or other non-linear models, the computation of the non-linear impulse response functions is not straightforward, for it requires assumptions about how long a given state (say a boom or recession) could last and how the state may be affected by changes in policy (eg a policy loosening may shorten a recession compared to no policy intervention).

sample of advanced economies and narrative shocks, corroborate the finding of small multipliers for the US economy in Ramey and Zubairy (2014) as well as Barro and Redlick (2011), which rely on military spending news. Past fiscal consolidation episodes may not be fully representative of the circumstances faced by several economies in the current post-crisis environment. But, at a minimum, our evidence should raise doubts about studies claiming that based on historical evidence post-crisis multipliers are necessarily, or everywhere, large post crisis.

Our analysis also sheds some light on the transmission channels of fiscal consolidation shocks. Linear (state-invariant) estimates indicate that an important factor contributing to dampen the negative effects of fiscal consolidation on output is net trade. Fiscal consolidation is found to lead to a larger increase in net exports than most empirical studies that do not rely on narrative shocks (in line with the results found in Bluedorn and Leigh (2011)). The nominal exchange rate depreciate temporarily, but wage moderation and lower price pressures help maintain the improvement in the competitive position and reabsorb the initial loss of employment. Moreover, the short-term interest rate, and especially the long-term rate, decline contributing to dampening the responses of private demand. We find that some of these channels are either stronger or weaker in certain states of the economy compared to the average case. First, while fiscal multipliers do not seem to differ much with the output gap, external adjustment through nominal exchange rate depreciation seems to be a main offsetting factor when the output gap is positive, whereas a loosening of monetary policy appears more relevant when the output gap is negative. Second, when public debt is high, fiscal consolidation leads to a larger-than-average drop in the long-term interest rate, due to a lower risk premium. This is associated with a crowding-in of private investment and a smaller negative impact on output (although not on employment). Third, consolidation that begins when monetary policy is tighter than normal tends to have larger and more persistent effects on private demand, despite a subsequent loosening of monetary policy. Fourth, when the current account is negative fiscal consolidation tends to be associated with larger currency depreciation as well as a larger drop in the real wage, thus suggesting an improvement in the economy's degree of competitiveness. Finally, a bigger-than-average drop in private consumption seems to drive the increase in fiscal multipliers when private credit growth is weak, suggesting a smaller ability of consumers to smooth consumption.

The remainder of the paper is organised as follows. Section 2 explains the relationship between our paper and the existing literature. Section 3 describes the empirical method in detail as well as the data. Section 4 presents the estimated impact of fiscal consolidation on output under different states of the world. Section 5 examines the transmission of fiscal policy under different states. Section 6 concludes.

## 2 Relationship with existing literature

In addition to Jordà and Taylor (2013) and Guajardo et al (2014), our work is also related to several other empirical studies that investigate the existence of non-linearities in the effects of fiscal policy. This section highlights the key differences between these studies and our work.

The empirical literature on state-contingent fiscal multipliers generally differs along three main dimensions: the estimation technique used to capture potential non-linearities in the data; the strategy adopted to identify the fiscal shocks; and the scope or questions addressed in the analysis. The most prominent study in this growing literature, Auerbach and Gorodnichenko (2012), estimates a smooth-transition VAR (STVAR) on US quarterly data, finding that fiscal multipliers are larger than unity during NBER recessions, unlike in expansions.[12] In a follow-up paper, Auerbach and Gorodnichenko (2013) show that these results hold in a panel of OECD countries using semi-annual data. They use LP methods, but crucially their model assumes a smooth transition between states like in their earlier paper. Unlike our work, identification of fiscal shocks in both studies is achieved by comparing actual realisations of the fiscal variable to private or official forecasts.[13] Their method has been recently criticised by Ramey and Zubairy (2014) on a number of grounds. First, the computation of non-linear impulse responses in Auerbach and Gorodnichenko (2012) is based on assumptions that do not appear to be entirely plausible.[14] Second, Auerbach and Gorodnichenko (2012, 2013) use centered moving average of GDP growth to represent the state of the economy, which means that *future* GDP growth enters into the definition of the current state. Ramey and Zubairy (2014) and Alloza (2014) point out that changing both the symmetry and the size of the moving average alter the results. In particular, by using only *past* values of GDP growth fiscal multipliers become larger in expansion than in recession. Third, fiscal multipliers are obtained from estimating regressions in logarithms and multiplying the resulting elasticities by the average share of government spending over the sample period. Multipliers are also calculated with the respect to the initial fiscal shock; that is, the change in output is not scaled by the cumulative change in the fiscal variable over the relevant time horizon. Both choices are questionable and tend to bias upward the size of estimated multipliers. Our paper shares with Ramey and Zubairy (2014) the use of LP methods and the same approach to calculating multipliers, but focuses on OECD countries and fiscal consolidation shocks identified through the narrative approach (rather than military spending news). Nonetheless, our results similarly find no evidence of large multipliers.

[12] Interestingly, the multiplier tends to fall rapidly below unity soon after the economy exits recession. See Batini et al (2012) for similar results.

[13] Riera-Crichton, Vegh and Vuletin (2014) examine whether the size of fiscal multipliers in recessions and expansions depends on whether government spending is increasing or decreasing. They use the same model and fiscal news shocks as in Auerbach and Gorodnichenko (2013). In particular, they assume that the state of the business cycle is proxied by a 7-quarter moving average of real GDP growth.

[14] The economy is assumed to remain in an extreme recession or expansion for at least five years; and changes in government spending are also assumed to have no effect on the state of the economy. This criticism, however, does not affect the findings in Auerbach and Gorodnichenko (2013), for this study employs LPs.

Other studies employ Threshold VAR models (TVAR), in which regression coefficients change according to the value taken by a threshold variable. The latter is normally chosen to be a measure of economic slack. For example, Fazzari, Morley and Panovska (2014) condition their estimates on capacity utilisation and find large government spending multipliers in post-WWII United States when capacity utilisation is low (a state which prevails half of the time). Batini, Callegari and Melina (2012) and Baum et al (2012) find similar results by estimating individual-country TVAR models and using negative GDP growth and negative output gap, respectively, to define the bad state. Common to these TVAR studies is the identification of the fiscal shock through exclusion restrictions and information on tax elasticities, as in the approach pioneered by Blanchard and Perotti (2002). Unlike in these studies, the use of directly observed narrative shocks in our work minimise the problem of fiscal foresight typically encountered in VAR analyses (Leeper, Walker and Yang, 2013).

The above studies generally investigate whether fiscal multipliers differ across different states of the business cycle. They do not attempt to estimate the magnitude of fiscal multipliers across other relevant states or characteristics. An exception is the study by Iltzetzki, Mendoza and Vegh (2012), which estimate a panel VAR on a quarterly dataset of 20 high income and 24 developing countries. They find fiscal multipliers to be smaller in the short run (and negative in the long run) when the government debt is above 60% of GDP, and inversely related to trade openness and exchange rate flexibility. [15] Their fiscal shocks are identified by imposing restrictions on the VAR coefficients as in Blanchard and Perotti (2002). Similarly, in a panel of OECD countries, Corsetti, Meier and Muller (2012) investigate the role played by public debt as well as the exchange rate regime. Fiscal shocks for each country are first identified by estimating country-specific fiscal policy rules and then used as regressors in a panel VAR. High public debt (above 100% of GDP) is shown to reduce fiscal multipliers, whereas financial crises are found to raise it substantially. We share with these two studies the broader scope of analysis – that is, the fact that we look at a wider or different range of factors that can affect fiscal multipliers. Yet, our findings are based on narrative fiscal consolidation shocks and do not lump together fiscal expansions and contractions.[16]

Our paper is also related to Alesina, Favero and Giavazzi (2014). Based on the narrative fiscal consolidation made available by Devries et al (2011), these authors construct fiscal plans by splitting the narrative shocks into unexpected and anticipated components.[17] They then estimate a model in which each component enters separately, arguing that explicitly allowing for the interaction between unexpected and anticipated components is needed for delivering more accurate estimates of the effects of fiscal policy. Although ingenious, the method proposed by Alesina, Favero and Giavazzi (2014) has some limitations. First, even the measures of (three-year) fiscal plans constructed by the authors may not

[15] The authors do not report a separate result for advanced economies, so it is unclear whether the finding of a small multiplier for public debt is driven by the presence of several developing countries.

[16] It is unclear that the effects of equally-sized expansion and tightening of fiscal policy should be symmetric, especially in the face of credit constraints and high level of debt.

[17] The length of the fiscal plan documented by Alesina, Favero and Giavazzi (2014) is remarkably similar the estimated response of the CAPB to one percentage point shock in our analysis.

be completely unanticipated (ie a plan announced and implemented at time t may also be anticipated). In our specification, we add control variables to minimise this problem. Second, their method consumes degrees of freedom. It is therefore not suitable for investigating the state-dependency of fiscal multipliers, which is instead the focus of our paper. LP methods, instead, offer more flexibility and should also be more robust to misspecification of the non-linearities that may be driving the data.

# 3 Empirical strategy

Our empirical strategy closely follows Jordà and Taylor (2013) in using regression-based difference-in-difference estimators and local projection methods (Jordà, 2005). Loosely speaking, the basic idea behind the *difference-in-difference estimator* is to compare the changes in output (the outcome variable) in the group of countries that undergoes fiscal consolidation (the treatment group) to the changes in output in the group of countries that do not undergo fiscal consolidation (the control group). The difference between changes in the two groups corresponds to the average effect of fiscal consolidation on output (the average treatment effect). For the comparison to be valid, however, any unobservable difference between the two groups should not be correlated with the treatment (that is, any change in the difference should only be caused by the treatment). In addition, the potential outcome should be independent from the treatment (and the selection into the treatment).

Given the lack of experimental data, the behaviour of output and other variables of interest is modelled by estimating a fixed-effect longitudinal model in which the regressors include a measure of fiscal consolidation as well as several control variables. The method can be formally stated as follows. Let $y_{i,t}$ denote an outcome variable of interest, say the log of real GDP in country $i$ at time $t$, and let $D_{i,t}$ be the continuous random policy variable indicating the size of the policy intervention. In our case this is measured by the change in the cyclically-adjusted primary balance (CAPB). Also let the $k_z$-dimensional vector $z_{i,t}$ indicate a set of instrumental variables. Finally, let $X_{i,t}$ indicate the rich conditioning set of variables, including lags of the outcome and the treatment variables as well as the instruments (eg $\Delta y_{i,t-1}$, $\Delta y_{i,t-2},\ldots;D_{i,t-1},D_{i,t-2},\ldots;$ and $z_{i,t}$). We assume that policy is determined by $D_{i,t} = D(X_{i,t}, \psi, \varepsilon_{i,t})$, where $\psi$ refers to the parameters of the implied policy function and $\varepsilon_{i,t}$ is an is an idiosyncratic source of random variation. Hence, $D_{i,t} = D(X_{i,t}, \psi,.)$ refers to the systematic component of policy determination.

