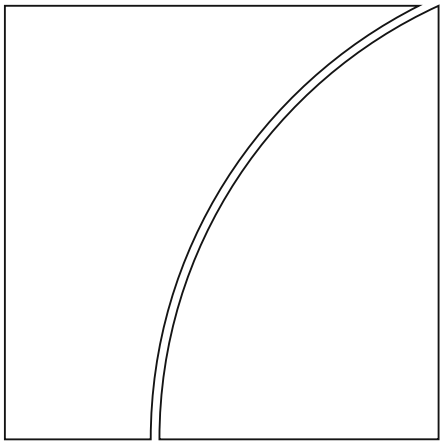

BANK FOR INTERNATIONAL SETTLEMENTS

BIS Working Papers

No 553

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by Ryan Banerjee and Fabrizio Zampolli

Monetary and Economic Department

March 2016, revised January 2019

JEL classification: H60, E62

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This publication is available on the BIS website (www.bis.org).

ISSN 1020-0959 (print)
ISSN 1682-7678 (online)

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

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First draft: November 2014

This draft: 26 January 2019

Abstract

We investigate how the short-term effects of fiscal consolidation on output and employment vary with the state of the business cycle, monetary policy, public debt, the current account, and private credit. By examining the response of a large number of variables, we are also able to shed light on the transmission channels of fiscal policy. Our main finding is that short-term output multipliers are below unity, even in states in which multipliers are expected to be larger (eg when the output gap is negative or monetary policy tight). Key offsetting factors that reduce the size of multipliers and explain differences across states are the extent to which the external sector improves and monetary policy eases.

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

JEL classification: H60, E62

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[#] The views expressed in this paper are those of the authors and do not necessarily reflect those of the Bank for International Settlements. We thank Tobias Adrian, Claudio Borio, Dietrich Domanski, Mathias Drehmann, Emmanuel Fahri, Carlo Favero, Francesco Giavazzi, Jacob Gyntelberg, Christophe Kamps, Enisse Kharroubi, Boris Hofmann, Òscar Jordà, Dubravko Mihaljek, Frank Packer, Valerie Ramey, Hyun Song Shin, Philip Turner, James Yetman, Feng Zhu, participants at the 2nd BIS Research Network meeting on "Macroeconomics and Global Financial Markets", 10-11 March 2015, the 48th Money Macro and Finance annual conference, 7-9 September 2016, and seminars at the ECB and the Bank of Korea for comments and suggestions. Cecilia Franco, Steven Kong, Marjorie Santos and Jimmy Shek provided excellent statistical assistance.

1 Introduction

The effects of fiscal policy are a source of significant disagreement among economists, with estimates varying greatly across studies.[1] Several empirical studies find that short-run government spending multipliers tend to be substantially larger when there is ample spare economic capacity or economic growth is weak (eg Auerbach and Gorodnichenko (2012, 2013), Bachmann and Sims (2012), Baum et al (2012), Batini et al (2012), Fazzari et al (2015), Tagkalakis (2008)).[2] Similarly, fiscal multipliers have been found to be strongly countercyclical in estimated conventional medium-scale DSGE models (Sims and Wolff (2014, 2018), Canzoneri et al (2016)) and much higher than normal at the zero lower bound (Christiano et al (2011), Eggertsson (2011) and Woodford (2011)).[3] A common feature of these studies is that fiscal multipliers are generally found to be larger than one – in some cases, significantly so – suggesting the presence of strong Keynesian features in the economy.[4] The evidence in favour of strong countercyclical fiscal multipliers has, however, not gone unchallenged. For example, using military spending news for the United States, Ramey and Zubairy (2018) found no evidence that multipliers are significantly larger when the unemployment rate is high.

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[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 (2012); Cogan et al (2010); Cwik and Wieland (2011); Leeper, Traum and Walker (2017); Drautzburg and Uhlig (2015). For evidence concerning emerging market economies see eg Ilzetzki et al. (2013), Jawadi et al (2014, 2016) and Jha et al (2014).

[2] 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.

[3] Several studies have challenged the notion of large fiscal multipliers at the zero lower bound. See eg Farhi and Werning (2016), Kiley (2016), Braun et al (2013), Aruoba and Schorfheide (2013) and Mertens and Ravn (2014).

[4] Fiscal multipliers have also been found to be much larger during financial crises (Corsetti, Meier and Müller (2012)), when credit constraints are most likely to be binding – a finding that holds when public finances are not in doubt. In the recovery phase after a financial crisis, credit constraints may still be binding for an unusually large share of the population. In our paper, we proxy for this circumstance by conditioning on the strength of private credit growth (see below). A number of recent studies (Guajardo et al (2014); Perotti (2011), Jordà and Taylor (2016)) have also laid to rest the notion that fiscal austerity can be expansionary contrary, in particular, to the findings of Alesina and Ardagna (2010).

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. We proceed in a similar way to Jordà and Taylor (2016) using local projections (LP) methods (Jordà (2005)) and fiscal shocks identified through the narrative approach (Devries et al (2011)).

Our contribution is twofold. First, we examine the dependency of fiscal multipliers across multiple states that may amplify or dampen the effects of fiscal consolidations. In particular, we examine how the size of fiscal multipliers depends on the state of the business cycle (or the output gap), the monetary policy stance, the level of public debt, the current account, the strength of private credit growth and the occurrence of a financial crisis. Second, we investigate why fiscal multipliers differ across these states by carefully examining the impact of fiscal consolidation on a large number of variables. For these purposes, LP methods are a more flexible tool than VAR models in that they allow the estimation of impulse responses on a variable-by-variable basis: this increases degrees of freedom and makes it possible to condition on a much larger set of variables than in a VAR; it also makes it easier to incorporate potential non-linearities in the variables' responses.

Our main finding is that estimates of fiscal multipliers are generally below one across a variety of states (Graph 1). 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. In addition, fiscal multipliers are small in periods of strong private credit growth, when the output gap is positive or when monetary policy is loose. By contrast, the costs of fiscal consolidation tend to be larger when private credit growth is weak, when the country already runs a current account surplus, when the output gap is negative, when public debt is low or monetary policy is tight. The largest and more persistent costs of fiscal consolidation are found when private credit growth is weak. But even in this case, the point estimate of the multiplier is approximately

one. These results, based on a sample of advanced economies and narrative shocks, corroborate the finding of small multipliers for the United States in Ramey and Zubairy (2018) as well as Barro and Redlick (2011), which rely on military spending news.

<Graph 1 approximately here>

Our analysis also shows that a key factor contributing to the observed differences in fiscal multipliers across states is external adjustment. In particular, a 1% depreciation in the nominal effective exchange rate during consolidations reduces our estimated peak cumulative fiscal multiplier by 0.1 (Graph 2, left-hand panel). Greater accommodation during fiscal consolidations (measured by the deviation of the interest rate from that implied by an estimated country-level Taylor rule) is also associated with smaller estimated peak fiscal multipliers (Graph 2, right-hand panel). External adjustment and monetary policy can explain the difference between our estimates and fiscal multipliers estimates derived from fiscal shocks at the US state level, where neither flexible exchange rates nor monetary policy can play an offsetting role. For example, arithmetically subtracting the offsetting contribution of net trade from our fiscal multiplier estimates produces multipliers close to the US state level multipliers found by Nakamura and Steinsson (2014) and Demyanyk et al (2016). Thus, our findings suggest that fiscal consolidations do not necessarily require large output and employment costs provided exchange rates are flexible enough to adjust and monetary policy has sufficient room for easing.

<Graph 2 approximately here>

The remainder of the paper is organised as follows. Section 2 discusses the related literature. Section 3 describes the empirical method and 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

Our analysis is closely related to that of Jordà and Taylor (2016). As in their analysis, we use local projection (LP) methods (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 et al (2011) as an instrument to obtain consistent estimates.[5] Our analysis, however, has a broader scope. Jordà and Taylor (2016) 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, whereas we look at a broader set of factors influencing fiscal multipliers. Moreover, they do not examine the fiscal transmission mechanism.[6] The use of narrative shocks also links our analysis to that of Guajardo et al (2014), who also find no evidence of expansionary austerity. Yet, their study does not rely on LP methods, nor investigate the state dependency of fiscal multipliers.

Our work is also related to several other empirical studies that investigate the existence of non-linearities in the effects of fiscal policy. These studies generally differ 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.

