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Cross-Country Spillovers from Fiscal Consolidations

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By Antoine Goujard

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ABSTRACT/RESUMÉ

Cross-country spillovers from fiscal consolidations

In many OECD countries, government debt reached levels over recent years that call for reduction over the medium to longer term to ensure public finance sustainability. This paper investigates the international transmission of fiscal consolidation shocks via trade flows. Using a measure of exogenous fiscal shocks in export markets, fiscal consolidation spillovers are found to slow domestic growth and decrease employment. When fiscal consolidation efforts are synchronised across partner countries, fiscal policies have large spillover effects on output. Spillovers of fiscal consolidations on growth are found to be initially larger between countries belonging to currency unions, though this larger impact vanishes over the medium term. Larger spillovers of fiscal consolidation coincide with stronger shifts in bilateral trade flows in currency unions in the short term, despite smaller adjustments in relative exchange rates. Spillovers of fiscal consolidation are also found to be more detrimental to domestic growth during economic downturns in export markets.

JEL classification codes: E23; E32; E62; F42.

Keywords: Fiscal policy, fiscal consolidation, international spillovers, trade spillovers.

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Les répercussions internationales des consolidations fiscales

Dans de nombreux pays de l'OCDE, la dette publique a récemment atteint des niveaux appelant sa réduction sur le moyen à long terme afin d'assurer la soutenabilité des finances publiques. Ce document étudie la transmission entre pays des chocs de politique fiscale par les flux commerciaux. Les politiques d'assainissement budgétaire dans les marchés d'exports apparaissent réduire la croissance domestique et l'emploi, lorsqu'une mesure exogène des politiques fiscales est utilisée. Si les efforts d'assainissement budgétaire sont synchronisés dans les pays partenaires, ceux-ci peuvent avoir des effets importants sur la croissance. Les répercussions des consolidations fiscales apparaissent initialement plus élevées entre les pays qui partagent la même monnaie, mais cet effet additionnel s'estompe sur le moyen terme. Les plus forts mouvements des flux commerciaux au sein des unions monétaires contribuent à ces effets externes plus importants à court terme bien que les ajustements des taux de changes réels soient plus faibles. Les consolidations fiscales dans les marchés d'exports apparaissent également avoir des répercussions plus importantes sur la croissance domestique lorsque les marchés d'exports sont en récession.

Codes JEL : E23 ; E32 ; E62 ; F42.

Mots clés : Politique fiscale, assainissement budgétaire, effets externes, intégration commerciale.

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CROSS-COUNTRY SPILLOVERS FROM FISCAL CONSOLIDATIONS

by Antoine Goujard[1]

Introduction

1. Countries have introduced large fiscal stimulus packages in response to the global financial crisis of 2008-09, which left a substantial amount of public debt that now needs to be reduced, at least relative to GDP. Consequently, fiscal consolidation has become a major objective for many governments. With many governments consolidating at the same time, countries face potential headwinds from external demand apart from their own consolidation efforts. The OECD-wide fiscal consolidation effort is projected at around 1 percent of OECD GDP in both 2013 and 2014 (OECD, 2013), rising concerns about spillover effects. Building on previous OECD studies and other work, the present study looks at the channels through which fiscal consolidation in trading partner countries can affect domestic growth.

2. The paper focuses on short- to medium-term output effects of fiscal spillovers, in particular through trade. Fiscal consolidation may reduce domestic demand for imports and decrease output in other countries. The more important are the trade linkages, the more synchronised fiscal consolidation is likely to lead to significant cross-country spillover effects (Auerbach and Gorodnichenko, 2013). Blanchard and Leigh (2013) report a large negative cross-sectional correlation between trade-weighted fiscal consolidation of other countries and domestic growth in 2010. Moreover, empirical evidence suggests that fiscal multipliers are likely to be higher at the time of financial stress, when interest rates are close to the zero bound, and when exchange rates cannot adjust.

3. However, fiscal consolidation may also have positive spillovers through long-term interest rates. Foreign activity may increase if the reduction of debt-financed government spending leads to a drop in interest rates at home and abroad. This channel may be more evident in the case of countries under direct market pressures and large fiscal consolidation plans. In this case, fiscal consolidation could in principle have non-Keynesian effects (Alesina and Ardagna, 2010, 2012). Ultimately, the effects of foreign fiscal policy on domestic growth and their possible variation over time and across macroeconomic and institutional set-ups are an empirical question.

4. The empirical examination pursued in this paper sheds light on the output effects of international fiscal spillovers across OECD countries over the 1978-2009 period. The analysis identifies the effects of fiscal spillovers on output by isolating changes in foreign fiscal policies that are plausibly unrelated to contemporaneous economic conditions. It constructs new measures of trade-weighted fiscal spillovers by aggregating foreign fiscal shocks over seventeen countries that represent 86% of the OECD countries' imports. Foreign fiscal shocks are measured using the fiscal policy changes identified by Devries *et al*. (2011). The latter isolate discretionary government actions that do not seem to be motivated by short- to medium-term economic developments, at least not according to the narrative approach of Romer and

1. The author is member of the Economics Department of the OECD. He would like to thank Rudiger Ahrend, Boris Cournède, Jean-Luc Schneider, Cyrille Schwellnus and Alain de Serres for useful comments and suggestions. The author is also grateful to Caroline Abettan for her excellent editorial support. The views expressed here are those of the author, and do not necessarily reflect those of the OECD or its member countries.

Romer (2010). These discretionary government actions are measured consistently across countries and over time. Using these new measures of exogenous spending- and tax-based spillovers, the analysis estimates dynamic panel data specifications controlling for country and year fixed effects.

5. The empirical evidence in this paper suggests that domestic growth is reduced when trading partners consolidate. However, the estimated effects depend on country specific and macroeconomic circumstances.

- Taken as a whole, a 1 percentage point of GDP reduction of the fiscal balance in the main export markets is associated with an average contraction of 1.5 percentage point of domestic GDP growth on impact. However, historical fiscal shocks have been typically much more isolated. The estimates imply that an isolated fiscal contraction in Germany by one percentage point GDP is associated with a reduction of output growth by 0.23 percentage points for a typical OECD country. These estimates are in line with recent cross-country evidence in Auerbach and Gorodnichenko (2013), and in the upper range of the model based estimates of OECD (2009) and Ivanova and Weber (2011).

- The effects are differentiated between spending- and tax-based fiscal consolidations. Spending-based consolidations are associated with larger contemporaneous spillovers on output than tax-based consolidations. Over the medium term, the spillovers of spending cuts and tax increases appear to be similar in size.

- In the short term, fiscal spillovers are stronger between countries with limited exchange rate adjustment or within currency unions than among countries with more flexible exchange rate arrangements. Taken at face value, the estimates suggest that simultaneous consolidations of 1 percent of GDP in exports markets are associated with a contemporaneous contraction of domestic GDP growth by 2.2 percentage points in a currency union. The differential impact of fiscal shocks within and outside currency unions appears to be vanishing over the medium term. Medium-term spillovers are economically and statistically significant both within and outside currency unions.

- The large spillovers of fiscal consolidations are confirmed using bilateral trade flows and bilateral real exchange rate movements. Fiscal consolidations in trading partner countries tend to have an effect on domestic growth through a reduction in bilateral exports and an increase in bilateral imports. This finding is consistent with the view that consolidation tends to rebalance production towards servicing external demand (Leigh *et al.*, 2010). Under flexible exchange rate regimes, the bilateral nominal exchange rate appreciates on impact when a trading partner consolidates, while the real exchange rate adjustment occurs through a slower process of price and wage compression in currency unions.

- Trading partners' fiscal policies have larger short-term spillover effects on domestic growth during downturns. The spillovers of tax increases and spending cuts appear to be more detrimental to growth during downturns in export markets, as measured by large negative output gaps.

- Third-party countries also play a role in the transmission of shocks. When the export markets of one country are hit by fiscal consolidation shocks, the shocks tend to be further transmitted to the country's import partners.

- Once instrumented, spillover of fiscal consolidations measured using cyclically-adjusted revenues and spending have similar effects on domestic growth as in the baseline

specification. The analysis is robust to a number of other checks including additional controls for domestic slack (lagged unemployment rate or lagged output gap), and measures of the domestic fiscal stance. Static and dynamic panel data estimators and two measures of bilateral trade linkages also deliver similar results.

6. The remainder of this paper is divided in four sections. Section 1 briefly reviews the literature. Section 2 describes cross-border developments in fiscal policies and the data used to measure the cross-border fiscal shocks. Section 3 describes the identification of the spillovers of fiscal policies on domestic output. Section 4 presents the empirical evidence. Section 5 examines possible sources of heterogeneity of the estimated effects across exchange rate arrangements and macroeconomic conditions and Section 6 discusses additional robustness checks.

1. Literature review

7. The literature on economic spillovers across borders has grown in recent years. However, there are only few quantitative studies measuring the impact of domestic fiscal changes on growth in other countries. These studies find conflicting results on the effects of fiscal shocks on foreign countries.

8. A first strand of the literature calibrates macroeconomic models to quantify the possible spillover effects of fiscal consolidation (Taylor, 1993, OECD, 2009, Ivanova and Weber, 2011). Simulating large macroeconomic models generally leads to weak trade spillovers across countries (Bayoumi and Vitek, 2013). Taylor (1993) and Ivanova and Weber (2011) report that a fiscal spending shock of 1 percentage point of GDP in Germany would increase GDP in France by 0.04 to 0.12 percent after one year.