A potential outcome is given by $y_{i,t+h}{}^{\psi}(d) - y_{i,t-1}$ $(h=0,1,2,\ldots)$, the change in the observed outcome variable $y_{i,t+h} - y_{i,t-1}$ which would occur if $D_{i,t} = d$ for all possible realisations $\psi \in \Psi$ and $d \in D$. In the context of our application, the difference $y_{i,t+h} - y_{i,t-1}$ refers to the cumulative change in the outcome variable between period $t-1$ and $t+h$, where the fiscal shock occurs at time $t$. The causal effect of the fiscal policy intervention over the time horizon $h$ is the unobservable random variable $(y_{i,t+h}(d) - y_{i,t-1}) - (y_{i,t+h}(0) - y_{i,t-1})$ – ie the difference between changes in the treatment group and changes in the control

group. Note that $y_{i,t-1}$ is observed before the policy intervention.[18]

Following Angrist, Jordà and Kuersteiner (2013) we make the following *selection-on-observables* assumption (sometimes called *conditional ignorability* or *conditional independence* assumption),

$$\left(y^{\psi}_{i,t+h}(d) - y_{i,t-1}\right) \perp D_{i,t} | X_{i,t-1} \quad \text{for all } h \geq 0 \text{ and for all } d \in D \quad \text{and } \psi \in \Psi \tag{1}$$

We require the treatment variable to be independent from the outcome conditional on the set of covariates $X_{i,t-1}$. In practise, this means adding a sufficient number of covariates to remove biases in the comparison between treated and control units.

We further assume that the conditional mean can be linearly approximated by the following fixed-effect local projection panel regression:

$$y_{i,t+h} - y_{i,t-1} = \alpha_i^h + \eta_t^h + \theta^h D_{i,t} + \gamma^{h'} X_{i,t-1} + \varepsilon_{i,t+h} \qquad \text{for } h = 0,1, \ldots,H \tag{2}$$

Under assumption (1) the *average treatment effect* of a policy intervention $d$ relative to the baseline can be calculated from (2) as

$$E\left[\left(y_{i,t+h}(d) - y_{i,t-1}\right) - \left(y_{i,t+h}(0) - y_{i,t-1}\right)\right] \tag{3}$$

$$= E\left[E\left(y_{i,t+h} - y_{i,t-1} | D_{i,t+1} = d\,; X_{i,t-1}\right) - E\left(y_{i,t+h} - y_{i,t-1} | D_{i,t+1} = 0\,;\, X_{i,t-1}\right)\right]$$

$$= \theta^h (d - 0)$$

Under assumption (1) the key coefficient $\theta^h$ in (2) can be estimated by OLS as the local projection directly conditions on observables and the resulting residuals are orthogonal. If condition (1) is violated, appropriate instrumental variables may be used to obtain consistent estimates of (2). In LPs standard errors are likely to be heteroskedastic and serially correlated in an unknown way. Therefore their estimation requires robust estimators. In what follows we provide details of the variables entering the empirical model (3) and the dataset.

## 3.1 Specification of the empirical model

In our empirical analysis we separately estimate several models like (3) to gauge the effect of fiscal consolidation on different variables of interest. In addition to real GDP, we consider its components (private consumption, private investment, imports and exports, government consumption, public investment); budget variables (such as fiscal revenues and spending, the total balance, the primary balance and the underlying primary balance); the nominal and real effective exchange rate; CPI inflation and the real wage; labour market variables (such as the unemployment rate, the participation rate,

[18] Hence, for *h=0* the above difference would give the impact of the fiscal shock in the same year in which the shock occurred; for *h=1* it would give the effect in the year following the one in which the shock occurred, and so forth. If the control and the treatment groups are identical in all respects but fiscal consolidation, then the effect of consolidation would be given simply by $y_{i,t+h}(d) - y_{i,t+h}(0)$.

employment); the policy rate and the 10-year government bond yield; government debt and log private credit to GDP ratios.

To facilitate the interpretation of the estimated coefficients as multipliers, we scale real GDP on the left-hand side of (3) and the measure of fiscal policy on the right hand side by the level of real GDP: that is, the dependent variable is $(y_{t+h} - y_{t-1})/(\text{Real GDP})_{t-1}$, where $y$ is a generic variable, $h=0,1,2,\ldots$ (with $h=0$ indicating the time at which the change in policy takes place), while the fiscal variable is $(F_t - F_{t-1})/(\text{Real GDP})_{t-1}$. This normalisation allows us to interpret the coefficient $\theta^h$ in the local projection estimation for real GDP as a fiscal multiplier. Likewise, we also scale by real GDP other left-hand side variables such as the components of GDP and budget variables. Thus, the estimated coefficients $\theta^h$ in the local projections for these variables can also be interpreted as multipliers.[19]

The remaining dependent variables (including the log real and nominal exchange rate, log level of CPI, the log level of the real wage, policy rate, 10-year government bond yield, unemployment rate, labour force participation rate, the log level of employment, current account to GDP ratio, public debt to GDP ratio, log of the private credit to GDP ratio) appears in (3) as the difference $(y_{t+h}-y_{t-1})$. Therefore, the coefficient $\theta^h$ in their respective local projections should be interpreted as the cumulative percentage change (or percentage point change) in the variable of interest in response to a fiscal shock equal to one percentage point of GDP.

Fiscal consolidation is measured by the rise in the cyclically-adjusted primary balance (CAPB). Although this variable is corrected for the business cycle, it is not completely exogenous to economic conditions and it may also depend on omitted variables that affect both, such as for example asset prices (Devries et. al. 2011; Guajardo et al, 2014). Endogeneity and measurement issues cause the conditional independence assumption (1) to fail and result in biased and inconsistent OLS estimates of $\theta^h$ in (2). To address this problem, we follow Jordà and Taylor (2013) and instrument the CAPB by the discretionary fiscal-deficit action variables constructed through the narrative approach by Devries et al (2011). Guajardo, Leigh and Pescatori (2014) and Jordà and Taylor (2013) show that these narrative fiscal shocks are indeed strong instruments (Annex Table A1 shows that they are in our estimation too).

To address any potential residual endogeneity bias we add a rich set of controls which predict selection into the policy intervention.[20] We prefer using regression adjustment to the propensity score matching methods used by Jordà and Taylor (2013) because the former approach retains information about the size of fiscal consolidations in our estimation, whereas the latter only allows the partition of fiscal consolidations into a binary dummy variable 0/1 indicating periods of consolidation and periods of no consolidation. By retaining information about the magnitude of fiscal consolidations, we are able to

[19] As argued by Ramey and Zubairy (2014), Hall (2009) and Barro and Redlick (2011) this approach to computing multipliers seems more appropriate. For example, in many studies fiscal multipliers are computed multiplying estimated elasticities by the average value of the fiscal variable over the sample period. Since spending and taxes have generally been trending up in several countries, using this conversion factor may bias estimates up.

[20] Adding control variables to address endogeneity issues is a strategy generally precluded by limited degrees of freedom in VAR analyses.

directly measure the size of fiscal consolidation multipliers across different economic states, although at the cost of assuming linearity of our conditioning variables.

In all local projections we use a common set of control variables that comprises: two lags of (log) changes in real GDP, the inflation rate, the policy rate, and the real and nominal effective exchange rates; one lag of the output gap (measured by the difference between real GDP and the HP-filtered level, with lambda=100), the gross government debt to GDP ratio, the current account to GDP ratio, trade-weighted GDP growth of the country's major trading partners, the change in the CAPB and, following Jordà and Taylor (2013), a dummy variable indicating if fiscal consolidation, based on the narrative account, occurred in the previous period. In addition to this common set of controls, we also include two lags of (log) changes in the dependent variable in their respective local projection in order to economise on degrees of freedom. For example, in the private consumption's local projection we include two lags of log changes in real private consumption but do not include lags of the latter variable in other variables' local projections. We use robust standard errors clustered by country and time.

## 3.2 Conditioning on the state of the economy

To study how the effects of fiscal consolidation changes with the state of the economy, we split the sample depending on whether a given conditioning variable in the periods before the occurrence of the fiscal shock is above or below a given threshold. Specifically, we estimate:

$$y_{i,t+h} - y_{i,t-1} = \alpha_{1i}^{h} + \theta_1^{h\prime} D_{i,t} + \gamma_1^{h\prime} X_{i,t-1} + \varepsilon_{1i,t+h}, \quad q_{it-s} \leq \delta \tag{4}$$

$$y_{i,t+h} - y_{i,t-1} = \alpha_{2i}^{h} + \theta_2^{h\prime} D_{i,t} + \gamma_2^{h\prime} X_{i,t-1} + \varepsilon_{2i,t+h}, \quad q_{it-s} > \delta \tag{5}$$

where $q_{it-s}$ is the conditioning variable and $\delta$ is a threshold value; $s$ is generally set to one so that we condition on the state prevailing in the period immediately before the fiscal treatment is administered. This does not, however, preclude checking for robustness by experimenting with different $s$ or conditioning on a backward-looking average when appropriate. In this regard, it is important to notice that the conditioning variable should not violate the conditional independence assumption (ie the fiscal treatment should be independent of the outcome conditional on a set of covariates). That is why we take care to conditioning on a variable that is predetermined with respect to the fiscal treatment and make sure that this variable is constructed only with information available in the past. It is also worth stressing that, as noted in the introduction, an advantage of the LP methods is that, unlike VARs, they estimate the impulse response functions directly, thereby implicitly taking into account any natural tendency in the data for a change in the state as well as the average influence on the state of policy.