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[5] 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)).

[6] One of the key findings of Jordà and Taylor (2016) 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 (2016) 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 is also corrected for one-off major events.

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.[7] In a follow-up paper, Auerbach and Gorodnichenko (2013) show that these results hold in a panel of OECD countries using semiannual data. Auerbach and Gorodnichenko (2013) use LP methods. Unlike our work, identification of fiscal shocks is achieved by comparing actual realisations of the fiscal variable to private or official forecasts and their model assumes a smooth transition between states, as in their earlier paper.

Their approach has been criticised by Ramey and Zubairy (2018) 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.[8] In particular, recessions are assumed to last for twenty quarters. Second, Auerbach and Gorodnichenko (2012, 2013) use the centred 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 (2018) 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.[9] Third, fiscal multipliers obtained from estimating regressions in logarithms and multiplying the resulting elasticities by the average share of government spending over the sample period may be biased

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

[8] Changes in government spending are also assumed to have no full feedback on the state of the economy. These criticisms, however, do not affect the findings in Auerbach and Gorodnichenko (2013), for this study employs LPs. By *directly* estimating impulse response functions, LP estimates reflect the tendency of a state to transition to another state and its interaction with policy.

[9] Riera-Crichton et al (2015) 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 seven-quarter moving average of real GDP growth.

upwards. Moreover, the fiscal multipliers reported in Auerbach and Gorodnichenko (2013) are forecast multipliers rather than cumulative multipliers. That is, the path or peak effect on output is compared with the impact response of fiscal policy rather than the peak or its cumulative response (see online appendix of Ramey and Zubairy (2018) for further details). Our paper shares with Ramey and Zubairy (2018) 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.

Other studies use threshold VAR models (TVAR), in which regression coefficients change according to the value taken by a threshold variable, usually a measure of economic slack. For example, Fazzari et al (2015) 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 et al (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 et al (2013)).

Fewer studies estimate the magnitude of fiscal multipliers across other relevant states, beyond economic slack. Ilzetzki et al (2013), which estimate a panel VAR on a quarterly data set 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.[10] 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.[11] 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 that do not lump together fiscal expansions and contractions.[12]

Finally, narrative fiscal shocks (Devries et al (2011)) are also used in a recent paper by Alesina, Favero and Giavazzi (2015). These authors construct fiscal plans by splitting the narrative shocks into unexpected and anticipated components. 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. In our specification, we add control variables to minimise this problem. Even in the presences of fiscal plans, our cumulative LP estimate of multiplier of the entire fiscal consolidation is consistent with their results.[13] Second, their method consumes degrees of freedom. It is therefore less suitable for investigating the state-dependency of fiscal multipliers, which is instead the focus of our paper. LP methods, instead,

[10] 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.

[11] See also Corsetti, Kuester, Meier and Muller (2013) for a theoretical model incorporating sovereign risk.

[12] 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.

[13] The average length of fiscal plans documented in Alesina et al (2015) is remarkably similar to the estimated response of the CAPB to 1 percentage point shock in our analysis.

offer more flexibility and should also be more robust to misspecification of the non-linearities that may be driving the data.[14]

3 Empirical strategy

Our empirical strategy closely follows Jordà and Taylor (2016) in using regression-based difference-in-difference estimators and local projection methods (Jordà (2005)). 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 $D_{i,t} = D(X_{i,t}, \phi, \varepsilon_{i,t})$, where ϕ refers to the parameters of the implied policy function and $\varepsilon_{i,t}$ is an idiosyncratic source of random variation. Hence, $D_{i,t} = D(X_{i,t}, \phi, .)$ refers to the systematic component of policy determination.

A potential outcome is given by $y_{i,t+h}{}^{\phi}(d) - y_{i,t-1}$ $(h=0,1,2,\ldots)$, 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 $\phi \in \Psi$ 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

[14] Alesina et al (2015) also claim that serially correlated fiscal shocks make Local Projections (LP) unsuitable for estimating the effects of fiscal policy. The reason is an omitted variable problem: that is, the errors in the LPs contain "forward-looking" fiscal shocks that are correlated with the contemporaneous fiscal shock. Hence, the estimator associated with the contemporaneous fiscal shock is inconsistent. This argument confuses the inconsistency of the estimated contemporaneous effect (h=0) with the inconsistency of the estimated impulse response function over a time horizon h>0. An appendix (available from the authors on request) shows that the local projection delivers a consistent estimate of the impulse response function.

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.[15]

Following Angrist, Jordà and Kuersteiner (2018) we make the following *selection-on-observables* assumption (sometimes called *conditional ignorability* or *conditional independence* assumption),

$$\left(y_{i,t+h}^{\psi}(d) - y_{i,t-1}\right) \perp D_{i,t} | X_{i,t-1} \tag{1}$$

for all $h \geq 0$ and for all $d \in D$ and $\phi \in \Psi$. We require the treatment variable to be independent from the outcome conditional on the set of covariates $X_{i,t-1}$. In practice, 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:

$$y_{i,t+h} - y_{i,t-1} = \alpha_i^h + \eta_t^h + \theta^h D_{i,t} + \gamma^{h\prime} X_{i,t-1} + \varepsilon_{i,t+h} \tag{2}$$

for $h = 0,1, \ldots,H$. Under assumption (1), the *average treatment effect* of a policy intervention *d* relative to the baseline can be calculated from (2) as

$$\begin{aligned} & E\left[\left(y_{i,t+h}(d) - y_{i,t-1}\right) - \left(y_{i,t+h}(0) - y_{i,t-1}\right)\right] \qquad (3) \\ & = E\Big[E\left(y_{i,t+h} - y_{i,t-1} | D_{i,t+1} = d\,;X_{i,t-1}\right) \\ & \qquad\qquad - E\left(y_{i,t+h} - y_{i,t-1} | D_{i,t+1} = 0\,;\, X_{i,t-1}\right)\Big] \\ & = \theta^h(d - 0) \end{aligned}$$

[15] 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 $y_{i,t+h}(d) - y_{i,t+h}(0)$.

Under assumption (1) the key coefficient θ^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 data set.

3.1 Specification of the empirical model

In our empirical analysis, we separately estimate several models based on (2) 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, employment, general government 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 θ^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 θ^h in the local projections for these variables can also be interpreted as multipliers.[16]

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 θ^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 which increases the CAPB by 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 (eg 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 θ^h in (2). To address this problem, we follow Jordà and Taylor (2016) and instrument the CAPB by the discretionary fiscal-deficit action variables constructed through the narrative approach by Devries et al (2011). Guajardo et al (2014) and Jordà and Taylor (2016) show that these narrative fiscal shocks are indeed strong instruments (Annex Table B *not meant for publication* shows that they are in our estimation too).

[16] As argued by Ramey and Zubairy (2018), 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 upwards.

To address any potential residual endogeneity bias, we add a rich set of controls which predict selection into the policy intervention.[17] We prefer using regression adjustment to the propensity score matching methods used by Jordà and Taylor (2016) 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 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 (2016), 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.

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

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:

$$y_{i,t+h} - y_{i,t-1} = \alpha_{1i}^{h} + \theta_{1}^{h\,\prime}\, D_{i,t} + \gamma_{1}^{h\,\prime}\, X_{i,t-1} + \varepsilon_{1i,t+h}, \;\; q_{it-s} \leq \delta \quad (4)$$

$$y_{i,t+h} - y_{i,t-1} = \alpha_{2i}^{h} + \theta_{2}^{h\,\prime}\, D_{i,t} + \gamma_{2}^{h\,\prime}\, X_{i,t-1} + \varepsilon_{2i,t+h}, \;\; q_{it-s} > \delta \quad (5)$$

where q_{it-s} is the conditioning variable and δ 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). 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 a Taylor rule (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);

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 data set

The data are an unbalanced panel of 17 OECD countries over the period 1978–2007.[18] 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 A.

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 3 the *average treatment effect* of fiscal consolidation on real GDP over a number of years. The left-hand panel shows the cumulative percentage change in real GDP from year zero to year four in response to a fiscal shock of 1 *percentage point* of real GDP, where 0 indicates the year in which

[18] The countries are: Austria, Australia, Belgium, Canada, Germany, Denmark, Spain, Finland, France, Ireland, Italy, Japan, the Netherlands, Portugal, Sweden, the United Kingdom and the United States.

the shock occurs. Two aspects are important. 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.