9. A second strand of the literature estimates the effect of domestic fiscal shocks on the rest of the world through the current account and the "twin deficit hypothesis", suggesting that changes in government savings are not offset by domestic private savings and investment and transmitted abroad. The literature relying on quarterly VAR models reports a wide range of estimates for the relationship between the budget balance and the current account (Corsetti and Müller, 2006, Beetsma and Giuliodori, 2008). Kim and Roubini (2008) estimate that a fall of the cyclically-adjusted budget balance is associated with no change or even a small increase of the current account in the United States, contradicting thereby the twin deficit hypothesis. However, Monacelli and Perotti (2010) find that increases in the US budget deficit have negative effects on the current account balance. Ilzetzki *et al*. (2013) also report negative short-run effects of government consumption on the current account in a larger sample of advanced economies. These conflicting estimates of the effect of fiscal policy on the current account obtained with quarterly VAR models have been partly attributed to endogeneity issues (Abiad *et al*., 2011).

10. Another strand of the literature uses the "narrative approach", a specific methodology based on the examination of policy records, to define exogenous fiscal policy changes and estimate their effects on the current account. Feyrer and Shambaugh (2012) show that shocks to US taxes are transmitted abroad through changes in the current account. They use the tax increases identified by Romer and Romer (2010) to disentangle exogenous tax increases from fiscal responses to economic conditions. Bluedorn and Leigh (2011) confirm these findings using a larger sample of countries and the exogenous fiscal shocks identified by Devries *et al*. (2011). Both papers find significant positive effects of domestic fiscal consolidations on the current account balance. They estimate that a domestic fiscal contraction of one percentage point of GDP is associated with an improvement of the current account by 0.5 to 0.6 percent of GDP. Romer and Romer (2010) and Cloyne (2013) find larger effects of tax changes on the trade balance using narrative records in the United States and United Kingdom. The latter estimates that a tax cut of 1 percentage point of GDP in the United Kingdom is associated with a contemporaneous 1.2 percent increase in imports, rising to 6 percent after 2 years, while exports remain nearly unchanged.

11. A final strand of the literature aims at providing a more disaggregated picture of the cross-border effects of fiscal shocks. Beetsma *et al.* (2006) combine VAR and gravity models to estimate the spillovers of fiscal policies. They estimate that a fiscal spending shock of 1 percent of GDP in Germany would increase GDP growth in France by 0.09 percentage point after one year, and by an average of 0.145 percentage point across a sample of European countries. Hebous and Zimmerman (2013) investigate the fiscal spillovers within the euro area through trade linkages. They estimate a multi-country VAR model (Global VAR) and find that, for shocks of similar size, euro area-wide shocks have a much larger effect on domestic output than country specific fiscal policies. Auerbach and Gorodnichenko (2012b, 2013) construct a measure of fiscal spillovers using bilateral trade flows and forecasting errors in government spending at a semi-annual frequency across OECD countries. They estimate a large cross-border effect of government spending on output growth, in particular during periods of economic slack.

2. The data

12. This paper examines the output effects of international fiscal spillovers in OECD countries by constructing new measures of trade-weighted fiscal spillovers. These measures cover a long time-series 1978-2011 and provide a distinction between spending-based and tax-based spillovers. Spillover shocks are computed using exogenous fiscal changes from "narrative records" and cyclically-adjusted fiscal outcomes from the OECD Economic Outlook database.

2.1. Foreign fiscal shocks

13. Fiscal spillovers emanate from seventeen OECD countries that cover around 86% of OECD imports over the 1978-2011 period.[2] The countries are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, and the United States. These countries have sufficient fiscal data to construct a balanced panel of fiscal spillovers over the period 1978-2011.[3] Fiscal spillovers are measured at the annual frequency. By using annual data, the measurement of fiscal shocks is facilitated. Generally, there is no quarterly calendar for fiscal policy revisions and yearly data may be less subject to measurement error issues. Furthermore, potential anticipation effects of fiscal policy changes play a smaller role with annual data (Ramey, 2011, Beetsma *et al*., 2008).

14. For each OECD country, fiscal spillovers from trading partner countries, ΔTF_{it}, are computed as a weighted sum of the fiscal policy stance of the trading partner countries:

$$\Delta TF_{it} = \sum_{j,j\neq i}\left(\frac{1}{20}\sum_{s=1990}^{2009}\frac{exp_{ijs}}{exp_{is}}\right)\Delta F_{jt}\ , \qquad (1)$$

where ΔF_{jt} represents the fiscal policy changes of trading partner j in year t. The term exp_{ijs} represents the (merchandise) exports of country i towards country j in year s and exp_{is} represents the total exports of country i in year s towards the rest of the world. Equation 1 weights the foreign fiscal shocks by the long-run importance of the foreign countries in the exports of country i. The first term in brackets is the average share of exports of country i going towards country j. Export flows are averaged over 20 years to mitigate endogeneity and measurement error issues. This long-term measure is uncorrelated with changes in countries' industrial structures or relative trade costs. This identifies fiscal spillover shocks that are solely due to changes in trading partners' fiscal policies (e.g. Nekarda and Ramey, 2011).

2. Average 1978-2011 for trade in goods from OECD Main Economic Indicators (MEI) dataset. This share has been steadily declining from 93% to 80% over 1978-2011.

3 The dataset of Devries *et al*. (2011) ends in 2009. Robustness checks excluding recent years and the global financial crisis (2008-2009) present similar results.

15. The main measure of government fiscal policies in export markets, ΔF_{jt}, comes from the dataset of Devries *et al.* (2011). They use a narrative approach to identify "action-based" episodes of fiscal adjustments that correspond to discretionary policy choices unrelated to short-term economic developments. They focus on fiscal policy changes motivated by the desire to reduce the budget deficit and examine contemporaneous policy documents to establish whether discretionary changes in tax rates and government spending were motivated by a response to the business cycle or not. The estimated budgetary impact of the general government consolidation measures are based on contemporaneous historical sources and records.

16. Figure 1 Panel A displays the distribution over time and across OECD countries of the constructed action-based spillover shocks. Action-based spillover shocks regroup revenue and spending measures. They present large variations over time. For a typical OECD country, they are equal to an average 0.6 percent of GDP in 1995 and 1997, while Devries *et al.* (2011) do not report any significant consolidation plan in 2008. These large variations are mostly driven by spending-based consolidation episodes (Panel B). Tax-based consolidations have been comparatively modest and subject to more frequent temporary measures (Panel C). Indeed, Devries *et al.* (2011) record temporary measures as a positive consolidation shock, followed by a negative shock in the following year. The exposure to fiscal spillovers also varies substantially across OECD countries. For example, Austria, Germany and Italy consolidated by more than 1.5 percent of GDP in 1997, and the export-weighted consolidation shocks range from 0.3 percent of trading partners' GDP for Japan to 1 and 1.2 for the Czech Republic and Luxembourg, respectively. By contrast, the isolated fiscal consolidation of 0.9 percent of GDP in the United States in 1988 mostly affected its direct neighbours: Canada and Mexico.

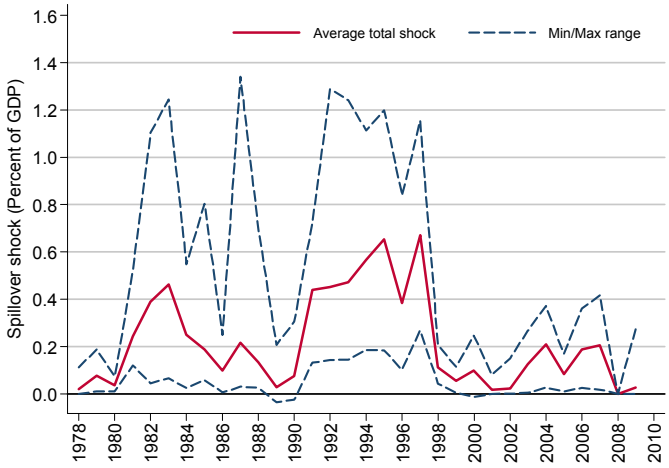
17. An alternative identification of fiscal policy shocks is based on cyclically-adjusted fiscal outcomes.[4] By using cyclically-adjusted rather than non-adjusted fiscal policy stance, the contemporaneous reactions of fiscal policy to domestic output are substantially reduced. Country-specific cyclical adjustments should reflect policymakers' decisions to change tax rates and spending levels by isolating the action of automatic stabilisers. However, the cyclically-adjusted primary balance does not distinguish discretionary shocks motivated by short-term economic developments and discretionary shocks that are exogenous to the economic cycle. For example, fiscal policy tightening in France in 1983 was primarily motivated by a desire to reduce the current account deficit (Abiad *et al*., 2011). Furthermore, the cyclically-adjusted primary balance classifies periods of consolidation on the basis of successful budget outcomes, while the action-based approach identifies episodes of fiscal policy actions motivated by deficit reduction, regardless of the outcomes. For example, if a country adopts a fiscal consolidation policy at the beginning of the year, but then is hit by an adverse shock and so adopts discretionary stimulus that completely offsets the fiscal consolidation, it is still recorded in the dataset of Devries *et al.* (2011), while it would be disregarded in the cyclically-adjusted primary budget balance.[5] Therefore, the narrative approach is, in principle, less affected by countries' macroeconomic conditions than measures of the fiscal stance based on cyclical adjustment (Guajardo *et al.*, 2011).