The conditioning states of the economy that we consider are the following:

1. Positive vs negative *output gap* (as measured by the HP-detrended component of real GDP);

2. Tight vs loose *monetary policy stance* (where tight is defined as meaning that the policy rate is greater than that predicted by an estimated Taylor rule);[21]
3. High vs low *government debt* (as defined by the gross debt being greater or lower than 80% of GDP);
4. Positive vs negative *current account balance*;
5. *Financial crises*, defined according to the classification of Reinhart and Rogoff (2009).
6. Strong vs weak *private credit growth* (as measured by greater or less than mean credit annual credit growth of the country over the entire sample);

### 3.3 The dataset

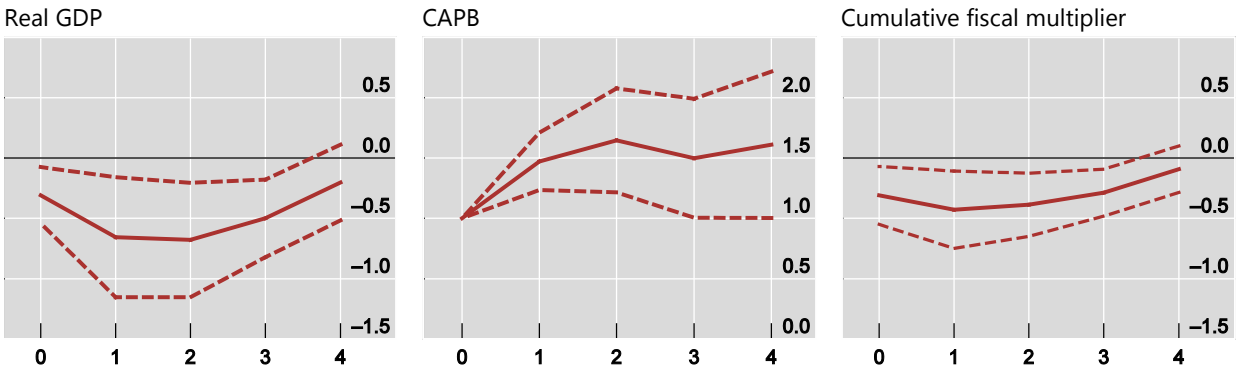
The data are an unbalanced panel of 17 OECD countries over the period 1978–2007. The countries are: Austria, Australia, Belgium, Canada, Germany, Denmark, Spain, Finland, France, United Kingdom, Ireland, Italy, Japan, Netherlands, Portugal, Sweden and the United States. All variables in the sample are sourced from the *OECD Economic Outlook Database* except the following: data on private sector credit, credit to GDP gap, real and nominal effective exchange rate indices, the consumer price indices, the policy rate and the 10-year government bond rate come from the *BIS Database*. National account series are deflated by the GDP deflator. The narrative fiscal consolidation shocks are taken from Devries et al. (2011). A detailed list of the variables with the indication of their statistical source is provided in Annex Table A2.

## 4 The short-term effects of fiscal consolidation

In this section we summarise the main results of our empirical analysis. We begin by showing in Graph 1 the *average treatment effect* of fiscal consolidation on real GDP over a number of years. The left-hand panel shows the cumulative percent change in real GDP from year zero to year four in response to a fiscal shock of one *percentage point* of real GDP, where 0 indicates the year in which the shock occurs. There are two aspects that are important to notice. The first is that the magnitudes shown are multipliers in that both output and the fiscal policy variable are expressed in the same units (recall discussion in Section 3.1). The second is that the estimated responses are *differences* relative to the control group: they should be interpreted as the value that a given variable would take compared with an otherwise similar economy that does not undergo any fiscal consolidation. For example, if the output effect is negative, it does not necessarily mean that output necessarily falls; it simply means that output is lower than it would have been had the economy not undergone the fiscal treatment.

[21] The Taylor rule is estimated by regressing the policy rate on the current inflation rate, the output gap and an ex-ante short-term interest rate in the panel of the sample countries with time effects.

Unconditional multipliers in responses to a fiscal consolidation shock of one pp of GDP Graph 1




Note: The continuous lines in the left and middle panels indicate the cumulative percentage change at year $h$=0,1,2,3,4 in the respective variable in response to a positive shock to the cyclically-adjusted primary balance (CAPB) of 1 percentage point of real GDP. The cumulative fiscal multiplier in the right panel is defined as the ratio of the cumulative change in real GDP (left panel) to the cumulative change in the CAPB (middle). Dotted lines are 90% confidence bands. Standard errors for the cumulative fiscal multiplier are calculated using the delta method.

Estimated effects of fiscal consolidation are, on average, contractionary. Output is lower on impact, reaching a maximum effect of about 0.7 percentage points in year one and two (with 90% confidence interval of about 0.3–1.2); the effect then starts to diminish in year three, and dissipates by year four, with output returning to the level that would have prevailed had there been no consolidation. It is, however, important to note that the effects on output depend not only on the size of the initial fiscal shock, but also on the predicted evolution of fiscal policy afterwards. In our sample of advanced economies the cyclically-adjusted primary balance (CAPB) does tend to increase after the initial shock of one percentage point of GDP, reaching a maximum of 1.6 percentage points in year two and remaining at approximately this level afterwards (Graph 1, middle panel). The fiscal tightening typically last for three years, which is also the typical length of multi-year plans documented in Alesina et al (2014), and it is for the most part not reversed. The improvement in the CAPB following the initial shock suggests that simply reporting the output multiplier of an initial fiscal shock over-estimates the effects of fiscal policy changes. Furthermore, the size and shape of the fiscal variable's time profile may also be significantly different across different states. For example, an initial cut in government spending may be followed by further cuts in some states, but be reversed in others. Hence, to compare like with like, in Graphs 1–3, we report cumulative fiscal multipliers, defined as

$$CFM(h) = \frac{\sum_{j=0}^{h} \Delta Y_{t+j}}{\sum_{j=0}^{h} \Delta CAPB_{t+j}} \qquad (6)$$

Graph 1 (right panel) shows that the cumulative multiplier in the linear case is relatively small: its maximum is reached after one year and is short of 0.5 (with a 90% confidence interval of 0.1–0.7); the multiplier effect then dissipates gradually over the subsequent years (Graph 1, right-hand panel).[22]

[22] Since we consider fiscal consolidation shocks, our estimated fiscal multipliers are reported as negative numbers in the graphs. However, when discussing their magnitude we refer to their absolute value. Also note that the multipliers shown in the left and middle panels of Graph 1 are forecast multipliers, whereas the multiplier shown in the right panel is a cumulative multiplier.

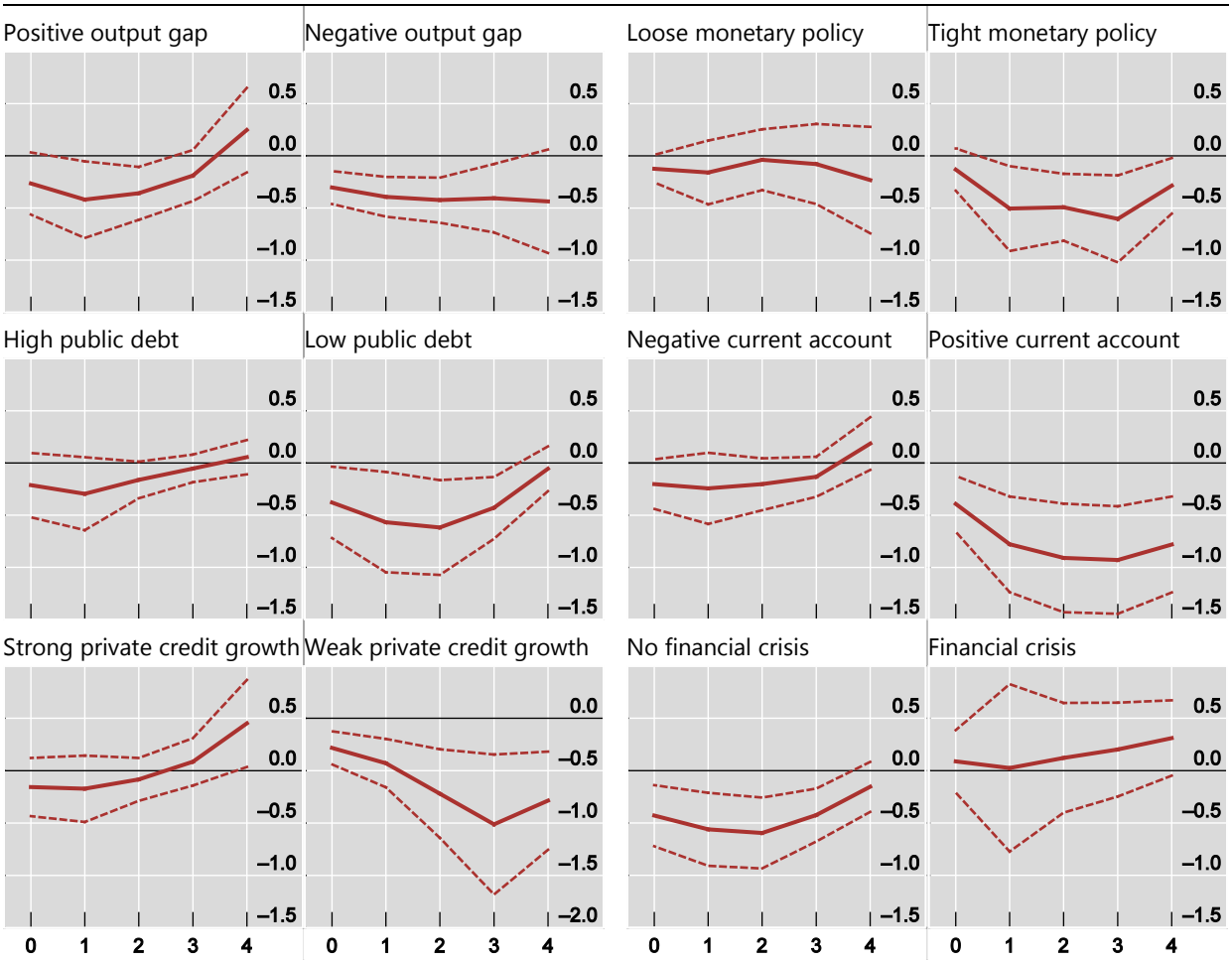
An important question is the extent to which the estimated state-invariant multiplier represents a valid guide to the effects of fiscal consolidation in all circumstances. Graph 2 shows how estimates vary across a number of states which are likely to be relevant in the aftermath of the global financial crisis. We consider first the *output gap*, the most common form of state dependency studied in the empirical literature (on the top left side of Graph 2). As noticed in the introduction, a number of studies have concluded that the fiscal multiplier is larger in a downturn than in an upside (in some cases substantially so). Our evidence suggests that fiscal consolidation may be somewhat more costly when the output gap is negative, but the difference appears to be small (and possibly statistically insignificant).[23] Point estimates show that the effects in the two states are very similar in year one and two (and close to the state-invariant multiplier), but they are persistent when the output gap is negative. Even so, the point estimate of the fiscal multiplier in the bad state is relative small at about 0.5. Second, we consider the stance of *monetary policy* proxied by whether the policy rate is above or below an estimated Taylor rule. Conditioning on monetary policy being loose, we do not find evidence that fiscal consolidation is costly. By contrast, when monetary policy is tight multipliers are clearly negative at about a half from year one to three, and declining afterwards. Third, conditioning on a relatively high level of *public debt* (defined as debt above 80% of GDP) reduces the point estimate of the multiplier compared with the unconditional case (Graph 2, middle left panel). Taking into account the confidence bands estimates are below a half, suggesting that when public debt is higher fiscal consolidation may be less costly in terms of output growth than average. Note that when public debt is relatively low, the confidence bands are too large to reach a clear conclusion about the size of multipliers. Next, we consider the sign of the *current account* balance. A deficit in the current account tends to be associated with smaller and less persistent estimates. This suggests that being in a deficit does not make fiscal consolidation more costly than average. On the contrary, a surplus makes the effects of fiscal consolidation much larger and more persistent. Finally, our estimates suggest that the strength of *private credit growth* is an important factor: above-average private credit growth is associated with near zero effects, whereas below-average growth is associated with significant adverse effects. The point estimates indicate that these effects are increasing over time with a maximum of around one reached in year three. Thus, when credit growth is weak consolidation appears to be more costly than average, although 90% confidence bands indicate a wide range of possible values.