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 1 percentage point of GDP, reaching a maximum of 1.6 percentage points in year two and remaining at approximately this level afterwards (Graph 3, centre panel). The fiscal tightening typically lasts for three years, which is also the typical length of multi-year plans documented in Alesina et al (2015), and 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 overestimates 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,[19] defined as

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

where $\Delta x_{t+j} = x_{t+j} - Y_{t+j-1}$. Graph 3 (right-hand 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 3, right-hand panel).[20]

<Graph 3 approximately here>

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 4 shows how estimates vary across a number of states.

We consider first the *output gap*, the most common form of state dependency studied in the empirical literature (on the top left-hand side of Graph 4). 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).[21] Point estimates show that the

[19] Mountford and Uhlig (2009) propose an alternative definition of the cumulative multiplier, which has been used by Ramey and Zubairy (2018): $\frac{\sum_{j=0}^{h} \beta^j (Y_{t+j})}{\sum_{j=0}^{h} \beta^j (CAPB_{t+j})}$, where β is the discount factor and x_{t+j} is the difference between the path conditional on fiscal consolidation minus the path without consolidation. Our results remain broadly unchanged with this alternative definition.

[20] 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 3 are forecast multipliers, whereas the multiplier shown in the right-hand panel is a cumulative multiplier.

[21] 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 test 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: ie that even conditioning on potentially bad states, there is no evidence of large fiscal consolidation multipliers.

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 relatively small at about 0.5.

<Graph 4 approximately here>

Second, we consider the stance of *monetary policy* proxied by whether the policy rate is above or below an estimated Taylor rule in the year before the fiscal consolidation. 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 4, centre left-hand 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 4, lower right-hand 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 shock. There are too few financial crises in our data set and the few that there are, are presumably too different from one another in terms of their nature, severity and policy responses to allow us 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.

In sum, the estimates presented in Graph 5 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 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. However, this link may not be stable and, importantly, it may change as a result of a fiscal correction. For this reason, we also show in Graph 5 the cumulative change in the log number of employed

persons in response to a fiscal consolidation shock of 1 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 4).

<Graph 5 approximately here>

We first consider the *output gap* (Graph 5, top left-hand panels). When the output gap is positive, employment declines by about half a 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% lower on impact and 1% lower in year three, after which it begins to recover. Below we show how the response of public employment explains the absence of state dependent output multipliers across output gap states but different employment multipliers.

Second, the stance of *monetary policy* also matters (Graph 5, top right-hand 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 4), but has a larger negative impact on employment (Graph 5, centre left-hand panels). The effect is minus half a per cent on impact and grows to a maximum of about minus 0.8% 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.

Fourth, the *current account* balance is also important (Graph 5, centre right-hand 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.

Fifth, 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 5, lower left-hand 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% lower in year five, the adverse effect on employment drops to 0.5%. 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 5, lower right-hand 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 4). 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 data set, and too varied, to precisely pin down any effect.[22]

[22] Not all fiscal consolidations are successful owing to factors such as the composition of fiscal measures and their duration (see eg Alesina and Ardagna (2010), Agnello and Sousa (2012, 2013)). Following the approach of Agnello and Sousa (2012), as a robustness test, we re-run our regressions including only episodes of successful consolidation, defined as consolidations that improved the CAPB by at least 1.5 percent of GDP. Our baseline findings are broadly robust to this test. In particular, the ordering of the size of fiscal multipliers by state remain broadly unchanged and less than one (further details are available on request from the authors). [See Annex Graph A *not meant for publication*].

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 (state-invariant) 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 1 percentage point of GDP. Such a shock is followed (as shown in Graph 3 above) by a continued improvement as the rise in the CAPB reaches about 1.5 percentage points after four years. As shown in Graph 6, 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% 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 6 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.

<Graph 6 & 7 approximately here>

Graph 7 shows the effects on the main components of GDP. These are expressed as contributions (in percentage points) to the 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 percentage points 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 percentage points after two years). Mechanically subtracting this offsetting contribution of net trade from overall response of GDP to fiscal consolidation produces multipliers very close to the US state level multipliers found by Nakamura and Steinsson (2014) of around 1.4. Along with the improvement in net trade, the current account also improves (Graph 7, first panel). This improvement in the external position is associated with a persistent depreciation of the real effective exchange rate (REER) (Graph 8). Initially, this is caused by a fall in the value of the currency, but in subsequent years it also reflects wage moderation (Graph 8). 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.

<Graph 8 approximately here>

The improvement in the current account is also consistent with the twin deficit hypothesis and is also quantitatively significant: a 1 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).[23]

<Graph 9 approximately here>

On average, monetary policy is 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 8) and currency depreciation (Graph 7). 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 its 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 9 also shows that credit to private sector tends to diminish in a persistent manner, by over 2.5% in year four, although there is quite large variation in the data.

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

[23] While Bluedorn and Leigh (2011) rely on the same set of narrative fiscal shocks as in our analysis and a similar sample of advanced economies, they adopt a different empirical specification and do not investigate systematically differences across states.

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 10, first panel). In the process, a temporary drop in the participation rate tends to limit the initial adverse impact on the unemployment rate (Graph 10, second and third panels). The reversal of the negative effect on employment also appears to be consistent with wage moderation (Graph 8, fourth panel) but also with the increase in general government employment that occurs two years after fiscal consolidations.

<Graph 10 approximately here>

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 declines persistently, dampening the contraction 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 4 indicate that there are no large differences in the size of contractionary effects on output in the initial years after consolidation, except that these effects tend to be more long-lived when the output gap is negative. Despite the similarity of the responses in the first few years, Graph 11 points to some differences across positive and negative output gap states. These differences are not large, 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.)

<Graph 11 approximately here>

There seems to be, in particular, four 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 11). 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 percentage points 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. Finally, the response of government employment is different across output gap states. Government employment actually increases in positive output gap states by around 1% while in negative output gap states it declines by 1%. The contrasting responses in public employment broadly explain the worse employment outcomes in negative output gap states. As the contribution of public employment to output is small, due to low productivity in this sector, it also rationalises why we find little evidence of little state dependence of cumulative fiscal multipliers across output gap states (Graph 3) but much larger cumulative employment multipliers in negative output gap states (Graph 4).

5.3 Monetary policy

Graph 4 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. Graph 12 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.

<Graph 12 approximately here>

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 4 indicates that a high level of public debt (over 80% of GDP) makes the output costs of fiscal consolidation smaller. Graph 13 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. The drop is only partially explained by the cut 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.

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 5). Graph 14 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.

<Graph 13 & 14 approximately here>

In high debt states, job cuts in the public sector that accompany a reduction in public consumption partly account for lower employment but are insufficient in magnitude to explain the complete fall in employment. 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 4 shows that the effects of fiscal consolidation on output are significantly smaller when the current account balance is negative. Graph 15 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 make 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.

<Graph 15 approximately here>

By contrast, conditional on a positive current account, fiscal consolidation is found to have a larger deflationary impact on the economy, compared with the average case. Consolidation is also associated with an appreciation of the nominal exchange rate.[24]

5.6 Private credit growth

Here we consider the strength of the credit cycle. Graph 4 shows that the cumulative fiscal multiplier is larger when credit growth is weak.

<Graph 16 approximately here>

Graph 16 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 1% 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

[24] As a further check, 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 15 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.

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 fiscal consolidation on output and employment for a sample of advanced economies. 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 a negative output gap. Therefore, contrary to the findings of some of the literature on the state-dependency of the fiscal multipliers (see Sections 1 and 2), we do not find evidence of large output costs from fiscal consolidation when there is slack in the economy. 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 approximately one or less at different horizons. Another important finding of our analysis is that the reasons why multipliers differ across states is

the different offset provided by the response of the nominal exchange rate and that of monetary policy.