4. Cyclically-adjusted revenues and spending are taken from the OECD Economic Outlook database. Girouard and André (2005) summarise the methodology.

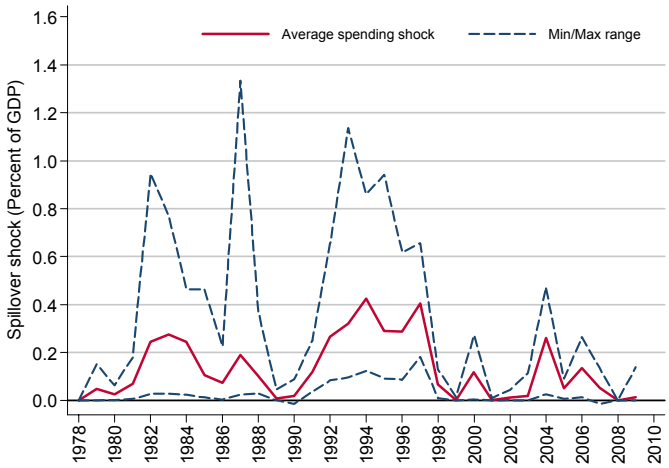
5. Devries *et al*. (2011) record only consolidation measures that were implemented. See Guajardo *et al.* (2011), Perotti (2011), and Riera-Crichton *et al*. (2012) for a review of the different measures of fiscal changes.

Figure 1. Cross-country and time variation of action-based cross-border fiscal shocks

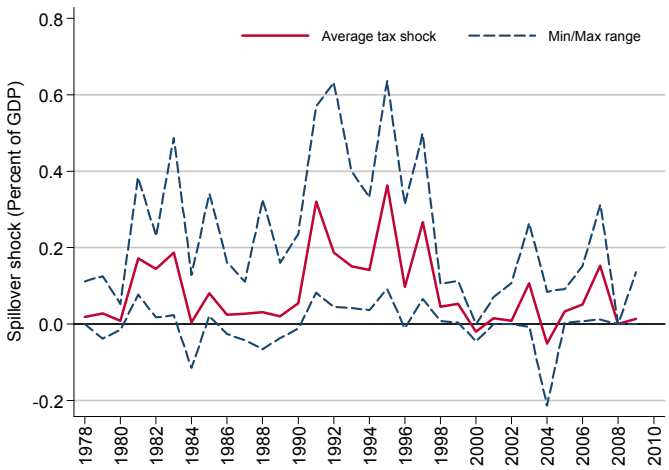
A. Export-weighted consolidations across OECD countries



B. Export-weighted spending cuts across OECD countries



C. Export-weighted tax hikes across OECD countries



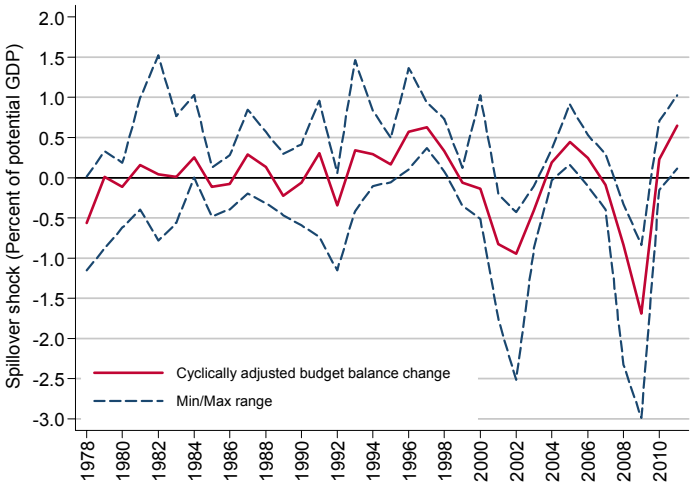
Note: each panel present the evolution of the export-weighted fiscal shocks for the 34 OECD countries over 1978-2009.

Source: Devries *et al.* (2011), UN Comtrade database, and OECD calculations.

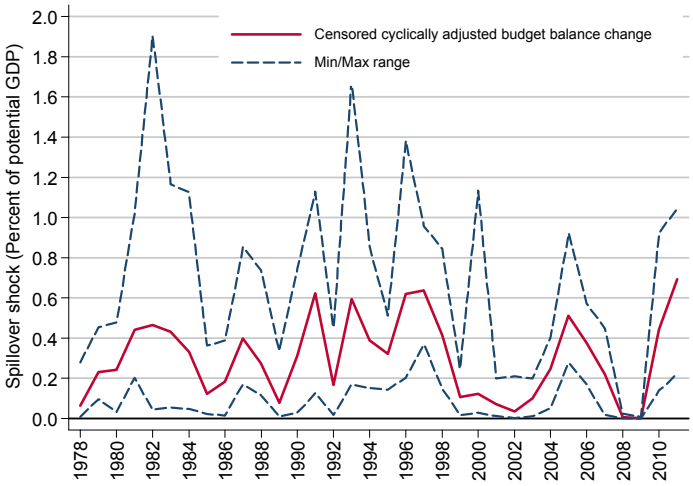
18. Fiscal spillovers constructed using action-based and cyclically-adjusted shocks tend to coincide. Figure 2 Panel A presents descriptive statistics for the export-weighted changes in cyclically-adjusted primary balance across OECD countries. Panel B displays the export-weighted changes in the cyclically-adjusted primary balance censored at 0 to isolate fiscal consolidation episodes and ease the comparison with Figure 1 Panel A. There is no tendency for large fiscal contractions in some trading partners to be offset by fiscal policy loosening in other trading partners and periods of average improvement of the budget balance are similar in Figures 1 and 2. However, action-based and cyclically-adjusted measures differ in some important aspects. By definition, action-based fiscal consolidations do not capture fiscal policy changes during periods of aggregate loose fiscal policy. Movements in asset prices also lead to measurement-errors in cyclically-adjusted budget outcomes (Price and Dang, 2011). For example, the action-based shocks and the cyclically-adjusted ones differ in the early 2000s, where the cyclically-adjusted approach identifies a pronounced fiscal contraction.

Figure 2. Cross-country and time variation of cross-border cyclically-adjusted fiscal shocks

A. Export-weighted changes in cyclically-adjusted budget balance



B. Export-weighted consolidations according to the cyclically-adjusted budget balance



Note: each panel present the evolution of the export-weighted fiscal shocks for the 34 OECD countries over 1978-2009.

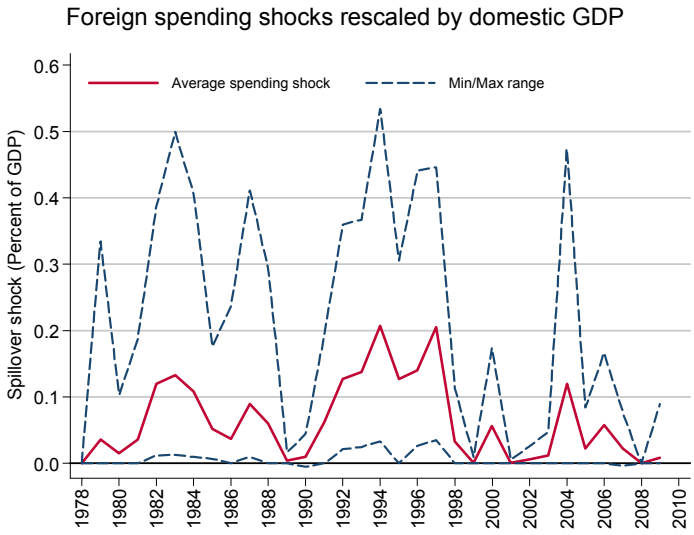
Source: OECD Economic Outlook database, UN Comtrade database, and OECD calculations.

19. The spillover shocks computed according to Equation 1 represent the average consolidation in export markets and they cannot be directly compared to domestic fiscal shocks. Auerbach and Gorodnichenko (2012b, 2013) propose to scale foreign fiscal shocks to ease the comparison between the estimated spillover effects and the traditional multipliers of domestic fiscal policies:

$$\Delta TF_{it}^{*} = \sum_{j,j\neq i}\left(\frac{exp_{ijb}}{imp_{jb}}\right)\left[\frac{imp_{jb}}{G_{jb}}\right]\left\{\frac{\Delta F_{jt}\times GDP_{jt-1b}\times EXCH_{jb}}{GDP_{it-1b}\times EXCH_{ib}}\right\} \quad , \qquad (2)$$

where $GDP_{jt\text{-}1b}$ is the lagged real GDP in base year b, $EXCH_{ib}$ is country i's US dollar exchange rate in base year b, and the fiscal shocks, ΔF_{jt}, are expressed in percentage point of GDP. The first term in brackets is the share of imports of country j coming from country i in base year b.[6] The second term in square brackets represents the size of the total imports of country j in base year b relative to the government spending of country j in base year b. This term is intended to correct for the fact that a certain part of government purchases will be converted into imports from other countries. The last term in curly brackets represents the size of the government shock in country j as a share of lagged output in country i. More precisely, the numerator is equal to the dollar value of the fiscal shock in country j using a base-year exchange rate b, while the denominator represents the dollar value of real potential GDP of country i in year t and base year b. Exchange rates, the size of government relative to imports and imports weights are kept constant to avoid endogeneity issues. Figure 3 displays the variation of this measure across countries and over time.