We also consider the occurrence of a *financial crisis* (Graph 2, bottom right panel). In normal times, the time profile of the contractionary effects of consolidation on real GDP are unsurprisingly similar to that in the unconditional case. Yet, conditional on being in a financial crisis the cumulative multipliers are very imprecisely estimated: the confidence bands are very large, allowing the effects of fiscal consolidation to be either negative or positive in the first two to three years after the initial fiscal

[23] Testing the statistical significance of the differences between impulse responses is not straightforward. One could, for example, compute a sequence of t-tests, one for each horizon and then tests the null hypothesis that the estimated coefficients under different states are identical. However, this is a joint test in which the t-statistics should be mutually dependent. In this case, correct critical values are, to the best of our knowledge, unknown. We leave the issue of testing for differences between IRFs for further research noting that it is not key to the central message of our paper, namely that even conditioning on potentially bad states, there is no evidence of large fiscal consolidation multipliers.

shock. There are too few financial crises in our dataset, and the few that there are, are presumably too different from one another in terms of their nature, severity and policy responses to allow to pin down any precise response of output. The responses of other variables than GDP growth (not shown here) are also very imprecisely estimated with large confidence bands that cover both positive and negative values at all horizons. With these data, it is does not seem possible to assess the effects of fiscal policy during or immediately after a financial crisis.

Cumulative fiscal consolidation multiplier conditional on various economic states Graph 2



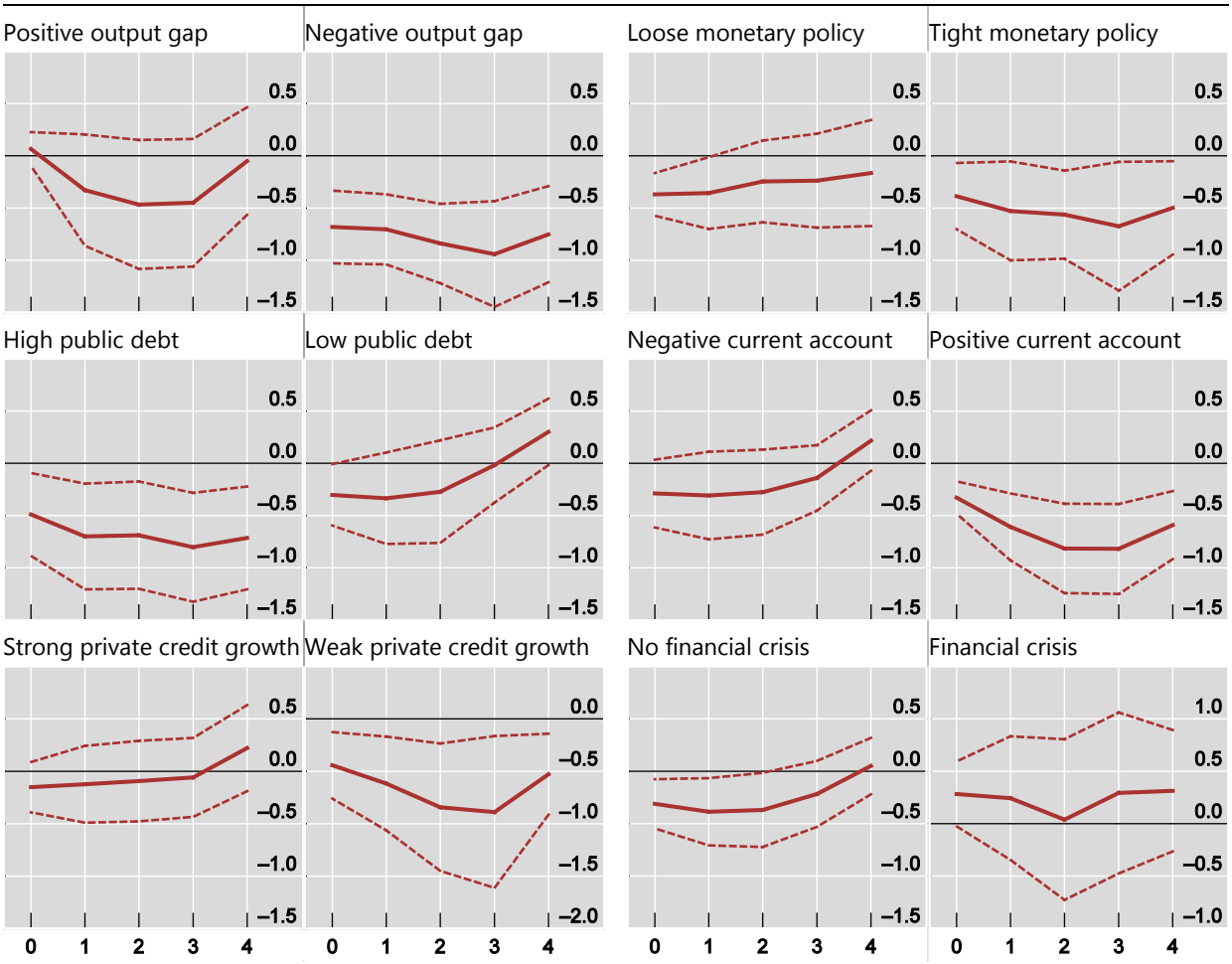

Note: The cumulative fiscal multiplier is the cumulative change in real GDP in response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years divided by the cumulative change in the CAPB over the same period. *h=0* indicates the period in which the fiscal consolidation shock occurs. The dotted lines indicate 90% confidence bands, computed with the delta method

In sum, the estimates presented in Graph 3 suggest that there are states of the economy in which the size of fiscal multipliers might be larger than average. Yet, a striking finding is that even in the states in which multiplier are found to be larger, both point estimates and their confidence intervals suggest that they are for the most part below unity.

## 4.1 The employment costs

Measuring the costs of fiscal consolidation only in terms of output may, however, not provide a complete picture. Policymakers also care about employment. If there were a stable link between output and employment growth, then it would be sufficient to look at output multipliers. But this link may not be stable and, importantly, it may also change as a result of a fiscal correction. For this reason we also show in Graph 3 the costs of fiscal consolidation in terms of employment. Specifically, the graph shows the cumulative change in the number of employed persons in response to a fiscal consolidation shock of one percentage point of GDP under different conditioning states. The responses are again scaled by the cumulative change in the CAPB over the relevant horizon (similarly to real GDP in Graph 2).

Cumulative consolidation multiplier for employment conditional on various states — Graph 3




Note: The cumulative fiscal multiplier for employment is the cumulative change in employment in response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years divided by the cumulative change in the CAPB over the same period. *h=0* indicates the period in which the fiscal consolidation shock occurs. The dotted lines indicate 90% confidence bands, computed with the delta method.

We first consider the *output gap* (Graph 3, top left panels). When the output gap is positive, employment declines by about half per cent in year two and three and then recovers quickly. The response, however, is statistically insignificant. On the contrary, when the output gap is negative, the decline in employment is evident. Employment is 0.7 per cent lower on impact and 1 per cent lower in

year three, after which it begins to recover. Second, the stance of *monetary policy* also matters (Graph 3, top right panels). When policy is loose, there is evidence of a small decline in employment on impact, but not in subsequent years. Instead, there is evidence of a decline when monetary policy is tight. The negative effect is about half a per cent and persistent, although the confidence bands are quite large (0.2–0.9 at year two). Third, *public debt* appears to have an asymmetric impact on employment and GDP. When public debt is high, consolidation leads to a small (and statistically insignificant) negative effect on output (Graph 2), but has a larger negative impact on employment (Graph 3, middle left panels). The effect is minus half a per cent on impact and grows to a maximum of about minus 0.8 per cent in year four (with confidence band of 0.5–1.4). By contrast, when public debt is low, the opposite pattern is observed: a larger negative effect on GDP goes hand in hand with a small or null effect on employment. Third, the *current account* balance is also important (Graph 3, middle right panels). Unlike the case of public debt, the effects on GDP and employment are symmetric: that is, the negative effect on both variables is small when the current account is a deficit, while the effect on both variables is positive (and statistically significant) when the current account is a surplus. Fourth, the costs of fiscal consolidation on employment are also similar and symmetric to that of output when taking into account the strength of *private credit growth* (Graph 3, bottom left panels). When credit growth is strong, there is barely evidence of any negative effect, similarly to output. On the contrary, when credit growth is weak employment drops similarly to output up to year four, after which the negative effect on employment appears to dissipate more rapidly: while output is still some 0.8 per cent lower in year five, the adverse effect on employment drops to 0.5 per cent. Hence, it seems that if one looks at employment rather than output the costs of fiscal consolidation may not be large even in the case of weak private credit growth. Large standard errors, however, caution against drawing strong conclusions.

For completeness we also consider the case of a *financial crisis* (Graph 3, bottom right panels). In normal times, the response of employment (which is close to the unconditional response) is negative but relatively small, and smaller than that of output (Graph 2). When conditioning on a fiscal crisis, there does not seem to be any effect but the standard errors are large. Again, we believe that there are too few crises in our dataset, and too varied, to pin down any effect precisely.