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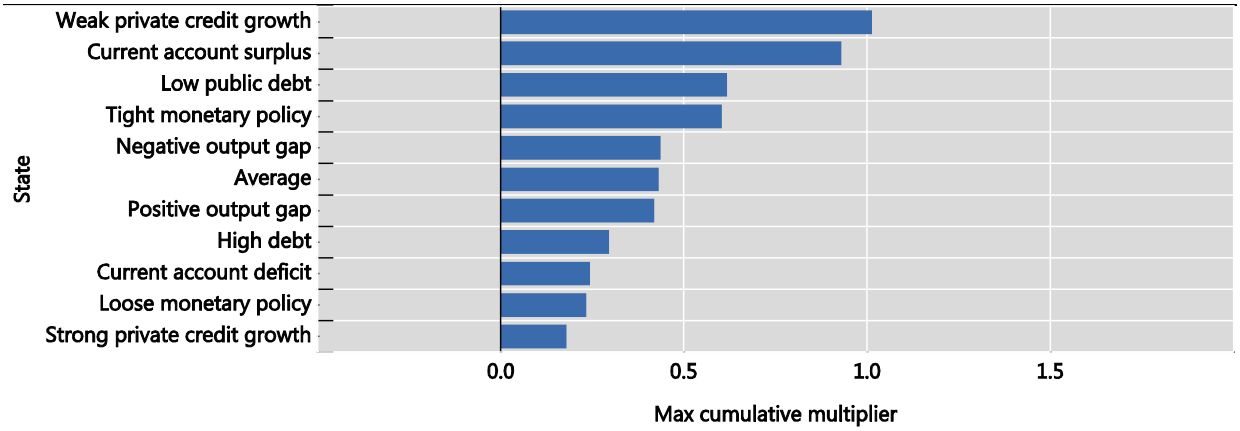
Peak cumulative fiscal consolidation multipliers across various states

Graph 1

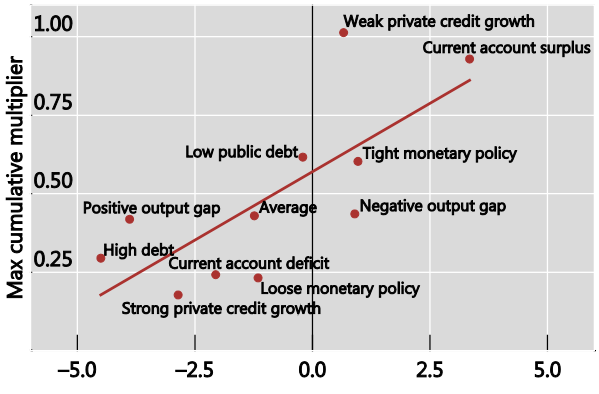


Note: The cumulative fiscal multiplier is the cumulative change in real GDP in response to a shock of 1 percentage point of GDP to the cyclically adjusted primary balance (CAPB) over *h* years divided by the cumulative change in the CAPB over the same period. The graph reports the maximum value multipliers over a period of *h=0-4* years.

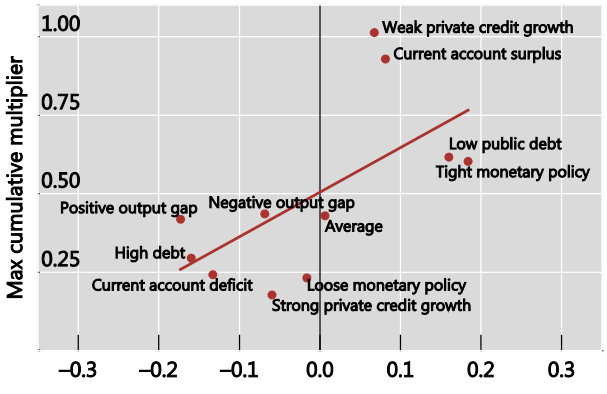
External adjustment and looser monetary policy lower fiscal multipliers

Graph 2

Exchange rate offsets fiscal consolidations



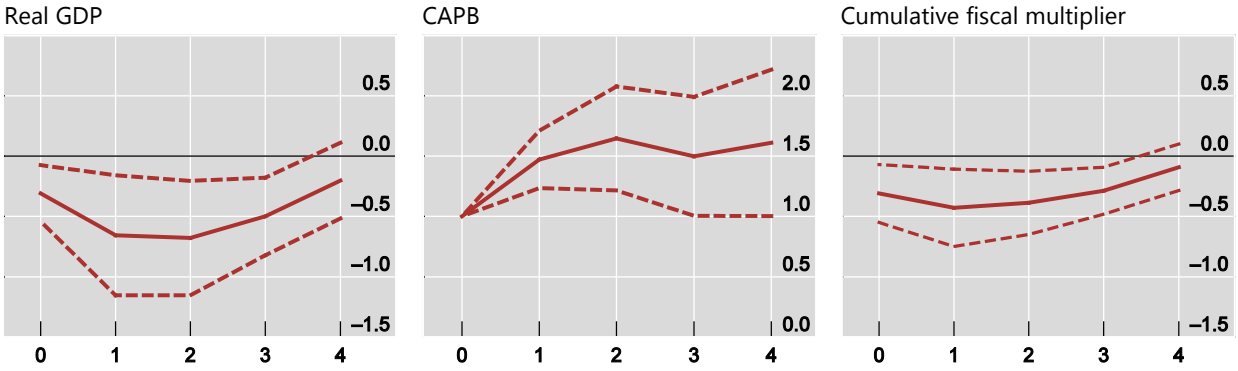
Monetary policy offsets fiscal consolidations[1]



[1] Monetary policy stance measured as the deviation of nominal interest rates from an estimated Taylor rule. Higher values indicate tighter monetary policy stance, given GDP and inflation outcomes

Unconditional multipliers in response to a fiscal consolidation shock of one pp of GDP

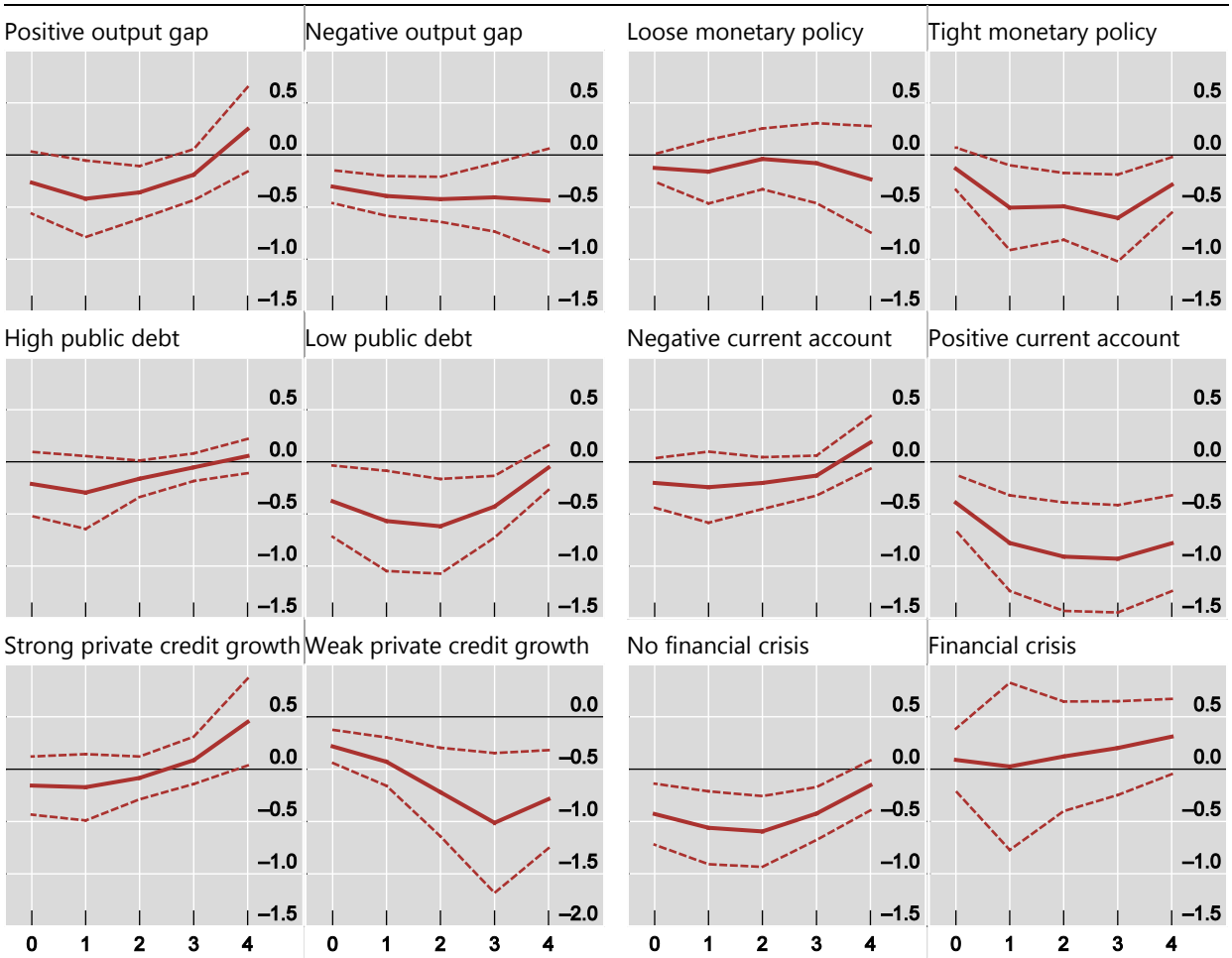
Graph 3



Note: The continuous lines in the left-hand and centre 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-hand panel is defined as the ratio of the cumulative change in real GDP (left-hand panel) to the cumulative change in the CAPB (centre). Dotted lines are 90% confidence bands. Standard errors for the cumulative fiscal multiplier are calculated using the delta method.