Figure 3. Cross-country and time variation of action-based cross-border spending shocks



Note: each panel present the evolution of the trade-weighted fiscal shocks for the 34 OECD countries over 1978-2009.

Source: Devries *et al.* (2011), OECD Economic Outlook database, UN Comtrade database and OECD calculations.

20. Auerbach and Gorodnichenko's measure of fiscal spillovers is directly rescaled by domestic GDP and leads to estimates comparable to domestic multipliers. However, there is no clear theoretical guidance on the exact size of the shocks transmitted abroad. Fiscal consolidation packages could be designed primarily to avoid hurting as much as possible the domestic economy, and the indirect effects of government spending on domestic private spending should be taken into account. An examination of the size of these shocks makes clear that fiscal spillovers have a small impact on domestic output in normal times but this effect may be large when an important trading partner consolidates or when fiscal policies are correlated across countries. During the 1978-2009 period, the average size of foreign spending

6. In the estimation, the base year is 1995.

spillovers is 0.06 percent of domestic GDP, but the spillover shocks can be as high as 0.5 percent of domestic GDP.

2.2. Other variables and descriptive statistics

21. The main variables are taken from the OECD Economic Outlook database. The unbalanced panel dataset covers 34 OECD countries over the period 1978-2012. The final database provides cyclically-adjusted budget components and potential output estimates with a good coverage of the 1980s for all OECD countries and a complete coverage of the 1978-2012 period for the 17 countries analysed by Devries *et al*. (2011). The variables taken from the Economic Outlook database are: real GDP, domestic private consumption, private investment, employment, unemployment rate, output gap, GDP deflator, consumer prices indices, exchange rates, and long- and short-term interest rates.

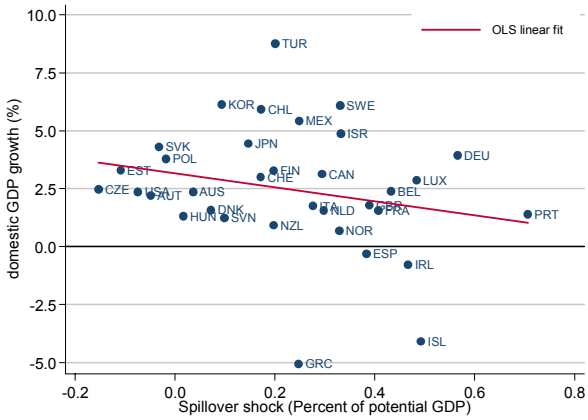
22. In addition, country-specific exchange rate arrangements are taken from Ilzeztki *et al*. (2011) and de Sousa (2012). Control variables for systemic banking crises come from Laeven and Valencia (2012) and variables characterizing each country political cycle are taken from the 2013 update of Beck *et al*. (2001). Bilateral trade data are taken from the UN comtrade dataset (1990-2009) and the IMF DOTS dataset. In the latter case, a correction for missing values and measurement error is implemented following Head *et al.* (2010). Tables A1 and A2 in Appendix detail the construction of the main variables and display summary statistics for the panel of countries used in the empirical analysis.

23. Before turning to the econometric analysis, Figure 4 provides some intuition for the results of the identification strategy. It focuses on the cross-sectional relationship between fiscal spillover shocks, as measured by the cyclically-adjusted budget balance of trading partners in Equation 1, and domestic growth in 2010. In the immediate aftermath of the financial crisis in 2009, governments simultaneously implemented fiscal stimulus packages, while the global tendency was to reduce fiscal deficits already in 2010. Countries for which governments in export markets were drastically reducing public deficits, such as Portugal and Spain, have seen a slower recovery than the United States or other European countries, as Estonia and the Czech Republic (Panel A). This correlation is driven by changes in fiscal policy on the spending side, while the cross-sectional correlation between the intensity of the increase in public revenue of trading partner countries and domestic growth is essentially zero (Panels B and C).[7] These descriptive correlations provide justifications for investigating separately the role of spending and revenue policies and to examine the effects of different macroeconomic conditions on the estimated impacts.

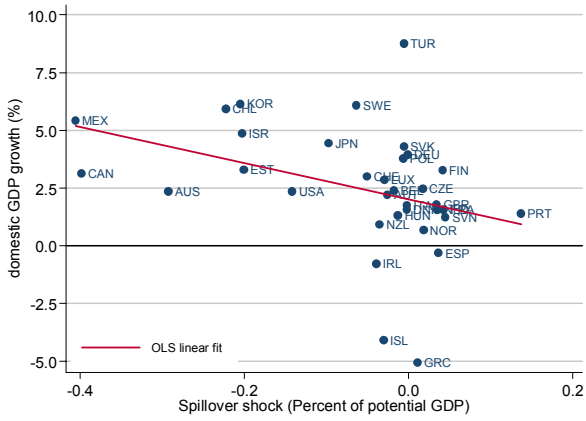
7. The figures in Panels A and B are statistically significant at the 10% and 1% significance levels, respectively.

Figure 4. Correlations between domestic growth and cross-border fiscal spillovers in 2010

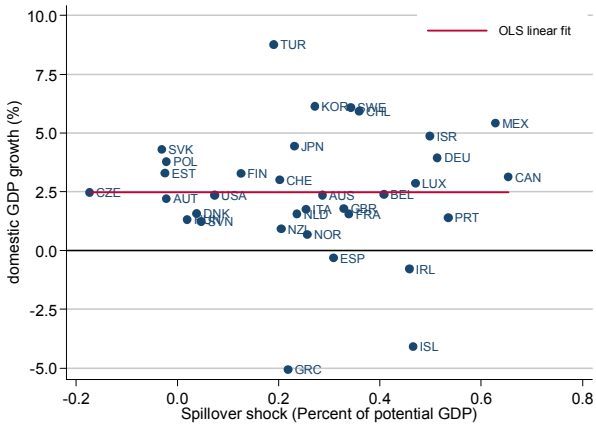
A. Export-weighted cyclically-adjusted budget balance and domestic growth



B. Export-weighted cyclically-adjusted government spending



C. Export-weighted cyclically-adjusted government revenue



Note: The figure reports the cross sectional correlation between fiscal spillover shocks in 2010 and economic growth.

Source: OECD Economic Outlook 92, UN Comtrade database, and OECD calculations.

3. Identification strategy

24. The empirical strategy pursued to assess how trading partner fiscal policies affect domestic growth and other outcomes is the following. A baseline equation assumes that domestic economic outcomes at time *t* are determined by:

$$\Delta Y_{it} = \sum_{k=1,2} \rho_k \Delta Y_{it-k} + \sum_{l=0,1,2} \Delta TF_{it-l} \alpha_l + \sum_{m=1,2} X_{it-m} \eta_m + \lambda_i + \delta_t + \varepsilon_{it} \ , \qquad (3)$$

where Y_{it} is the logarithm of real domestic output of country i, or another domestic outcome variable, and the lagged values ΔY_{it-k} control for the underlying dynamics of domestic outcomes. ΔTF_{it} is one of the measures of fiscal spillover shocks described in Section 2. X_{it-m} is a row vector of additional control variables identified by the literature as key determinants of short- to medium-term economic outcomes (detailed below). λ_i and δ_t capture unobserved country and time specific shocks. ε_{it} are idiosyncratic

disturbances. Importantly, the time dummies mostly neutralise the interest rate channel of foreign fiscal policy.[8]

25. The vector coefficients, α_l, captures the effects of trading partner fiscal policy allowing for a dynamic responses of domestic output and other outcomes. The estimated responses are for the level of the logarithm of real GDP to a permanent fiscal consolidation in export markets equivalent to one percent of trading partners' GDP in average (Equation 1), or a permanent fiscal consolidation in export markets equivalent to one percent of domestic GDP (Equation 2). For simplicity and to ensure that differences between regressions are not driven by the differences in selected lags, all regressions use the same lag structure. The baseline regression's lag order of 2 for real GDP growth is selected based on serial correlation properties associated with various lag lengths and the literature (Guajardo *et al.,* 2011*,* Bluedorn and Leigh, 2011). The results were insensitive to adding up to 4 lags (Section 6).

26. The key variable of interest, fiscal policy in trading partners, is likely to be correlated with country time-varying unobserved characteristics. Indeed, yearly data are used to estimate Specification 3 and the identifying assumption that public spending and revenue do not react to output movements within the observation period is unlikely to hold. To deal with the endogeneity of trading partners' fiscal policy, the baseline specification uses action-based measures of trading partners' fiscal policy that are likely to be unrelated to economic developments as described in Section 2. This specification follows Hall (2009) who treats endogenous fiscal policy changes as a source of noise in ε_{it}.[9] As endogenous fiscal policies change smoothly over time, their time-difference has little variability and is partly absorbed through the fixed effects λ_i and δ_t and the averaging across trading partner countries. Another way to estimate Specification 3 is to use exogenous discretionary fiscal policies from narrative records as instruments for export-weighted changes in cyclically-adjusted fiscal outcomes as in Kraay (2012). Specification 3 is the reduced form of this two-stage least-squares estimation. This gives essentially identical results.