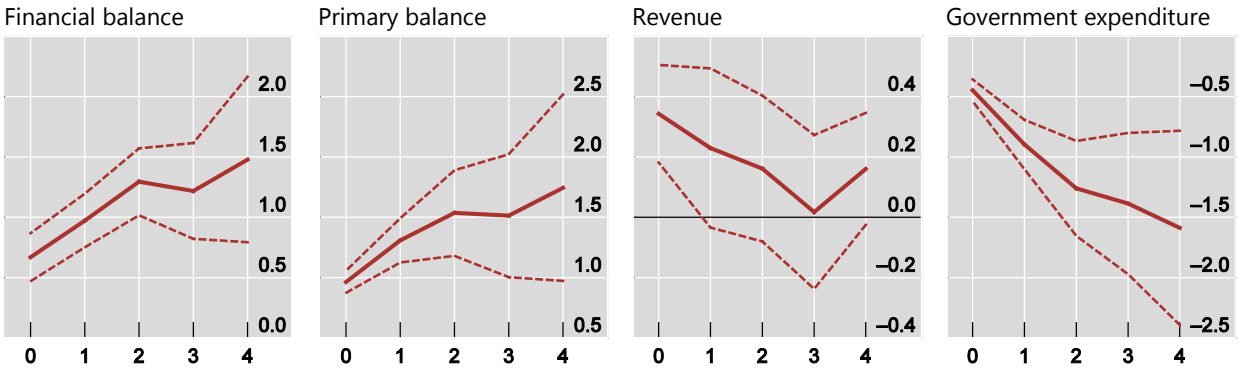
## 5 Transmission of fiscal consolidation shocks

Our analysis would be incomplete without investigating what drives the changes in output and employment shown in the previous section. We therefore compute the responses to the fiscal consolidation shock of a broad range of variables in the attempt to gain some insights on the potential state dependence of the transmission mechanism. Before doing that, it is useful to examine the responses in the linear case.

## 5.1 The linear (state-invariant) case

Graphs 4–8 plot the unconditional average response of several variables to an increase in the CAPB of one percentage point of GDP. Such shock is followed (as shown in Graph 1 above) by a continued improvement as the rise in the CAPB reaches about 1.5 percentage points after four years. As shown in Graph 4, the improvement in public finances is on average persistent. The fiscal balance rises on impact and continues so in the subsequent years, reaching a maximum effect of about 1.5 per cent in year five, approximately corresponding to the improvement in the CAPB. The widening confidence bands, however, suggest that there is some variation across countries and time in how persistent the improvement is. Graph 4 is also informative about the policy mix. Revenues are up initially, but only temporarily. They improve again in year five as output recovers. By contrast, government expenditure drops and continues to drop further. Hence, the evidence suggests that in the average case fiscal tightening tends to be lasting and based more on expenditure cuts than tax increases.

Government Budget — Graph 4




Note: Cumulative changes (in per cent) in response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands.

Graph 5 shows the effects on the main components of GDP. These are expressed as contributions (in percentage points) to cumulative change in real GDP (reproduced for convenience in the first panel). The negative effect on output is accounted for, on impact, by lower government spending, which declines further in subsequent periods. Government consumption contributes over half a percentage point of GDP to the fall in real GDP (relative to no consolidation) after two years and is not reversed subsequently, whereas the contribution of government investment, at negative 0.2 pp after two years, gradually subsides afterwards. Compared to public spending, domestic private demand declines more gradually and contributes significantly (especially private consumption) in year two and three, but it also recovers more rapidly, returning to near their pre-shock levels in year four.

An important offset to the decline in domestic demand is a significant positive contribution of net exports (0.7 pp after two years). Accordingly, the current account also improves (Graph 5, first panel). This improvement in the external position is associated with a persistent depreciation of the real effective exchange rate (REER) (Graph 6). Initially, this is caused by a fall in the value of the currency, but in subsequent years it also reflects wage moderation (Graph 6). Indeed, the nominal depreciation is

partly reversed as output recovers, while the real effective exchange rate continues to decline. Thus the empirical evidence is consistent with the expenditure switching channel highlighted in the standard Mundell-Fleming model whereby cuts in fiscal spending reduces the demand for home goods and make home goods cheaper than foreign ones.

GDP components

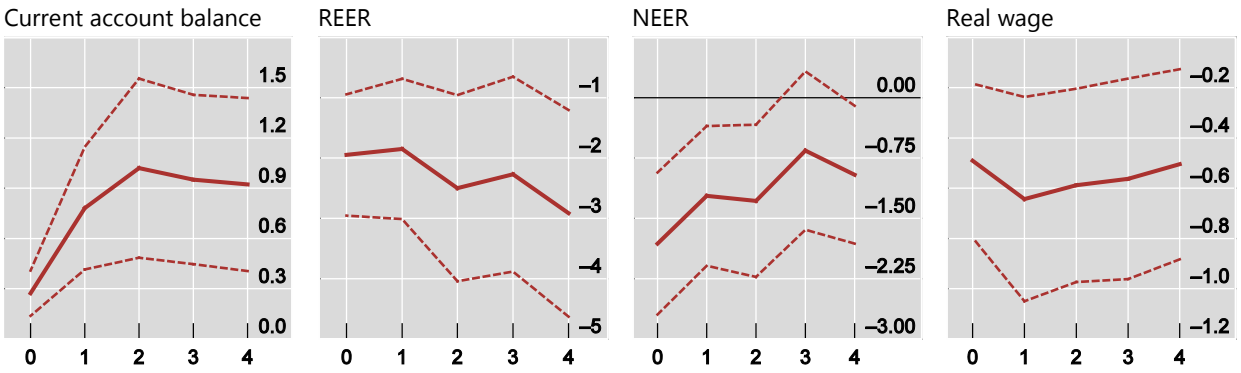
Graph 5


Note: All variables except GDP are expressed as contributions (in percentage points) to the cumulative change in real GDP in response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands.

The improvement in the current account is also consistent with the twin deficit hypothesis and is also quantitatively significant: a one percentage point consolidation leads to about 0.9 percentage point increase in the current account after two years and proves long lived. This effect is large when compared to the estimates typically found in the literature. Most studies find estimates in the range of 0.1–0.3, but normally rely on imposing zero or sign restrictions on the contemporaneous relationships between variables or estimated tax elasticities. A number of studies even find that the current account of advanced economies deteriorates in response to fiscal consolidation, which is not straightforward to reconcile with standard theory. Both the low estimate and the negative sign may, however, reflect the imperfect identification of the fiscal shock, thus underestimating the true effect. Our estimates are in line with standard theory and in the same ball park of recent findings by Bluedorn and Leigh (2011), which relies on the same set of narrative fiscal shocks as ours and a similar sample of advanced economies. Bluedorn and Leigh (2011), however, use a different empirical specification and do not investigate systematically differences across states.

## Current account and competitiveness

Graph 6

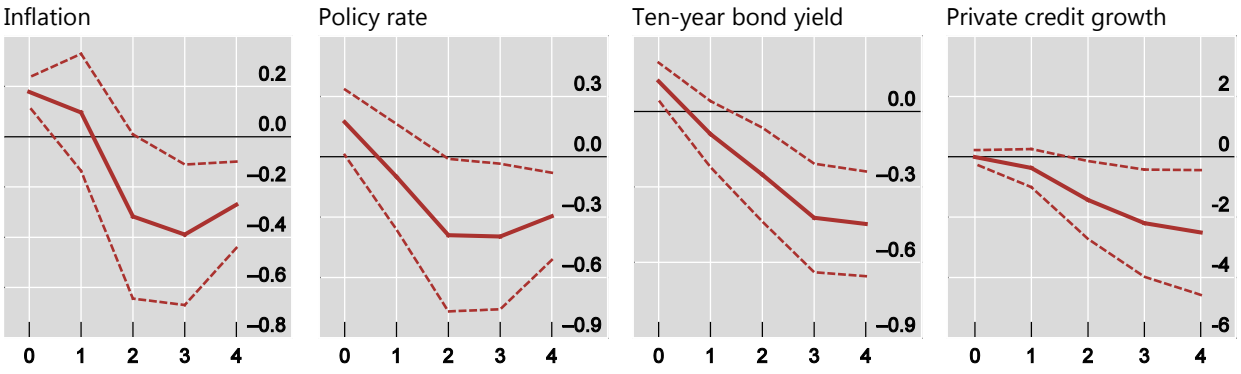



Note: Cumulative changes (in per cent) in response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. REER and NEER stand for Real and Nominal Effective Exchange Rate respectively. The dotted lines indicate 90% confidence bands.

Monetary policy is normally loosened following a consolidation shock, although its response is estimated relatively imprecisely. The evidence suggests that the policy rate may be even hiked on impact, although by a small amount, in reaction to a similar rise in the inflation rate (Graph 6) and currency depreciation (Graph 5). But, as inflation weakens and the negative effect of consolidation on output intensifies, the policy rate ends up being lower by some 40 basis points in year four. The effect on the policy rate is approximately the same as that on inflation, suggesting that the short-term real interest rate is little affected. Both inflation and the policy rate show signs of reversing in year five as output growth returns to pre-consolidation level. Yet, it is worth noticing that these responses are associated with large confidence bands suggesting significant cross country and time variation. By contrast, the drop in the long-term nominal interest rate is continuous and more precisely estimated. Graph 7 also shows that credit to private sector tends to diminish in a persistent manner, by over 2.5 per cent in year four, although there is quite large variation in the data.

## Inflation, monetary policy and credit

Graph 7

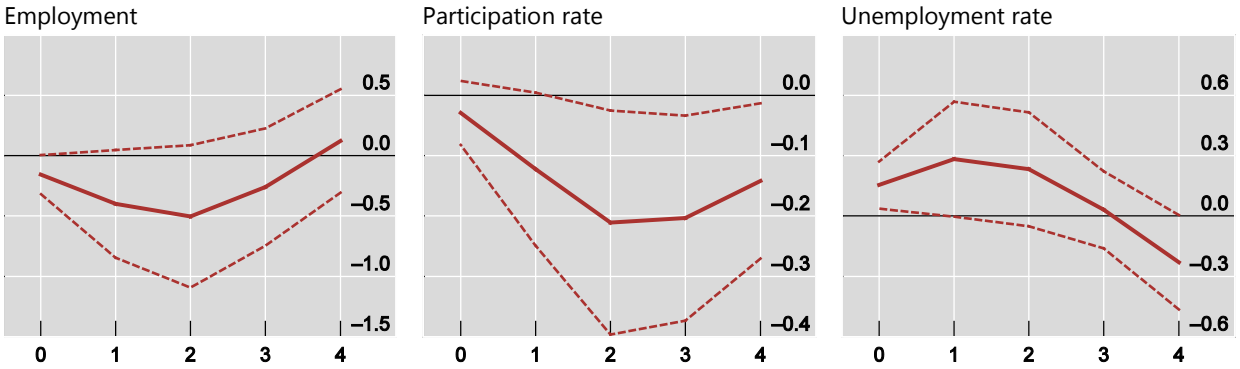



Note: Cumulative changes (in per cent) in response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands.