Cumulative fiscal consolidation multiplier conditional on various economic states

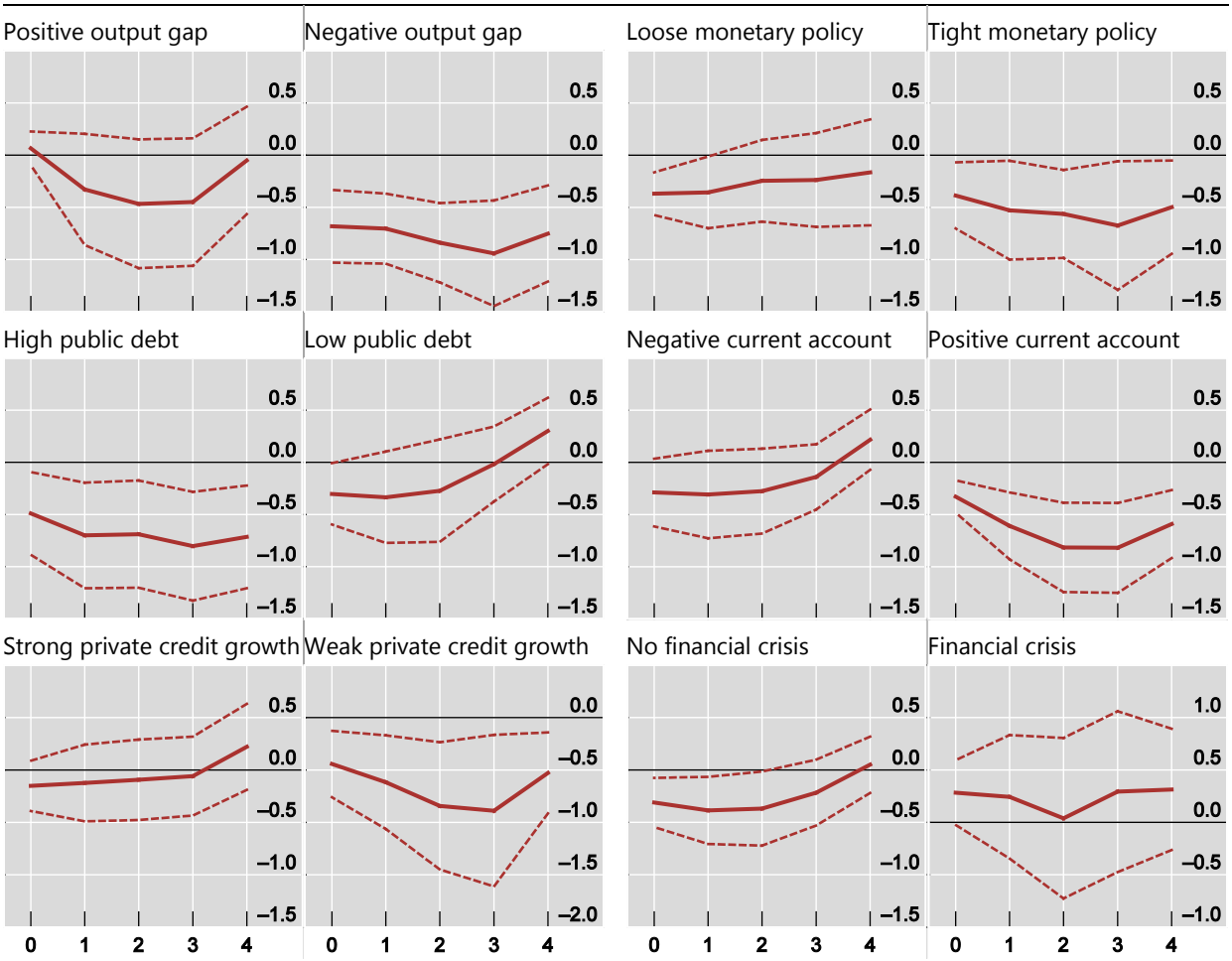
Graph 4



Note: The cumulative fiscal multiplier is the cumulative change in real GDP in response to a shock of 1 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

Cumulative consolidation multiplier for employment conditional on various states

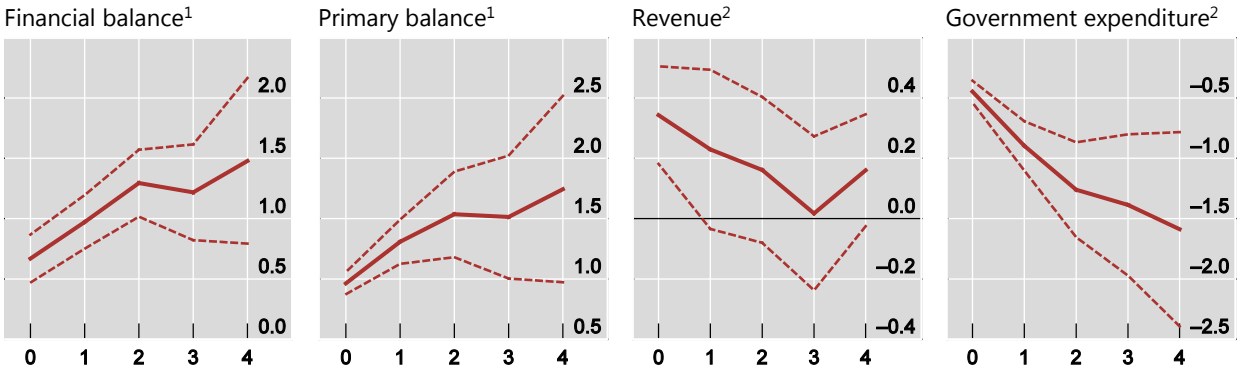
Graph 5



Note: The cumulative fiscal multiplier for employment is the cumulative change in log employment in response to a shock of 1 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.

Government Budget

Graph 6



Notes: [1] Cumulative changes (in percentage points) in response to a shock of 1 percentage point of GDP to the cyclically adjusted primary balance (CAPB) over *h* years. [2] Contributions (in percentage points) to the cumulative change in real GDP in response to a shock of 1 percentage point of GDP to the cyclically adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands.

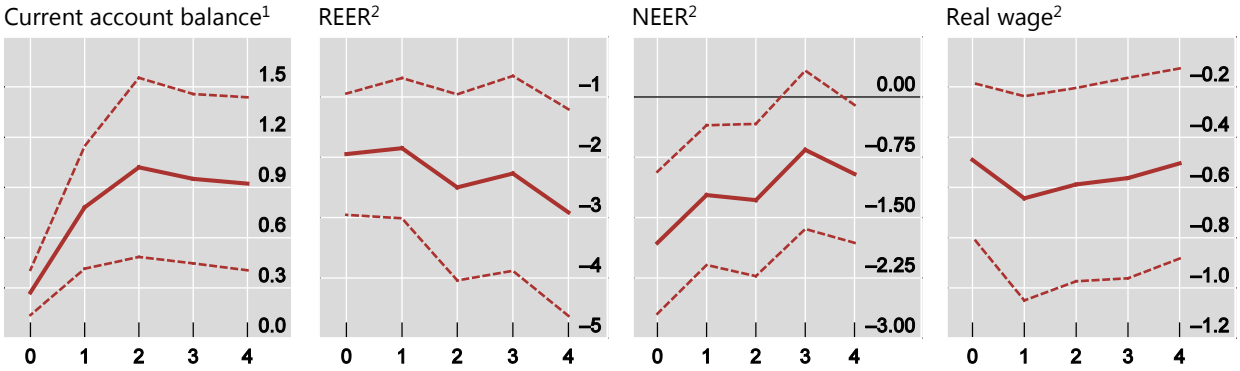
GDP components

Graph 7

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 1 percentage point of GDP to the cyclically adjusted primary balance (CAPB) over *h* years. The dotted lines indicate 90% confidence bands.