27. However, one additional concern is that even though policymakers may say they are changing taxes and spending for reasons unrelated to current and prospective macroeconomic conditions, perhaps the democratic process causes such changes to be correlated with economic performance. For example, when the economy is weak, all main candidates may be promising to delay tax increases and fiscal consolidations. Thus, seemingly exogenous tax hikes and spending cuts may be rare when output is below trend. The baseline specification controls for lagged output growth (or other dependent variables) and additional control variables, X_{it-m}: the lagged weighted growth in trading partner countries according to Equation 1, the lagged unemployment rate, and the lagged occurrence of systemic banking crises. These variables control for the normal dynamics of output, and other omitted factors that may affect output growth and are likely to be serially correlated. These control variables are lagged one and two years to isolate change driven by foreign fiscal shocks. Robustness checks in Section 6 control for additional variables: domestic public debt-to-GDP ratio, domestic changes in fiscal policies, country size, openness to trade and additional lags of output growth and fiscal shocks. As fiscal consolidations are mainly exogenous to domestic economic developments, the different control variables are not found to affect the main results.

28. To compute impulse response functions of domestic growth to fiscal spillover shocks, this paper uses the projection method (Jorda, 2005) that has been implemented by Auerbach and Gorodnichenko (2012a and b, 2013) and Owyang *et al.* (2013). By contrast to standard VAR methods that solve for the

8. For example, Beetsma *et al.* (2006) use GDP weighted average of *ex-post* long-term interest rates to capture the spillover of fiscal consolidation through interest rates. This would be nearly collinear to the dummy variables of Specification 3.

9. Here endogenous fiscal policy changes refer to the cyclical component of fiscal policies through the action of automatic stabilisers, discretionary fiscal policies motivated by short-term macroeconomic conditions, and measurement error in the cyclically-adjusted measure of fiscal policy.

impulse responses recursively based on one estimated equation per variable, so that the response at a given time horizon shares estimated parameters with the responses at other horizons, Jorda's method does not impose any link between responses at different horizons. The estimated response for each variable at each horizon comes from a different estimated equation. In such specifications, lagged dependent variables are intended as control variables and the Nickell bias is a minor concern.[10] Moreover, the Anderson-Hsiao estimator that deals explicitly with the endogeneity of the lagged dependent variables and static panel data models deliver similar estimates of Specification 3, suggesting that lagged domestic economic shocks have only low correlation with current action-based consolidations in trading partner countries. Therefore, the results reported in the main text correspond to the estimation of Specification 3 by ordinary least squares, and the standard errors are clustered at the country level to take into account heteroskedasticity and within country auto-correlation.[11]

4. Empirical results

4.1. Fiscal spillovers and domestic output

29. Table 1 presents the results for the baseline Specification 3. Fiscal consolidations in large economies appear to have a substantial negative impact on trading partners' growth. The first panel displays the contemporaneous effect of fiscal spillovers on output growth. Columns 1 to 3 use the first definition of fiscal consolidation spillovers according to Equation 1. In a typical country, a fiscal consolidation in export markets of 1 percent of GDP on average is associated with a decrease in domestic growth of 1.5 percentage points (Column 1). The contemporaneous spillover effects of spending cuts is significantly larger: an average spending cut of 1 percent of GDP in export markets is associated with nearly 3 percentage points reduction in domestic growth (Column 2). By contrast, the estimated spillover effect of tax increases in export markets is close to zero and imprecisely estimated (Column 3). The difference in short-term spillover effects between spending and aggregate consolidation efforts is statistically significant at the 5% level.

30. The short-term dynamics of spending-based and tax-based fiscal spillovers are also different, while spending-based spillovers tend to have high contemporaneous effect on domestic output, domestic output tends to react with a lag to tax-based spillovers. The lower panel presents the three year average of the effects of fiscal consolidation spillovers on GDP growth.[12] At this medium-term horizon, an export-weighted fiscal consolidation of 1 percent of GDP appears to have similar spillover effects through spending cuts or tax increases, though in the latter case the impact is again not statistically significant. An average 1 percent of GDP consolidation in export markets is associated with an average decrease of GDP growth of between 2.1 and 2.7 percentage points (Columns 1 to 3). The different timing of tax-based and spending-based fiscal spillovers on GDP growth is visually confirmed through their impulse response functions displayed Figure 5, Panels A to C.

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10. The inclusion of the lagged dependent variable introduces a bias into the fixed effects estimator. The size of the bias is asymptotically decreasing in the number of time-series observations, which in this paper (around 30 years of data) is relatively large for a panel data application.

11. In practice, once two lags of the dependent variable are introduced in the specification, the absence of AR(1) or AR(2) autocorrelation of the residuals could not be rejected at the 10% or 20% significance level using the heteroskedasticity robust tests described in Wooldridge (2002). As the number of clusters is small (34), block-bootstrapped standard-errors were also computed but led to similar inference.

12. 1/3 x $(\alpha_{11}+\alpha_{21}+\alpha_{31})$, where α_{h1} is the coefficient α_1 of Specification 3 at horizon h years. The standard-error is computed using seemingly unrelated estimation (White, 1982) with clustered standard-errors at the country level and a small sample adjustment by (N-1)/(N-k), where N is the number of observations and k the number of estimated parameters.

Table 1. Spillovers of action-based fiscal consolidations across OECD countries and GDP growth

Effect of fiscal consolidation in export markets on domestic growth

	Dependent variable: Real GDP growth					
Weighting of fiscal shocks:	Equation 1			Equation 2		
Fiscal shocks:	Overall	Spending	Revenue	Overall	Spending	Revenue
	(1)	(2)	(3)	(4)	(5)	(6)
Contemporaneous effect						
Fiscal spillovers	-1.547*	-2.998***	-0.196	-1.564*	-3.361***	0.345
	(0.776)	(0.568)	(1.280)	(0.892)	(1.130)	(1.364)
3-year average effect						
Fiscal spillovers	-2.149***	-2.691***	-2.408	-1.112	-1.977	0.626
	(0.819)	(0.940)	(1.617)	(1.262)	(1.420)	(2.494)
R2	0.559	0.563	0.557	0.559	0.561	0.556
Observations	885	885	885	885	885	885
Countries	34	34	34	34	34	34

Note: The Table reports the effect of a trade-weighted consolidation package of an average 1 percent of GDP (Columns 1 to 3), or a 1 percentage point of domestic GDP (Columns 4 to 6). All specifications control for country and year fixed effects, as well as lagged (real) GDP growth in t-1 and t-2. Baseline controls also include lagged unemployment rate, occurrence of systemic banking crises and real GDP growth in export markets. Standard errors in parentheses are robust to heteroskedasticity and within country autocorrelation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

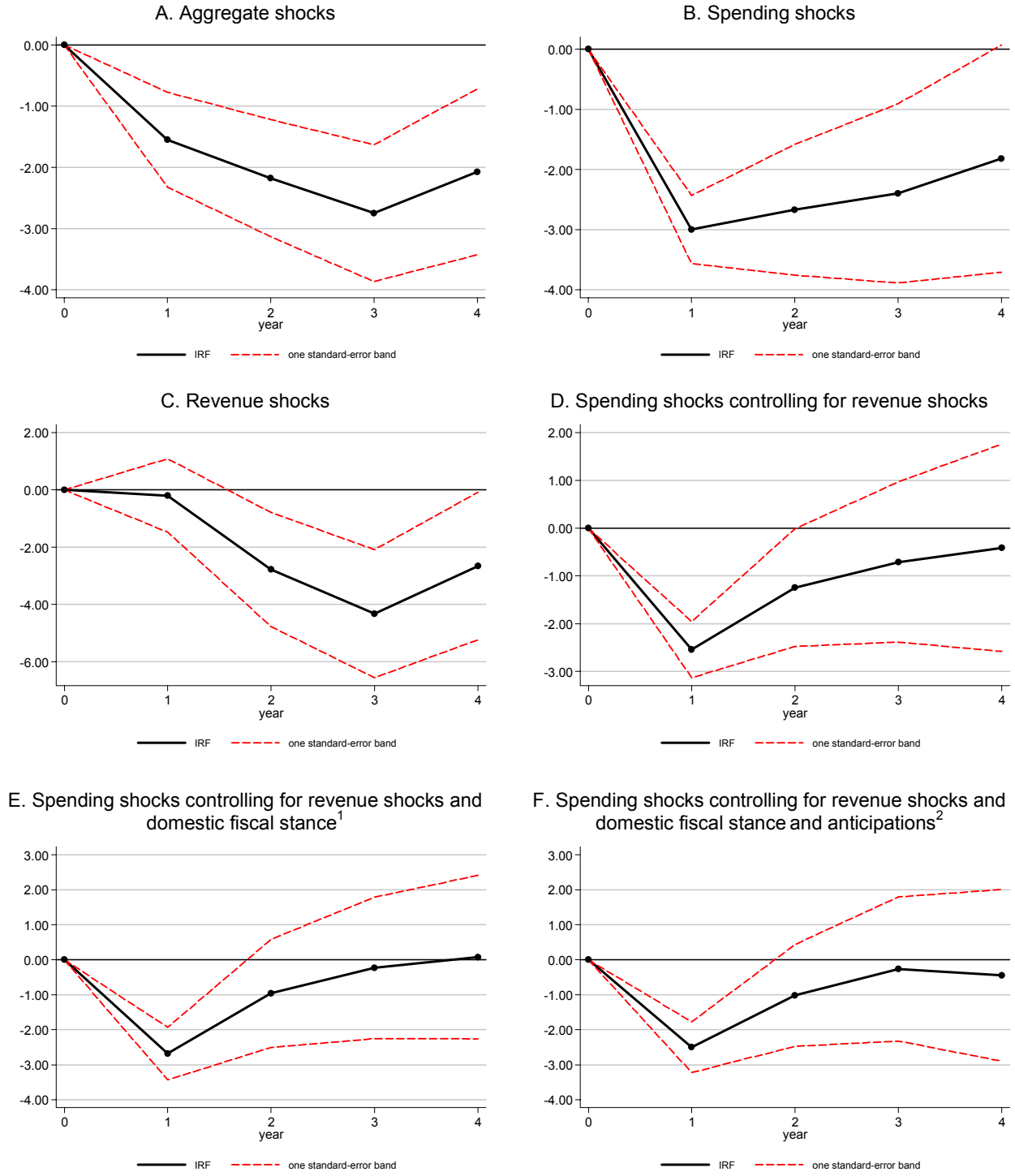
Source: OECD calculations.