The average impact of fiscal consolidation on the labour market is contractionary in the first few years, but vanishes later on. Employment drops by a small amount and by less than output, but the adverse effect begins to narrow after year two. At the end of our estimation horizon employment growth

is clearly on an upward trajectory, suggesting that the long-term effects of fiscal consolidation on employment may be on average positive (Graph 8, left panel). In the process, a temporary drop in the participation rate tends to limit the initial adverse impact on the unemployment rate (Graph 8, middle and right panels). The reversal of the negative effect on employment also appears to be consistent with wage moderation (Graph 6, fourth panel).

Labour market — Graph 8




Note: Cumulative changes (in per cent) in response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands.

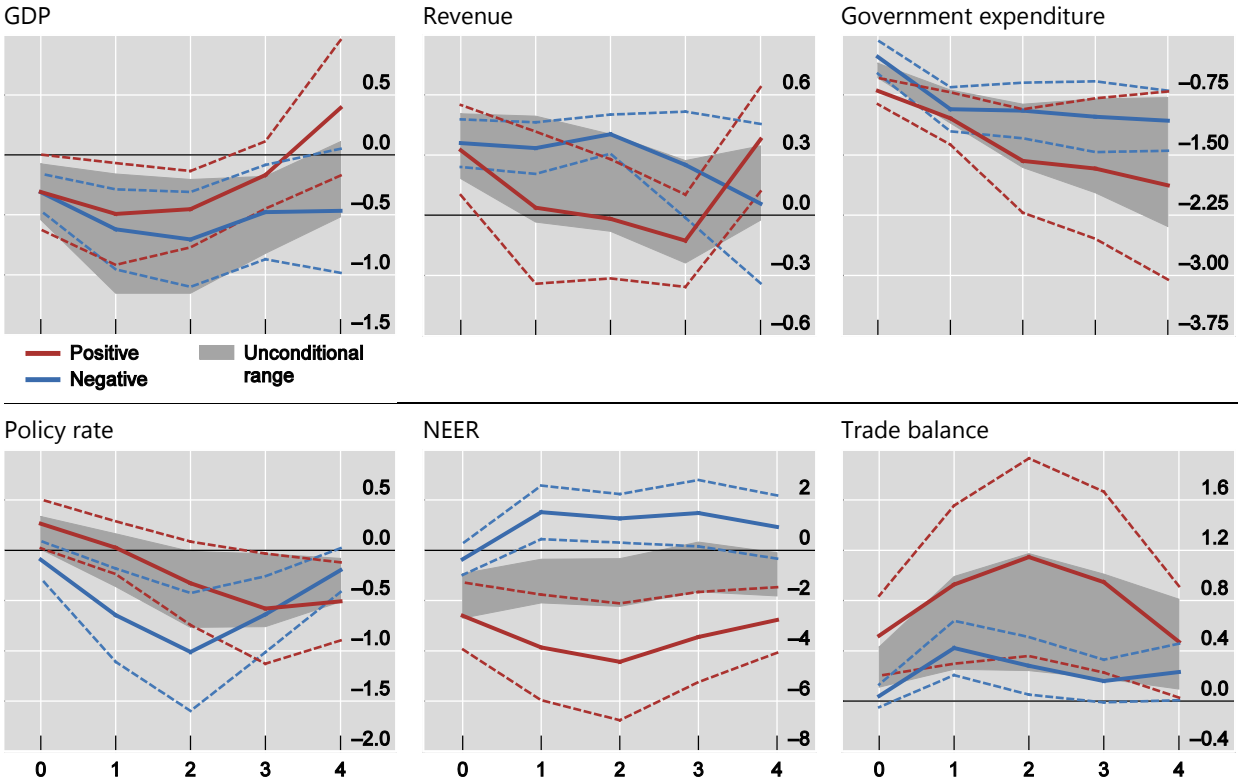
To sum up, fiscal consolidation is initially contractionary but its effects tend to wane fully after four years. A significant offsetting factor, which diminishes the negative impact on output, is a significant positive response of net exports. This is associated with a temporary nominal depreciation and a persistent drop in the real wage. The long-term interest rate also decline persistently, contributing to dampening the response of private investment. The next sub-sections investigate the extent to which this description of the fiscal transmission mechanism remains valid, qualitatively and quantitatively, when conditioning on specific states of the economy.

## 5.2 Output gap

We consider first the sign of the output gap. Estimates shown in Graph 2 indicate that there are no large differences in the size of contractionary effects in the initial years after consolidation, except that these effects tend to be more long-lived when the output gap is negative. Despite the responses' similarities in the first few years, Graph 9 point to some differences across positive and negative output gap. These differences are not large (perhaps they are not statistically significant at conventional confidence levels), but they are suggestive of potentially different mechanisms at play. (In this and the subsequent sub-sections we highlight only the variables that appear to play a role across different states.) There seems to be, in particular, three main differences between positive and negative output gap states. The first is the degree of fiscal tightening following the initial shock. Conditional on a negative output gap, fiscal consolidation (as measured by the CAPB, not shown here) tends to be larger, but it is partly reversed after year two. Moreover, government spending cuts are smaller and revenue increases larger (Graph 9). This suggests that consolidation may be more tax-based when the output gap is negative. Second, conditional on a negative output gap the degree of monetary accommodation is larger: policy rates are

0.5–1.5 pp lower in year two, whereas they hardly move when the output gap is positive. Third, conditional on a negative output gap the expenditure switching channel seems less important: both the nominal and the real exchange rate hardly depreciate and the improvement in the trade balance and current account is smaller. By contrast, the external channel seems more important than average when the output gap is positive.

Positive vs negative output gap — Graph 9



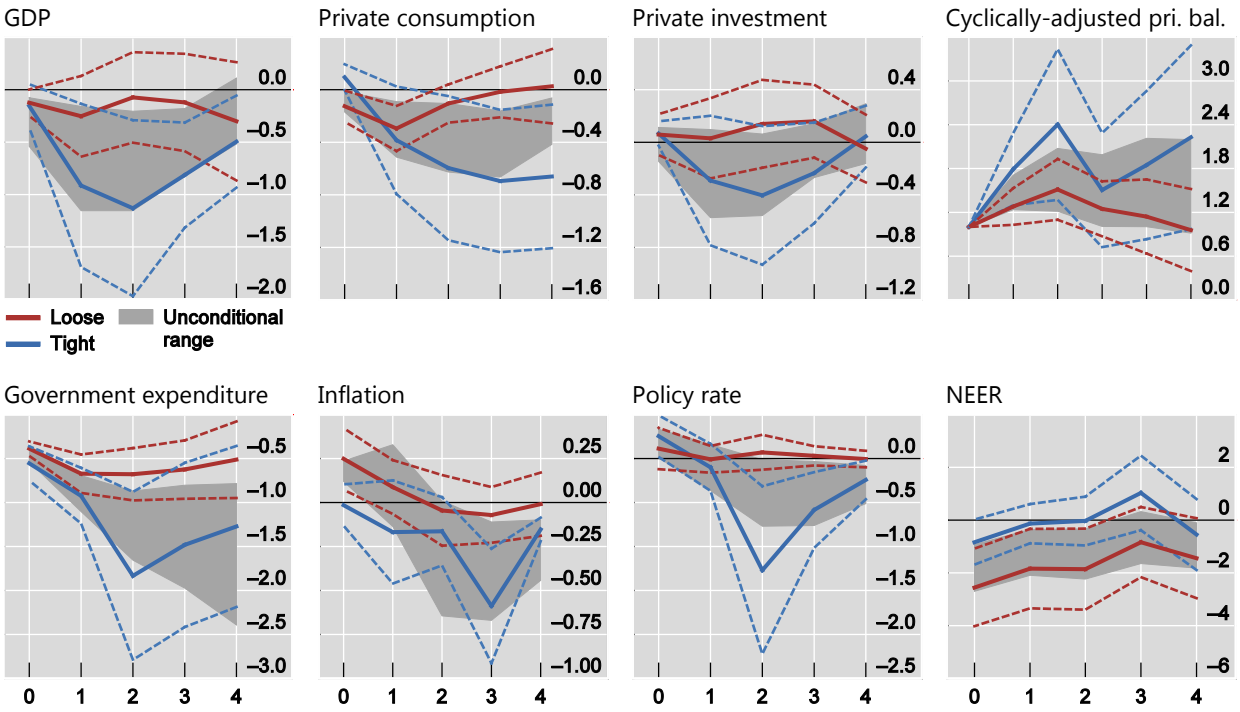

Note: Response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands. The grey area corresponds to the 90% confidence band in the linear (state-invariant) model.

## 5.3 Monetary policy

Graph 2 suggests that the effects of fiscal consolidation on output are larger when monetary policy is tight prior to the fiscal consolidation shock than when it is loose. Yet, tight monetary policy does not seem to make the multipliers large. Graph 10 provides further insights. Conditional on tight monetary policy, the initial fiscal shock tends to be followed by further tightening of fiscal policy (as witnessed by further rises in the CAPB). Government spending (as a percentage of GDP) is cut by more, in particularly driven by lower public investment. Yet, this tightening is also accompanied by cuts in the policy rate, which help cushion the negative effects. Thus, starting from a tight position, monetary policy tends to be loosened significantly after a fiscal consolidation shock.

Tight vs loose monetary policy

Graph 10




Note: Response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands. The grey area corresponds to the 90% confidence band in the linear (state-invariant) model.