Current account and competitiveness

Graph 8

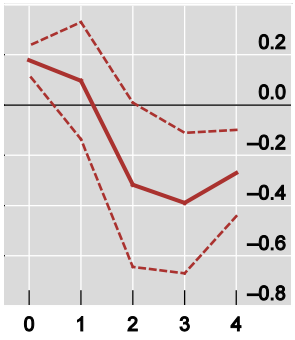


Note: [1] Cumulative changes (in percentage points) in response to a shock of 1 percentage point of GDP to the cyclically adjusted primary balance (CAPB) over h years. [2]Cumulative changes (in per cent) in response to a shock of 1 percentage point of GDP to the cyclically adjusted primary balance (CAPB) over h years. REER and NEER stand for Real and Nominal Effective Exchange Rate respectively. The dotted lines indicate 90% confidence bands.

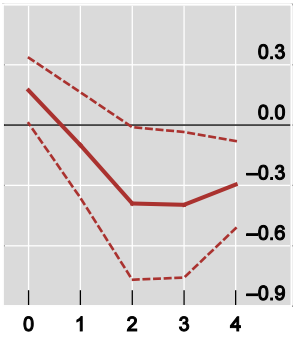
Inflation, monetary policy and credit

Graph 9

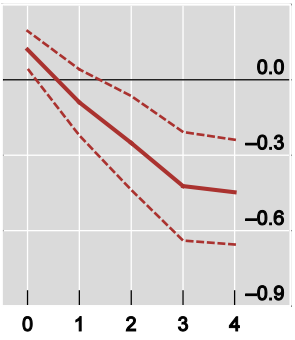
Inflation[1]



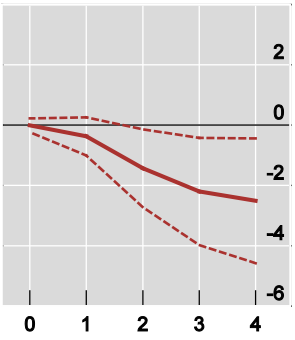
Policy rate[1]



Ten-year bond yield[1]



Private credit growth[2]

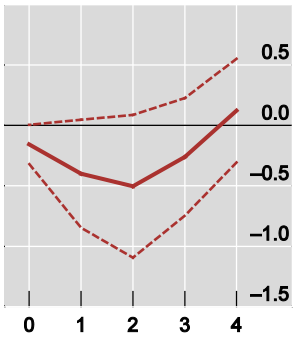


Note: [1] Cumulative changes (in percentage points) in response to a shock of 1 percentage point of GDP to the cyclically adjusted primary balance (CAPB) over h years. [2] Cumulative changes (in per cent) in response to a shock of 1 percentage point of GDP to the cyclically adjusted primary balance (CAPB) over h years. The dotted lines indicate 90% confidence bands.

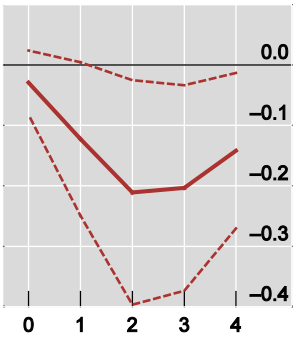
Labour market

Graph 10

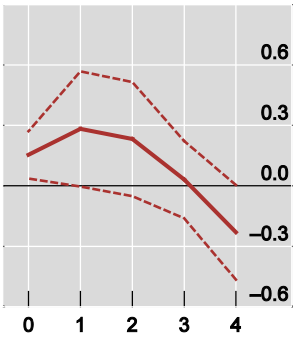
Employment[1]



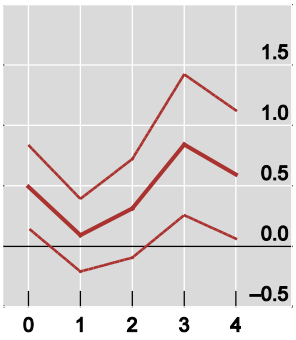
Participation rate[2]



Unemployment rate[2]



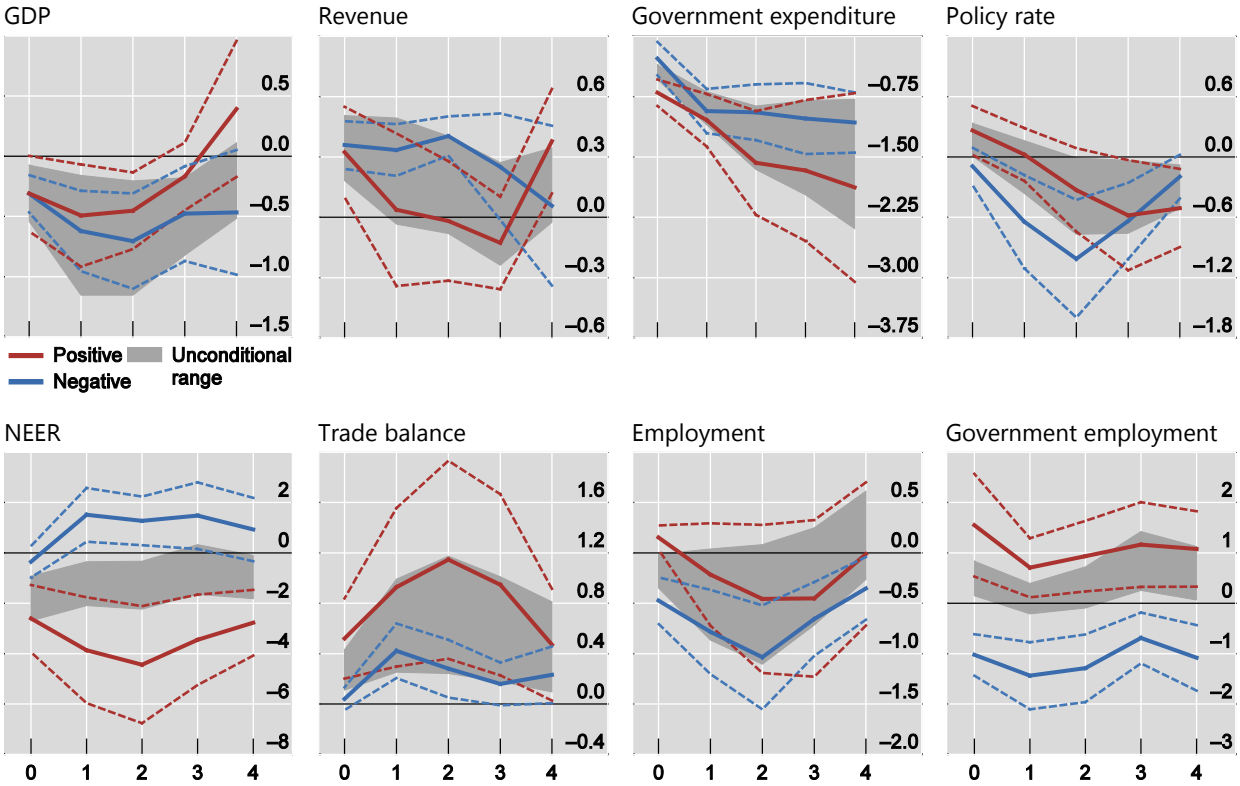
Government employment[1]



Notes: [1] Cumulative changes (in per cent) in response to a shock of 1 percentage point of GDP to the cyclically adjusted primary balance (CAPB) over h years. [2] Cumulative changes (in percentage points) in response to a shock of 1 percentage point of GDP to the cyclically adjusted primary balance (CAPB) over h years. The dotted lines indicate 90% confidence bands.