31. The large spillover effects obtained in Table 1 and Figure 5 are for an average consolidation effort of 1 percent of GDP in export markets. This corresponds to current policy plans (OECD, 2013), but it represents an extremely large and unusual shock relative to the historical measure of fiscal shocks that has a mean and standard-deviation of 0.2 percent of GDP. The relationship is relatively precisely estimated and of plausible magnitude. Taken at face value, the estimated effects suggest that the average fiscal consolidation of 0.7 percent of GDP in the trading partners of Portugal in 2010 reduced its contemporaneous output growth by 1 percentage point and its medium-term growth by around 1.5 percentage points. By contrast, the large but isolated (action-based) consolidation in Spain of 1.2 percent of GDP in 1989 would have had much smaller effects on the growth of Portugal. The estimated relationship implies that GDP growth in Portugal decreased by 0.3 percentage points on impact due to fiscal consolidations in trading partner countries in 1989.

32. Columns 4 to 6 of Table 1 presents the results of similar regressions using the spillover shocks defined in Equation 2. Rescaling foreign spending shocks to make them more comparable with domestic shocks as in Auerbach and Gorodnichenko (2012b, 2013), a foreign spending contraction of 1 percent of domestic GDP appears associated with a decrease of domestic output by 3.4 percentage points in the short term and 2 percentage points in the medium term (Column 5). Therefore, the two specifications of the spillover shocks in Equations 1 and 2 give qualitatively similar results for spending shocks. Furthermore, the magnitude of the effects measured using Equation 2 is in line with Auerbach and Gorodnichenko (2013). As they use a very different definition of the fiscal shocks, one that focuses on six-month ahead forecast errors and includes expansionary policies, as well as a more limited sample of countries and a shorter time period, these results give confidence that the estimated spillover effects are not driven by a particular specification of the fiscal shocks, a particular sample, or the chosen trade weights.

Figure 5. Dynamic effects of action-based fiscal consolidations on output across OECD countries

Effect of an average one percentage point GDP consolidation in export markets on domestic growth



Note: t=1 denotes the year of export-weighted fiscal contraction. Spillovers of fiscal policies are weighted according to Equation 1. The figure reports heteroskedacity and autocorrelation robust one standard-error band clustered at the country level.

1. The controls are the change in the domestic cyclically-adjusted budget balance in t-1 and t-2.

2. The additional controls are the spillover shocks measured in t+1 and t+2.

Source: OECD calculations.

33. Figure 5, Panels D to F display a visual robustness check of these findings for the spending based spillover shocks measured as in Equation 1. Panel D reports the impulse response function of the spending shocks controlling for the revenue shocks. Panel E adds further control variables for the domestic fiscal policy stance as measured by the changes in the cyclically-adjusted budget balance. Finally, Panel F includes one-year and two-year ahead fiscal consolidations of trading partners to account for the possibility that fiscal shocks in trading partner countries could be anticipated. If foreign government fiscal policies are anticipated, it may affect growth in the previous year and the estimated response may be biased. For example, firms may begin to reduce inputs and output before the observed government consolidations. Reassuringly, none of these robustness checks alter the main findings.

34. The results confirm previous evidence using the action-based fiscal contractions to test the effect of fiscal policy on domestic outcomes. Guajardo *et al*. (2011) find that fiscal consolidations are associated with a fall in the real effective exchange rate that partly offsets the direct effect on domestic demand. They estimate that a fiscal contraction of 1 percent of GDP increase exports by 0.9 percents within two years, while real imports decrease sharply by 1.2 percents. Feyrer and Shambaugh (2012) report that an increase of 1 percent of GDP of US taxes is associated with an improvement of the current account by around 0.6 percent of GDP. The typical country sees a current account decline in excess of 1 percent of its GDP, of around 1.6 percent of GDP when the United States increases taxes by 1 percent of world GDP. These large spillover effects of fiscal policies are in line with evidence using variation across US states. Nakamura and Steinsson (2012) report a government spending multiplier of approximately 1.5, while Suárez Serrato and Wingender (2011) and Shoag (2012) estimate fiscal policy multipliers around 2 when the tax burden of additional spending in one US state is mainly borne by the other states.

4.2. Comparing action-based and cyclically-adjusted fiscal spillovers

35. This subsection compares the fiscal consolidation spillovers estimated using the action-based and cyclically-adjusted fiscal shocks in export markets. Action-based and cyclically-adjusted fiscal changes broadly coincide regarding the size of the shocks (Figures 1 and 2), but the estimated spillovers on output differ significantly between the two measures. Figure 6 displays the estimated effects of fiscal spillovers on domestic output when cyclically-adjusted budget changes are used to measure the fiscal policy stance. Panels A to D focus on government primary spending. Using cyclically-adjusted spillover shocks, Panel A reports large positive effects of foreign spending contractions on domestic output contrasting with the negative impact reported earlier from estimates based on action-based measures of fiscal consolidations. This counterintuitive result does not appear to be driven by the fact that Devries *et al*. (2011) select only episodes of fiscal consolidation. The effects of spending-based foreign consolidations also appear expansionary when cyclically-adjusted spending changes are censored at zero to select only episodes of fiscal consolidation (Panel B).

36. Panel C illustrates the endogeneity of the spillover shocks measured using the cyclically-adjusted primary expenditures. It controls for observable macroeconomic developments using the procedure of Perotti (1999) and Fatas and Mihov (2003). This leads to a clear drop in the short-term positive effects estimated in Panels A and B.[13] This suggests that the endogenous components of the cyclically-adjusted primary spending do not average out across countries but are correlated with the global business cycle, leading to an upward bias in the estimated spillover effects. Isolating cyclically-adjusted fiscal shocks in election years that are arguably less likely to be endogenous also leads to negative but imprecisely

13. More precisely. the new fiscal spending shocks are defined as the residuals of country specific regressions as in Perrotti (1999), Fatas and Mihov (2003) or Corsetti *et al*. (2012). For each country, the specification is: $\Delta F_t=\alpha+\gamma \text{ x } t+\rho_1\Delta F_{t-1}+\beta_1 g_t+\delta_1\pi_t+\delta_2\pi_t \text{ x } \pi_t+\varepsilon_t$, where ΔF_t is the change in cyclically-adjusted government spending divided by potential GDP, g_t is real GDP growth, π_t is the inflation rate measured by the GDP deflator and g_t is instrumented by an index of oil prices, lagged growth and inflation.

estimated effects of foreign government spending on domestic output (results not reported). This provides indirect evidence that the positive effects estimated in Panels A and B may be driven by endogenous fiscal reactions.

37. When foreign shocks to the cyclically-adjusted primary spending are instrumented using the action-based measure of Devries *et al*. (2011), the results are in line with Figure 5 (Panel D). This demonstrates that the measure of exogenous fiscal spillover shocks is a strong predictor of the export-weighted cyclically-adjusted changes in primary spending.[14] As argued by Perotti (2011), such instrumental variable approach leads to estimate a specific effect: the effect of discretionary foreign fiscal policies that are not motivated by short- to medium-term economic conditions.