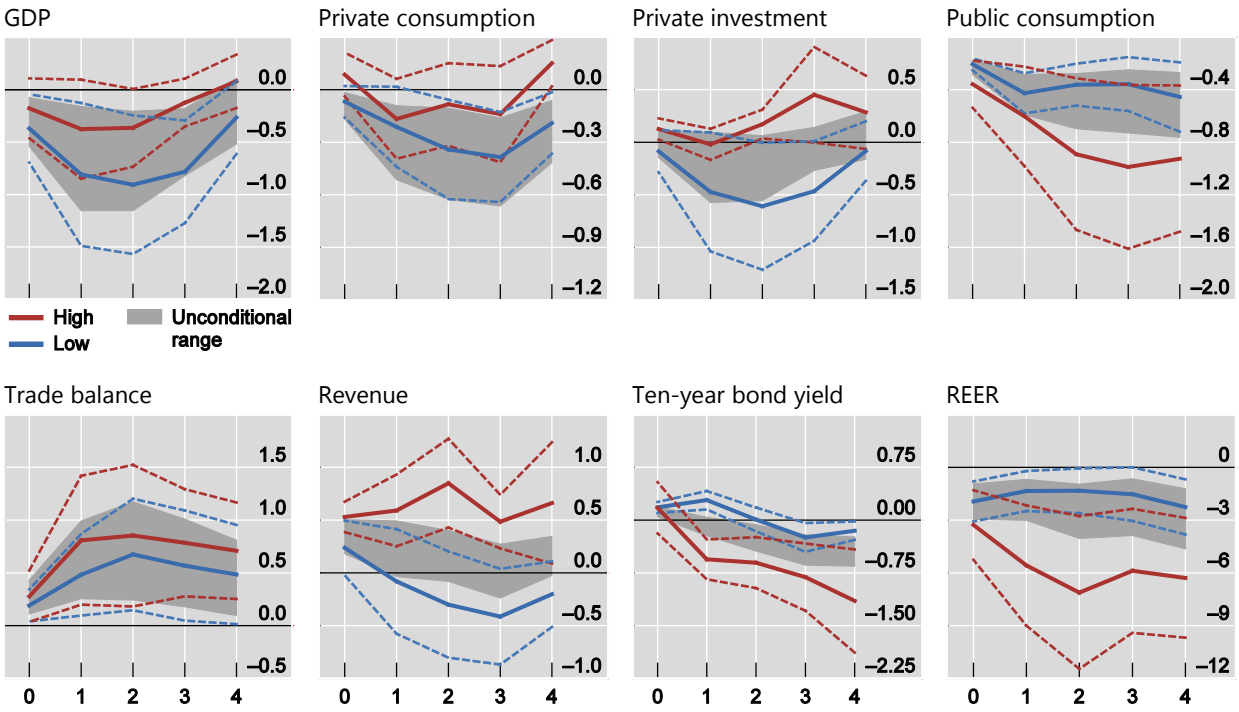
Starting consolidation in a tight monetary policy environment leads to a larger negative impact on interest-sensitive GDP components. Indeed, private consumption is persistently lower, contributing almost 0.7 percentage points to the negative effect of consolidation on output. The contribution of private investment is also negative but fades in year four. Exchange rates do not depreciate but the trade balance improves by more, since the contractionary effects of fiscal consolidation reduce imports by more than exports. When monetary policy is tight, employment declines by a similar amount as output.

## 5.4 Public debt

Graph 2 indicates that a high level of public debt (over 80% of GDP) makes the output costs of fiscal consolidation smaller. Graph 11 shows that this smaller effect is related to at least three features. First, the long term interest rate is substantially lower, by 50 basis points in year one and by a full percentage point in year five. Such drop is explained only partially by the drop in the policy rate (of about 30 basis points) and it is therefore likely to reflect a reduction in the risk premium. Second, the positive effect on competitiveness is bigger. When debt is high, consolidation is associated with a larger depreciation of the real effective exchange rate, reflecting a nominal depreciation as well as a compression of costs (lower real wage and lower inflation). Both lower interest rates and improved competitiveness are associated with a delayed but persistent *crowding in of private investment*, contributing some positive 0.4 percentage point to real GDP as of year three, as well as a persistent improvement in net exports and the current account balance.

## High vs low public debt

Graph 11

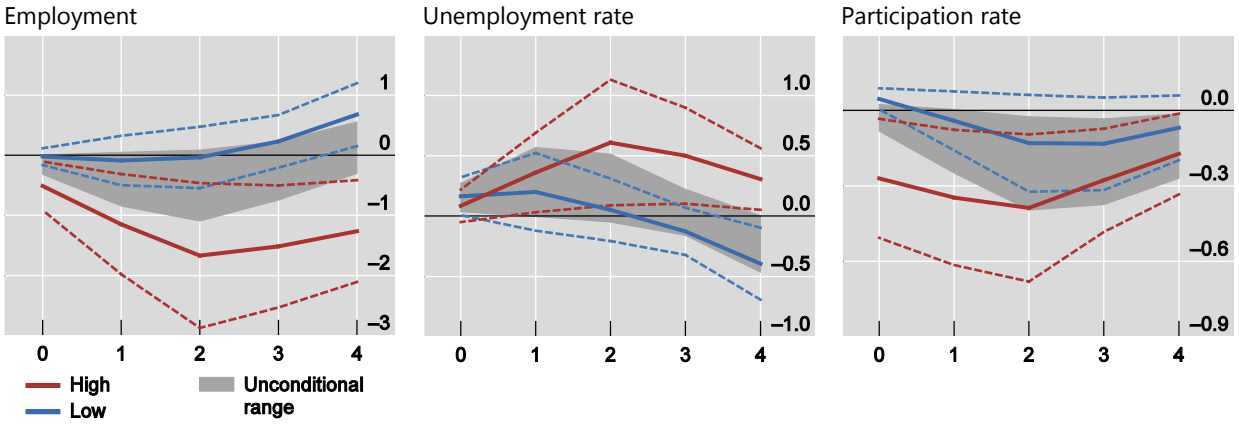



Note: Response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands. The grey area corresponds to the 90% confidence band in the linear (state-invariant) model.

Another feature of high debt is the asymmetric behaviour of employment: while consolidation is less costly in terms of output, it has some negative impact on employment (as shown in Graph 3). Graph 12 shows that this effect is persistent and does not reverse completely within the time horizon of the empirical analysis. The negative effect on the unemployment rate is somewhat smaller, but this occurs at the cost of a lower participation rate.

## High vs low public debt: labour market

Graph 12




Note: Response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands. The grey area corresponds to the 90% confidence band in the linear (state-invariant) model.

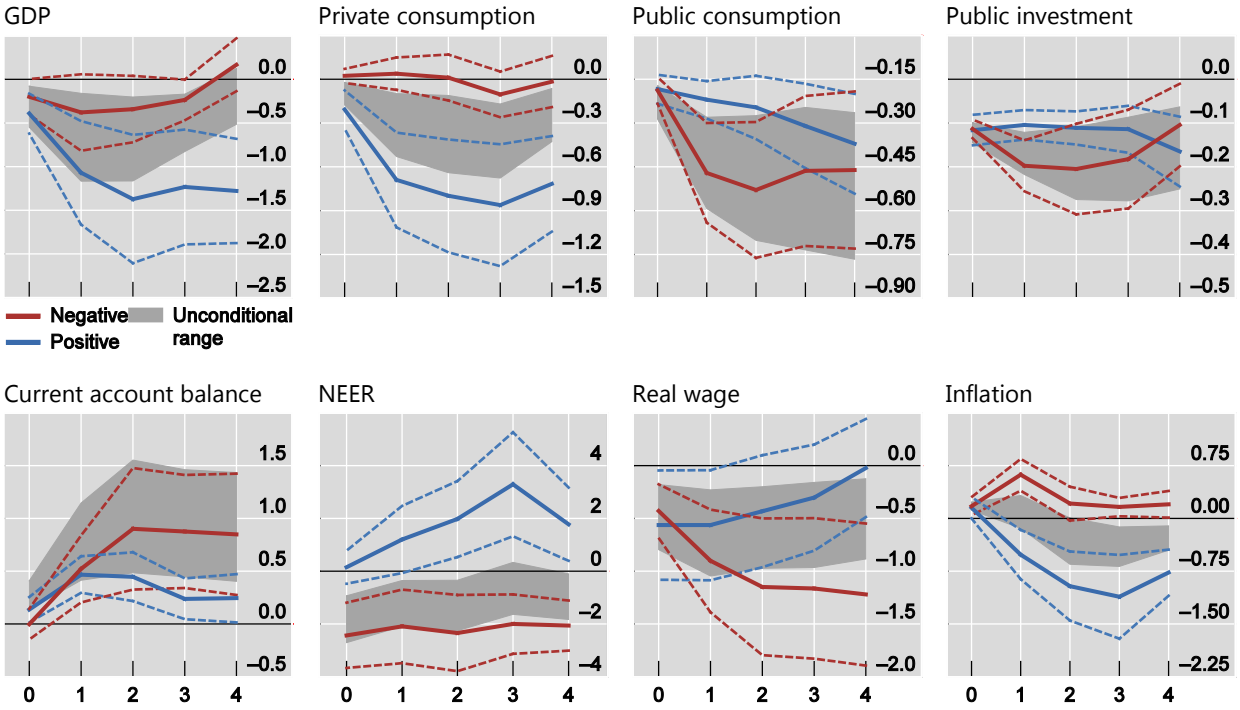
One can speculate that the lower employment may be partly accounted for by the job cuts in the public sector that accompany a reduction in public consumption and that such job cuts are not fully

reabsorbed by a pickup in employment in the private sector. Moreover, a lower supply of labour, as indicated by the lower participation rate, may be explained by a fraction of the unemployed workforce becoming discouraged or by the lower real wage. Further research is required to clarify what factors are driving these changes in the labour market.

## 5.5 Current account

Graph 2 shows that the effects of fiscal consolidation on output are significantly smaller when the current account balance is negative. Graph 13 shows that the smaller costs of consolidation appear to be explained by the fact that private domestic demand does not drop as much as in the average case: cuts to government consumption and public investment have a similar contribution to the drop in GDP as in the linear case, as does the positive contribution from net exports; yet, the responses to both private consumption and investment tend to be smaller. Conditional on a current account deficit, fiscal consolidation tends to produce a larger nominal exchange rate depreciation, which presumably explains the positive temporary response of inflation, as well as a large and persistent drop in the real wage. These responses seem consistent with the notion that fiscal consolidation helps the economy to rebalance and improve its competitiveness.