Positive vs negative output gap

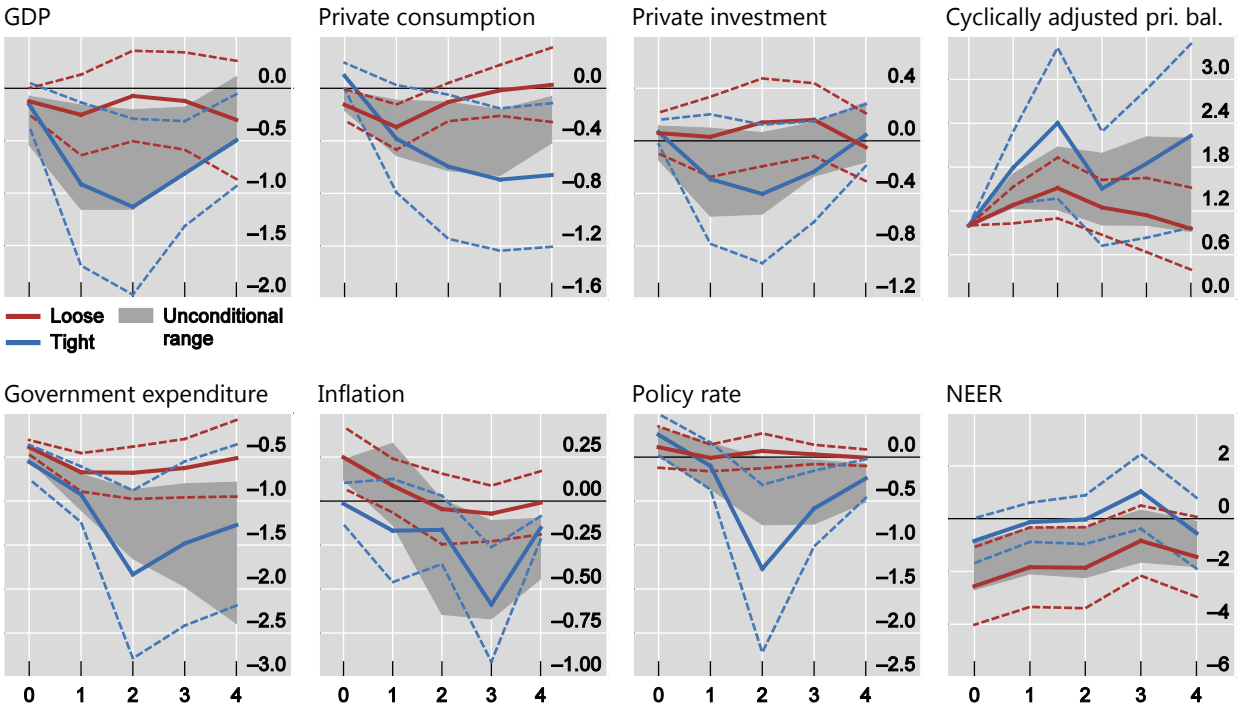
Graph 11



Note: Response to a shock of 1 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.

Tight vs loose monetary policy

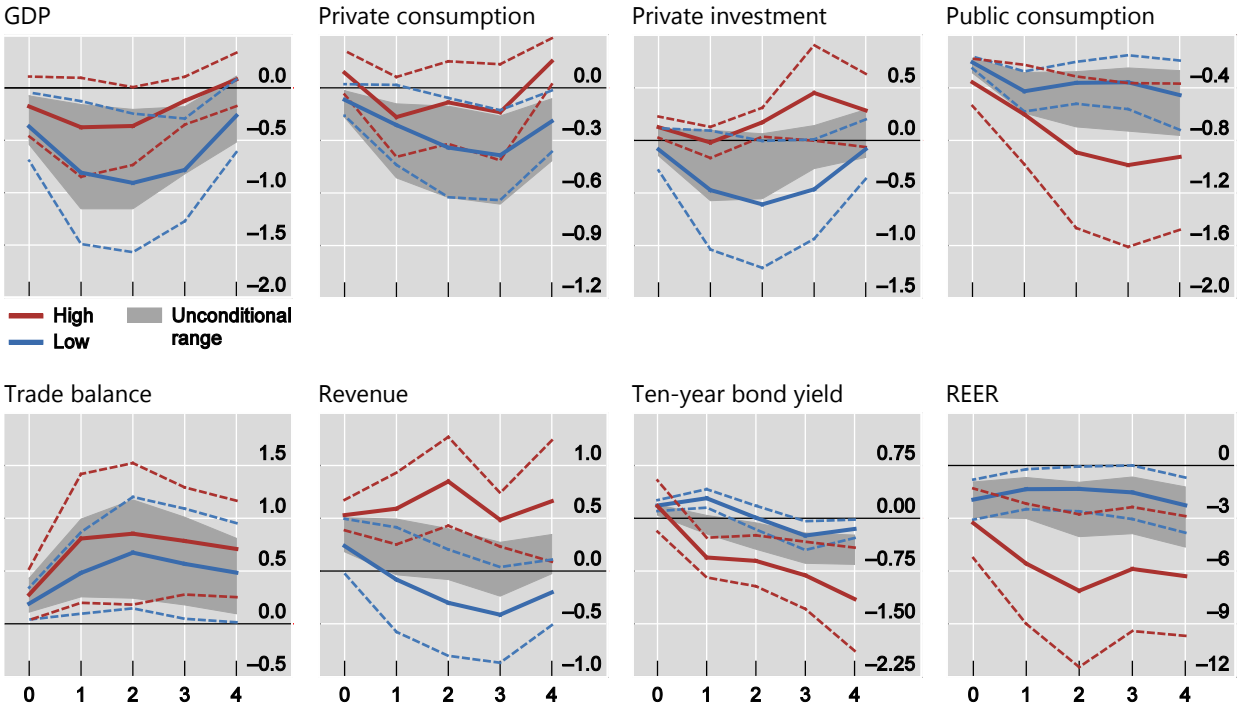
Graph 12



Note: Response to a shock of 1 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.

High vs low public debt

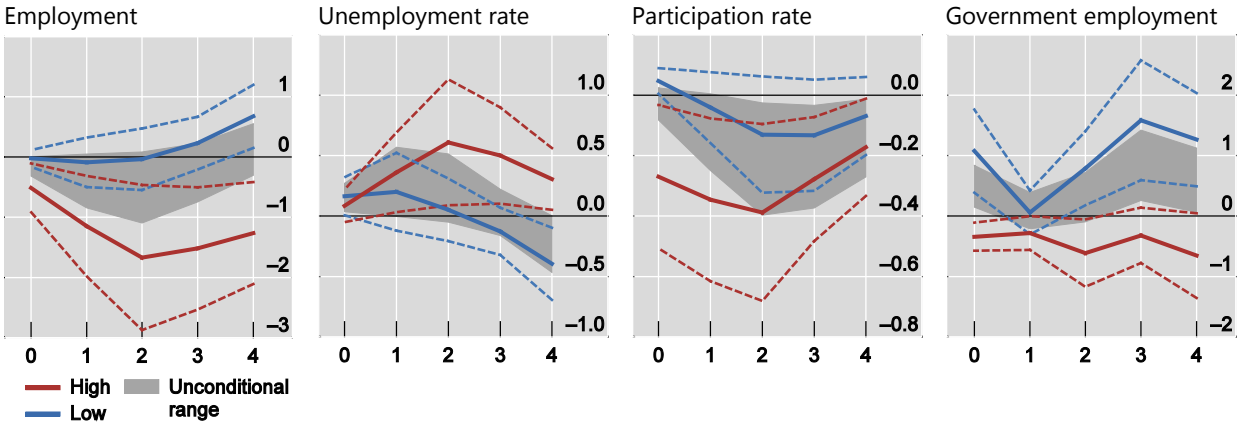
Graph 13



Note: Response to a shock of 1 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.