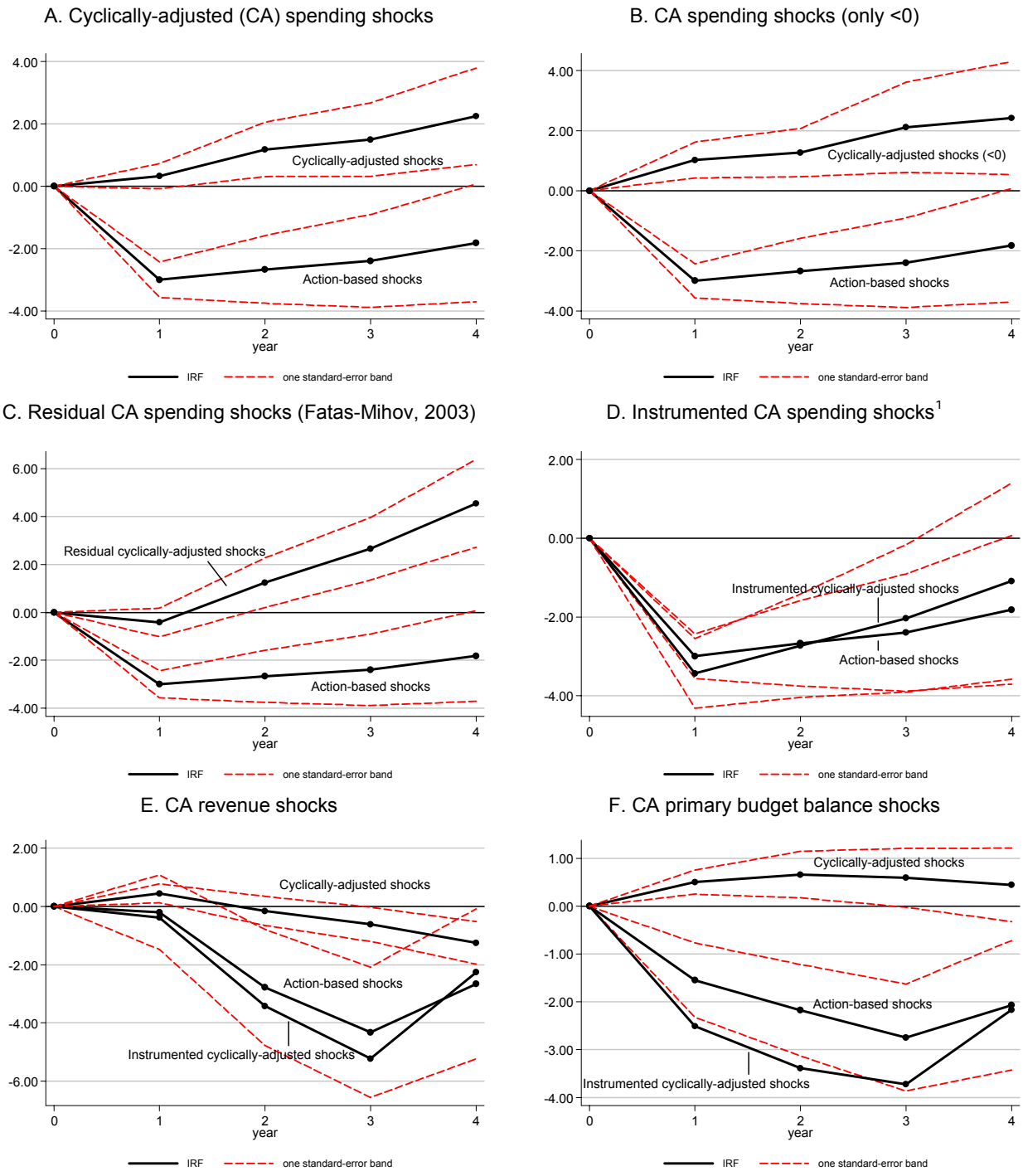
38. Other measures of the foreign fiscal stance based on cyclical adjustments display a similar pattern. Foreign fiscal contractions appear to have positive effects on output when trading partners' fiscal policies are measured by cyclically-adjusted revenues and primary balances (Panels E and F). However, the estimated effects become negative and close to those reported in Figure 5 when cyclically-adjusted measures are instrumented using the action-based fiscal shocks.[15] Guajardo *et al.* (2011) and Riera-Crichton *et al*. (2012) obtain similar results when they investigate the effect of domestic fiscal policy on domestic output. They estimate an expansionary effect of fiscal consolidations on domestic output when the fiscal stance is measured through cyclical adjustments, while the effects of fiscal consolidations become contractionary when they control for the endogeneity of the cyclically-adjusted fiscal stance.

14. The first stage Kleibergen-Paap F-statistics is 120.

15. The first stage Kleibergen-Paap F-statistics are 29 and 29, respectively.

Figure 6. Comparison between cyclically-adjusted and action-based fiscal spillovers

Effect of an average one percentage point GDP consolidation in export markets on domestic growth



Note: t=1 denotes the year of export-weighted fiscal contraction. Spillovers of fiscal policies are weighted according to Equation 1. The figure reports heteroskedacity and autocorrelation robust one standard-error band clustered at the country level. Panels E and F do not report the one standard-error bands of the instrumented cyclically-adjusted shocks.

1. Cyclically-adjusted spillover shocks are instrumented by action-based spillover shocks.

Source: OECD calculations.

5. Heterogeneity of fiscal spillovers across countries

39. This section examines the extent to which fiscal spillovers could be mitigated or exacerbated by country-specific and macroeconomic circumstances. The issue of fiscal shock transmission within currency unions and between countries with fixed exchange rate regimes is of particular interest, given the limited ability of those countries to offset fiscal shocks *via* exchange rate adjustments and monetary policies. The effects of foreign fiscal policies on domestic output could also be larger when the domestic economy or foreign export markets have more slack (Parker, 2011). Therefore, the empirical analysis tests for the impact of exchange rate arrangements, as well as economic downturns, on domestic growth when countries are hit by foreign fiscal shocks.

5.1. Exchange rate policy and fiscal spillovers

40. The effects of a fiscal consolidation on demand for imports, export competitiveness and real exchange rate adjustments could differ between currency unions and more flexible exchange rate regimes. On the one hand, if a member of a currency union consolidates, other members of the currency union may be less affected than countries outside the currency union by the change in net exports of the consolidating country, owing to the absence of exchange rate adjustment. In a stylised one country Mundell-Fleming model with short-term price rigidity, countries with floating exchange rate regimes are able to "export" their fiscal consolidations through nominal exchange rate depreciations and changes in net exports, leaving their domestic GDP unaffected. By contrast, domestic GDP growth decreases sharply in pegged countries in the short term, while the medium-term adjustment must take place through price compression and internal devaluation (*e.g*. Mankiw, 2012). Consistent with this simple model, Ilzeztki *et al*. (2013) and Beetsma *et al*. (2012) report larger multipliers of fiscal consolidation plans on domestic output in pegged countries, and larger disinflationary effects.

41. On the other hand, the spillovers of fiscal consolidations on GDP growth and trade flows could be larger within currency unions than among countries with more flexible exchange rate regimes if, following a fiscal consolidation, trade flows are more sensitive to a shift in relative prices in currency unions compared to countries with more flexible exchange rate regimes. Indeed, the (price) elasticity of trade flows may be larger in currency unions since goods traded may be closer substitutes to each other and the uncertainty about the change in competitiveness may be lowered by the absence of nominal exchange rate changes. Furthermore, public spending cuts may also dampen exports of other members of a currency union more directly, if public procurement is designed so that government spending is partly bought from other member countries. Indeed, Bluedorn and Leigh (2011) find that the current account response to domestic fiscal consolidations increased for euro area countries after the euro adoption.

42. The analysis of the effects of exchange rate arrangements decomposes foreign fiscal shocks into two parts: a first part with limited exchange rate movements and another part with flexible exchange rate movements. Equation 1 becomes:

$$\Delta TF_{it} = \sum_{j,j\neq i}\left(\frac{1}{20}\sum_{s=1990}^{2009}\frac{exp_{ijs}}{exp_{is}}\right)\Delta F_{jt} \times Fix_{ijt} + \sum_{j,j\neq i}\left(\frac{1}{20}\sum_{s=1990}^{2009}\frac{exp_{ijs}}{exp_{is}}\right)\Delta F_{jt} \times (1 - Fix_{ijt}) \text{ , (4)}$$

where Fix_{ijt} is a dummy variable taking value one, if the domestic country (the exporter) and foreign country (the importer) are both subject to some form of fixed exchange rate regime. The dummy variable corresponds to the *de facto* classification of Reinhart and Rogoff (2004) updated to 2009 by Ilzeztki *et al*. (2011), while the *de facto* classification of Shambaugh (2004) led to similar results. The pegged regime corresponds to their coarse classification and includes: no separate legal tender, pre-announced peg or currency board arrangements, pre-announced horizontal bands that are narrower than or

equal to +/-2%, and *de facto* pegs.[16] The non-pegged regime is defined as the complement of the pegged regime.

43. Based on the decomposition of Equation 4, fiscal consolidations appear to have larger spillover effects on growth between pegged countries in the short run, contrasting with the expected dynamics of real exchange rates. Table 2 Panel A displays the estimated effect of exogenous foreign fiscal shocks between non-pegged and pegged countries according to Reinhart and Rogoff's classification (2004). The estimated contemporaneous effect of fiscal consolidation between pegged countries is much more negative and precisely estimated than the one between non-pegged countries. This result appears to hold for both tax and spending shocks. However, the differential effects of foreign fiscal shocks between pegged and non-pegged countries appear to be mainly due to short-term dynamics. When looking at the 3 year average effect of fiscal consolidation, the magnitude of the spillovers on growth appear larger between non-pegged countries than between pegged countries.