Current account — Graph 13



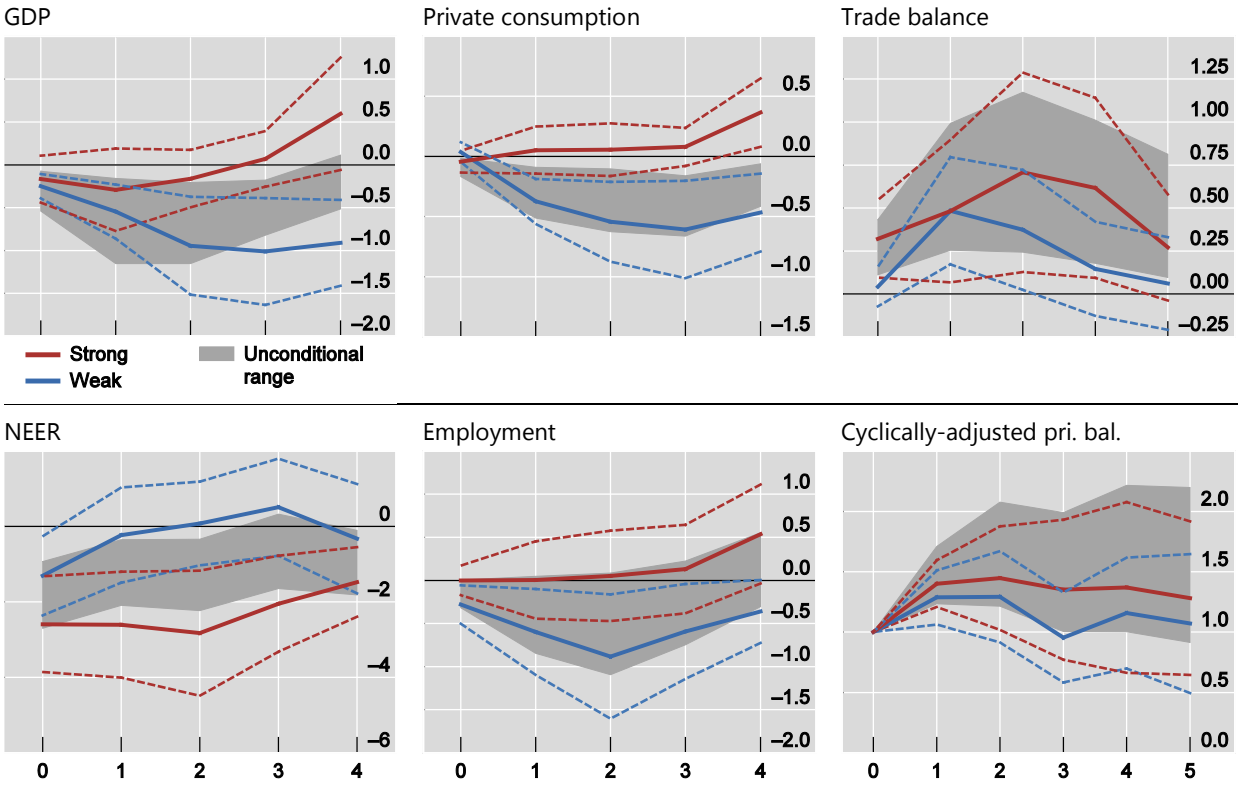

Note: Response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands. The grey area corresponds to the 90% confidence band in the linear (state-invariant) model.

By contrast, conditional on a positive current account, fiscal consolidation is found to have a larger deflationary impact on the economy, compared to the average case. Consolidation is also associated with an appreciation of the nominal exchange rate.

We also split the sample into three parts: large current account deficit (ie less than -2% of GDP); "normal" current account (ie between -2 and +2%); and large current account surplus (ie larger than 2%). We find that for larger current account deficits, the responses are similar to the ones shown in Graph 13 for the negative current account state; for normal current account balances the responses are similar to the linear ones; and for the large current account surplus, the responses are more similar to ones corresponding to the positive current account state. Further research is needed to understand what drives the behaviour of the economy in response to fiscal consolidation when the current account balance is positive and large.

Weak vs strong credit growth

Graph 14




Note: Response to a shock of one percentage point of GDP to the cyclically-adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands. The grey area corresponds to the 90% confidence band in the linear (state-invariant) model.

## 5.6 Private credit growth

Here we consider the strength of the credit cycle. Graph 2 shows that the cumulative fiscal multiplier is larger when credit growth is weak. Graph 14 shows that a key difference between the weak and strong credit states is the behaviour of private consumption. In the weak credit state the negative effect of consolidation on private consumption is larger and more persistent: from year three onwards, it contributes around 0.5 percentage points out of the one percent fall in output. In contrast, private investment (not shown here) does not seem to be much different in the two states, while public investment is marginally lower. At the same time, the nominal exchange rate does not depreciate and there is less offset from the trade balance. The adverse effect on employment is also more pronounced

in the weak state. This pattern of behaviour seems consistent with the smaller ability of consumers to smooth consumption in the face of falling income and rising unemployment in the weak credit state. This stands in contrast with the opposite case of strong credit growth. It is also worth stressing that while the output loss tends to persist, employment shows signs of a partial recovery after year three. Finally, another difference is that there is somewhat less fiscal tightening following the initial consolidation shock, reflecting the larger negative impact on output in the weak credit state. Overall, the fiscal position improves but by less than average.

# 6 Conclusion

In this paper we have examined the short-term effects on output and employment of fiscal consolidation episodes that took place in advanced economies in the three decades prior to the global financial crisis. Our main finding is that estimates of fiscal multipliers are generally less than unity, even in states of the world that raises their estimated size. These states include negative output gap and tight monetary policy. Therefore, contrary to the finding of some of the literature on the state-dependency of the fiscal multipliers, we do not find evidence of large output costs of fiscal consolidation when the output gap is negative. In addition, we find that multipliers are generally lower than average when public debt is high or when countries face a current account deficit, consistent with the notion that fiscal consolidation may help improve broad financial conditions, competitiveness and private agents' confidence. A state in which the costs of fiscal consolidation are larger and more persistent than average is when private credit growth is weak. But, even in this case, point estimates are one or less at all horizons.

Can we draw the conclusion from these findings that fiscal multipliers are generally larger in the aftermath of the global financial crisis? One possible conclusion is no. Several countries face large and rising public debt, in some cases accompanied by a higher perceived sovereign risk. In this case the costs of fiscal consolidation should be smaller. Furthermore, some countries experience large current account deficits. In this case a successful fiscal consolidation should help rebalance demand and improve competitiveness. On the other hand, our findings indicate that weak private credit growth may be associated with larger multipliers than average, albeit not large. This result naturally suggests the potential relevance of accompanying fiscal consolidation measures with interventions aimed at improving the functioning of credit markets. Even if multipliers are larger than average in the aftermath of the global financial crisis, our evidence nonetheless suggests that post-crisis multipliers are not necessarily, or everywhere, larger than one – that is, fiscal consolidation does not necessarily magnify the impact of deficit-cutting measures in every country.

Past fiscal consolidation episodes may, however, not be fully representative of the circumstances faced by several economies in the current post-crisis environment. In particular, a characteristic of recent and ongoing consolidation is that it is taking place more or less at the same time in a large number of countries. This greater simultaneity may act to raise the costs of fiscal consolidation compared to past estimates, given the importance of net trade in offsetting the costs of consolidation.

Whether this is really the case requires further careful research. At a minimum, however, our findings should raise doubts about studies claiming that past historical evidence imply large multipliers post crisis. And if multipliers are really larger than one, it may be because of different drivers than those highlighted by the recent literature on the state-dependency of fiscal multipliers.

## IV first-stage regression

Annex Table A1

| | Estimate | Std. error | t-value | Pr(>\|t\|) |
|---|---|---|---|---|
| total_1 | 0.668*** | 0.083 | 8.068 | 0.000 |
| hply | -0.138*** | 0.018 | -7.495 | 0.000 |
| dly | 0.141*** | 0.038 | 3.671 | 0.000 |
| ldly | 0.102** | 0.042 | 2.409 | 0.016 |
| dlcpi | 0.086 | 0.061 | 1.418 | 0.157 |
| ldlcpi | 0.008 | 0.065 | 0.127 | 0.899 |
| polRt | -0.032 | 0.021 | -1.489 | 0.137 |
| lpolRt | -0.034 | 0.021 | -1.621 | 0.106 |
| dlreer | 0.009 | 0.010 | 0.915 | 0.361 |
| ldlreer | 0.006 | 0.010 | 0.626 | 0.532 |
| debtGross | 0.009*** | 0.002 | 4.048 | 0.000 |
| cay | -0.004 | 0.030 | -0.149 | 0.882 |
| treatment | 0.218** | 0.095 | 2.301 | 0.022 |
| dbalp | 0.029 | 0.046 | 0.633 | 0.527 |
| tradewgtd_gdpgrowth_scaled | -0.396*** | 0.142 | -2.792 | 0.005 |

| | |
|---|---|
| R-squared | 0.278 |
| Adj. R-Squared | 0.258 |
| F-statistic | 10.600 |
| p-value | 0.000 |

Partial F-test

| Model | Residual Df | Df | F | Pr(>F) |
|---|---|---|---|---|
| 1 | 412 | | | |
| 2 | 413 | -1 | 65.095 | 0.000*** |

Note: total_1: the narrative shock (period t); hply: HP filtered output gap (period t-1); dly: log change in real GDP (period t-1); ldly: lagged log change in real GDP (ie growth in period t-2); dlcpi: change in log(CPI) (t-1); ldlcpi: lagged change in log(CPI) (ie inflation in period t-2); polRt: policy rate in period t-1; lpolRt: lagged policy rate (ie in t-2); dlreer: change in log real exchange rate (t-1); ldlreer: lagged change in log real exchange rate (ie in t-2); debtGross: gross financial liabilities as a share of GDP in % (t-1); cay: current account balance as a share of GDP in % (t-1); treatment: if a narrative shock occurred in period t-1; dbalp: change in the primary balance (t-1); tradewtgd_gdp_growthscaled: trade weighted GDP growth t-1. Partial F-test based on Staiger and Stock (1997).

Data sources

Annex Table A2

| Description | Unit | Source |
|---|---|---|
| **OECD FISCAL DATA (refers to general government sector)** | | |
| Total receipts, tax and non-tax | % of GDP | OECD |
| Total outlays / disbursements / expenses | % of GDP | OECD |
| Total disbursements, underlying | bln local currency | OECD |
| Financial balance / net lending | % of GDP | OECD |
| Underlying balances | % of potential GDP | OECD |
| Primary balances | % of GDP | OECD |
| Underlying primary balances | % of GDP | OECD |
| Gross financial liabilities | % of GDP | OECD |
| **OTHER OECD VARIABLES** | | |
| Potential output, value | bln local currency | OECD |
| Potential output, volume | bln local currency | OECD |
| Nominal GDP | bln local currency | OECD |
| Real GDP | bln local currency | OECD |
| GDP deflator | Index, 2010=100 | OECD |
| Nominal fixed investment | bln local currency | OECD |
| Nominal government fixed investment | bln local currency | OECD |
| Nominal private consumption | bln local currency | OECD |
| Nominal government consumption | bln local currency | OECD |
| Nominal exports of goods and services, national accts basis | bln local currency | OECD |
| Nominal imports of goods and services, national accts basis | bln local currency | OECD |
| Current account balance | USD bln | OECD |
| Unemployment rate | % | OECD |
| Labour force participation rate, age 15 and older | % | OECD |
| Wage rate, total economy (figures look like annual wages per person) | In local currency | OECD |
| Total employment | millions persons | OECD |
| **Data from other sources** | | |
| Consumer price index | Index, 2010=100 | BIS |
| Effective exch rates, real (CPI-based), narrow basket | Index, 2010=100 | BIS |
| Exch rate, | USD per national currency | BIS |
| Debt of/credit to the private sector | bln local currency | BIS |
| Consensus forecast in Jan for inflation the following year | annual CPI inflation, % | Consensus Economics |
| Bilateral import and export shares | % | IMF DOTS |
| Policy rates | Percent | BIS |
| Ten-year bond yields | Percent | BIS |
| Narrative fiscal shocks (Devries et al) | % of GDP | IMF |

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