High vs low public debt: labour market

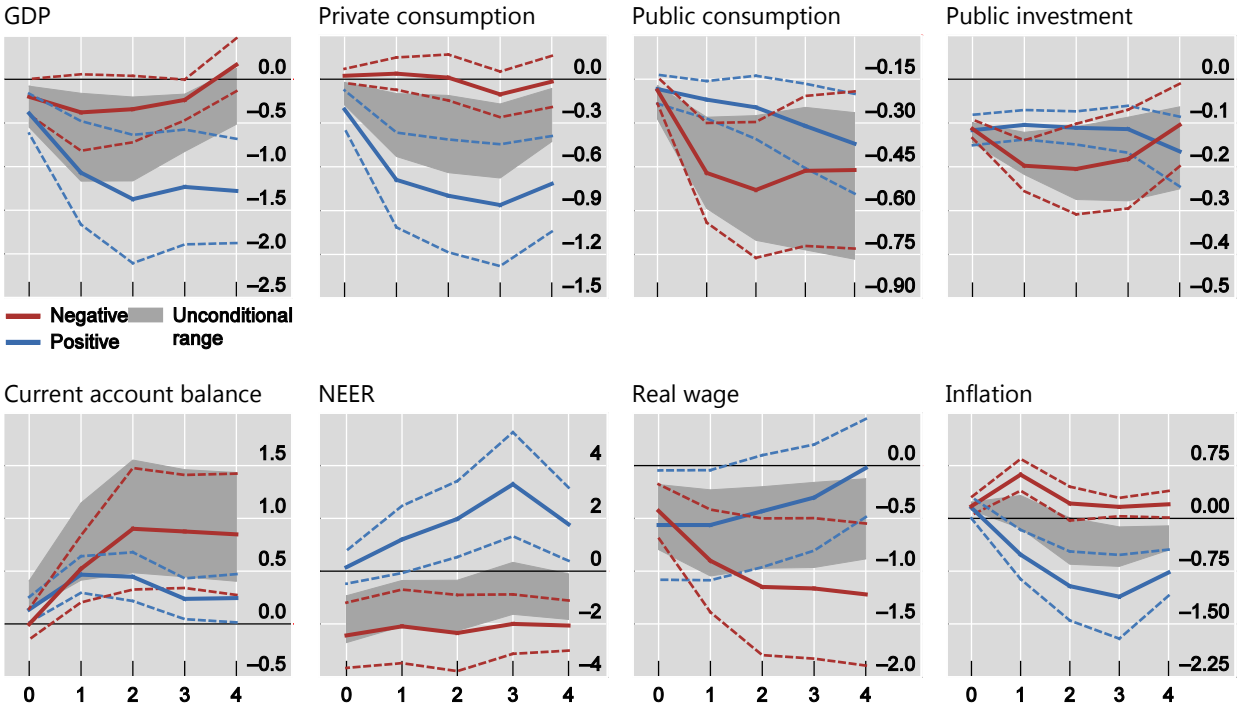
Graph 14



Note: Response to a shock of 1 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.

Current account

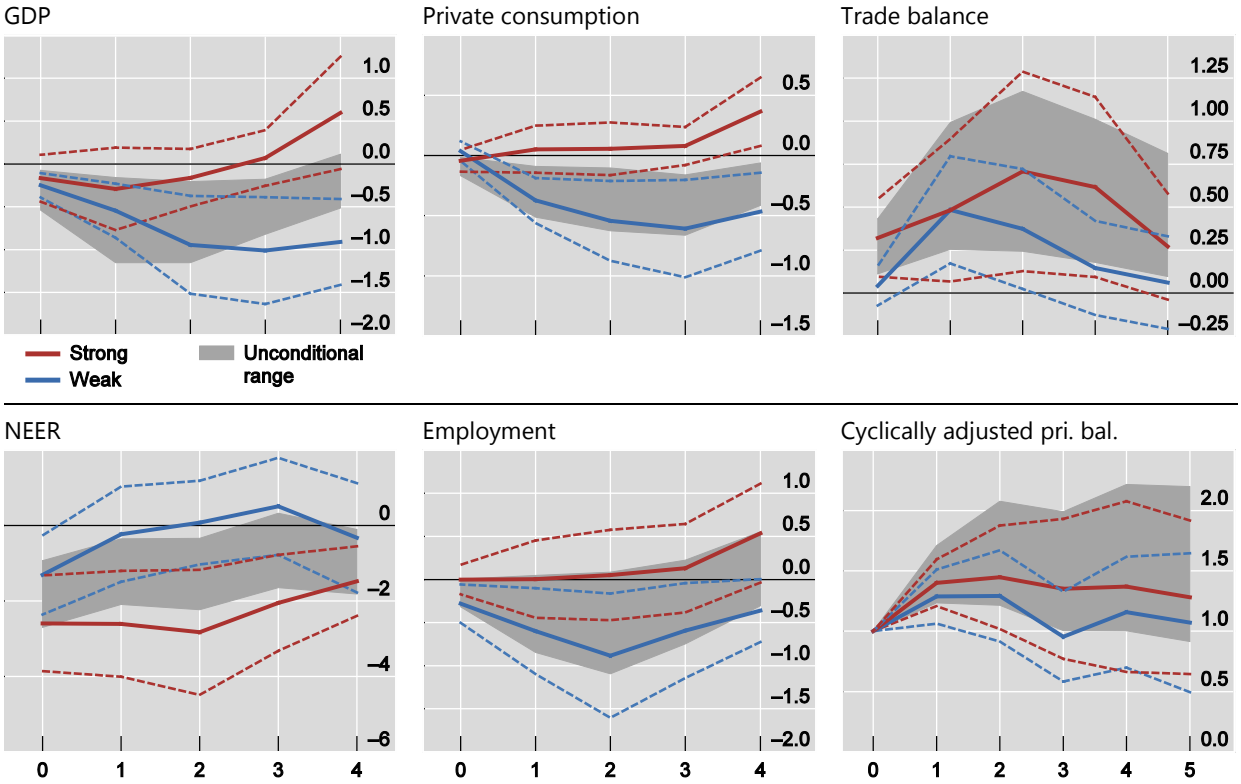
Graph 15



Note: Response to a shock of 1 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.

Weak vs strong credit growth

Graph 16



Note: Response to a shock of 1 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.

Data sources

Annex Table A

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	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
Bilateral import and export shares	%	IMF DOTS
Policy rates	Percent	BIS
Ten-year bond yields	Percent	BIS
Narrative fiscal shocks (Devries et al, 2011)	% of GDP	IMF

Annex: Not for publication

IV first-stage regression

Annex Table A1

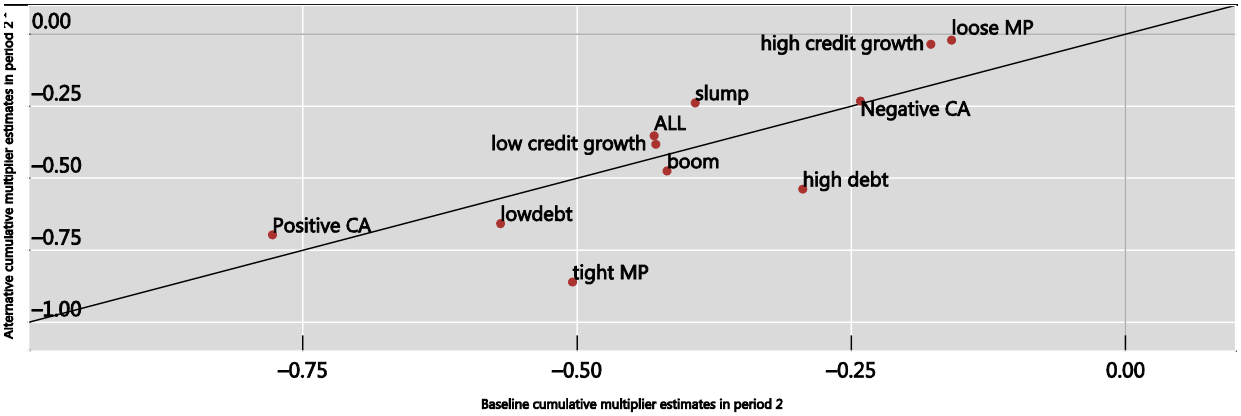
	Estimate	Std. error	t-value	Pr(>|t|)
total_1	0.668***	0.083	8.068	0.000
hply	-0.138***	0.018	-7.495	0.000
dly	0.141***	0.038	3.671	0.000
ldly	0.102**	0.042	2.409	0.016
dlcpi	0.086	0.061	1.418	0.157
ldlcpi	0.008	0.065	0.127	0.899
polRt	-0.032	0.021	-1.489	0.137
lpolRt	-0.034	0.021	-1.621	0.106
dlreer	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).

Robustness check: successful consolidation episodes (not for publication) Annex Graph A



[1] Estimates based only on successful consolidation.

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