Table 2. Exchange rate arrangements and spillovers of action-based fiscal consolidations on GDP growth

Effect of an average one point GDP consolidation in export markets

	Dependent variable: Real GDP growth					
Exchange rate arrangement:	A. Reinhart and Rogoff (2004)			B. Glick and Rose (2002)		
Fiscal shocks:	Overall	Spending	Revenue	Overall	Spending	Revenue
	(1)	(2)	(3)	(4)	(5)	(6)
Contemporaneous effect						
Fiscal spillovers	-0.718	-2.760**	1.337*	-0.990	-2.893***	1.283
in a non-fixed regime	(0.941)	(1.130)	(0.758)	(0.860)	(0.883)	(0.848)
Fiscal spillovers	-2.214***	-2.900***	-2.466	-2.501***	-3.096***	-2.739
in a fixed regime	(0.518)	(0.447)	(1.681)	(0.581)	(0.525)	(1.937)
3-year average effect						
Fiscal spillovers	-2.196*	-3.484**	-0.822	-2.173**	-2.944**	-0.572
in a non-fixed regime	(1.276)	(1.695)	(1.145)	(1.082)	(1.327)	(1.210)
Fiscal spillovers	-1.368	-1.493*	-0.190	-1.988**	-2.315**	-1.123
in a fixed regime	(0.862)	(0.839)	(2.629)	(0.881)	(1.040)	(2.610)
R2	0.563	0.564	0.565	0.561	0.563	0.561
Observations	885	885	885	885	885	885
Countries	34	34	34	34	34	34

Note: All specifications control for country and year fixed effects, as well as lagged (real) GDP growth in t-1 and t-2. Baseline controls also include lagged unemployment rate, occurrence of systemic banking crises and real GDP growth in export markets. Standard errors in parentheses are robust to heteroskedasticity and within country autocorrelation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

Source: OECD calculations.

44. The different dynamic effects of fiscal spillovers between countries with limited exchange rate movements and those with more flexibility is confirmed using currency unions as defined by Glick and Rose (2002). Glick and Rose's definition regroups three kinds of bilateral currency unions: (1) currency unions which occur when a small and/or poor country unilaterally adopts the money of a larger, richer "anchor" country, (2) multilateral currency unions between countries of more or less equal size and wealth, and (3) country pairs where "money was interchangeable between the two countries at a 1:1 par for an extended period of time, so that there was no need to convert prices when trading between a pair of countries". The updated currency union classification is taken from de Sousa (2012). In the sample of OECD countries, this definition is very close to a euro area dummy, but it differs significantly from the

16. The dummy variable is defined as Fix_{jt} x Fix_{it}, where Fix_{it} is the exchange rate regime of country *i* in year *t*. The *de jure* IMF classification was also used, but led to insignificant results. Klein and Shambaugh (2008) and Rose (2011) compare the different exchange rate classifications.

Reinhart and Rogoff's classification.[17] During the 1978-2009 period, 13% of country-pair observations have limited exchange rate movements according to Reinhart and Rogoff's classification, while only 7% of the country-pair observations belong to bilateral currency unions. Panel B of Table 4 reports the results the estimated effects of foreign fiscal shocks within and outside currency unions. The results are in line with those in Panel A. Currency union members tend to have much larger short-term fiscal spillovers on output than countries with more flexible exchange rate arrangements. However, the differential impact of fiscal spillovers within and outside currency unions is again vanishing over the medium term.

45. Given the limited variation of bilateral exchange rate arrangements based on currency unions or pegged countries and their possible endogeneity, Tables A3 and A4 in Appendix present further robustness checks. They exploit the bilateral variation of exchange rate arrangements from pegged countries to freely floating country pairs as measured by Reinhart and Rogoff (2004) and different lagged structures. All the results of Table 2 hold unchanged, suggesting that nominal exchange rate rigidity increases short-term consolidation spillovers across OECD countries.

46. To shed more light on the mechanisms driving the effects of fiscal spillovers on output growth, the analysis relates changes in bilateral trade flows and exchange rates across OECD countries for the different exchange rate arrangements and trading partner countries using Glick and Rose's classification (2002). For example, the export growth from country *i* to country *j* in year *t*, Δe_{ijt}, is related to fiscal consolidation in export market *j*, ΔF_{ijt}, through the following bilateral specification:[18]

$$\Delta e_{ijt} = \sum_{l=1,2}\left(\rho_l + \rho_{Fl} Fix_{ijt-l}\right)\Delta e_{ijt-l} + \sum_{k=0,1,2}\left[\left(\beta_k + \beta_{Fk} Fix_{ijt-k}\right)\Delta F_{jt-k} + \alpha_{Fk} Fix_{ijt-k}\right] + \lambda_{ij} + \delta_{it} + \varepsilon_{ijt} \quad , \qquad (5)$$

where *i* is an OECD country and *j* is one of the 17 OECD countries for which fiscal consolidations are identified by Devries *et al*. (2011). Fix_{ijt} is a dummy variable taking value 1 if the country pair belongs to a currency union. The specification allows for the export dynamics in currency unions to differ from that among countries with more flexible exchange rate arrangements through the coefficients ρ_{Fl} and α_{Fk}. λ_{ij} is a bilateral fixed effect that captures long-run trends in trade flows. Importantly, the fixed effects, δ_{it}, capture all observable and unobservable shocks to country *i* in year *t*. As argued by Khwaja and Mian (2008), such specification absorbs all demand and supply shocks that are specific to country *i*. Since the comparison is across importing countries *j* for the same exporting country-year (*i, t*), Specification 5 focuses on bilateral trade movement between *i* and *j* that are driven solely by changes in importing countries, *j*, and their identified action-based fiscal consolidations.

47. Table 3 reports the estimate for exports from country *i* to country *j* and the imports of country *i* coming from country *j*. The bilateral panel dataset cover the period 1978-2009 and 561 country-pairs (17 x 33). In all specifications of Table 3, exports towards country *j* contract sharply when country *j* consolidates. A one percent of GDP consolidation in country *j* is associated with a decrease in exports from country *i* towards *j* by 1.4 percentage points (Column 1). The effect on country *i*'s exports is much stronger if *i* and *j* are in a currency union: a one percent of GDP fiscal contraction in country *j* is associated with a decrease in bilateral exports by 3.7 percentage points. Trade spillovers of spending cuts appear larger than

17. The currency unions between Belgium and Luxembourg and between Ireland and United Kingdom prior to 1979 are the two differences with a simple euro area dummy.

18. Export growth is calculated as: $\Delta e_{ijt}=[(\log(EXP_{ijt})-\log(EXP_{ijt-1})]$ x 100, where EXP_{ijt} is the exports from country *i* to country *j* in US dollars from the IMF DOTS statistics. The exports of country *i* are deflated by an implicit export deflator for country *i* through the fixed effects, δ_{it}. The growth in imports of country *i* from country *j* is computed similarly using mirror flows ($IMP_{ijt}=EXP_{jit}$).

those of tax hikes in a currency union, though the difference between the effect of tax and spending shocks is not statistically significant at the 10% level (Columns 2 to 4).

48. Domestic GDP growth could be reduced through a contraction in exports and an increase in imports when trading partners' consolidate. Columns 5 to 7 of Table 3 investigates if net exports could explain further the larger effect of fiscal consolidation spillovers in currency unions. A fiscal consolidation of 1 percent of GDP is associated with an increase in exports towards the other members of the same currency union by 2.4 percentage points, while the increase in exports towards other countries is essentially zero (Column 5).

Table 3. Bilateral trade, exchange rate regimes, and action-based fiscal consolidations

Effect of a one percentage point of GDP consolidation in country j

Dependent variable:	Growth in exports from i to j				Growth in imports of i from j		
	Fiscal consolidation	Spending based	Tax based	Spending / tax based	Fiscal consolidation	Spending based	Tax based
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fiscal consolidation	-1.367***				0.057		
(in export market, j)	(0.380)				(0.309)		
Fiscal consolidation	-2.286**				2.446***		
x Currency union (CU)	(1.043)				(0.940)		
Spending cuts		-2.509***		-1.953***		0.917**	
(in export market)		(0.553)		(0.547)		(0.454)	
Spending cuts		-3.551**		-2.488		3.381**	
x Currency union		(1.775)		(1.994)		(1.625)	
Tax hikes			-1.704***	-1.188**			-0.410
(in export market)			(0.583)	(0.592)			(0.523)
Tax hikes			-3.565**	-1.868			4.166***
x Currency union			(1.781)	(1.966)			(1.554)
R2	0.349	0.349	0.349	0.350	0.436	0.436	0.436
Observations	14,521	14,521	14,521	14,521	14,521	14,521	14,521
Country pairs	561	561	561	561	561	561	561

Note: All specifications control for bilateral fixed effects, destination-year fixed effects, two lags of the dependent variable and two-lags of the explanatory variables and the currency union dummy as in Equation 5. Clustered standard errors in parentheses are robust to heteroskedasticity and within country-pair auto-correlation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

Source: OECD calculations.

49. Table 4 challenges the finding that a currency union affects the transmission of fiscal shocks in a number of ways. Panel A adds to the baseline specification interaction terms between lagged exports, fiscal consolidation and different measures of proximity and integration between country *i* and country *j*. More precisely, controls for regional trade agreements, direct neighbours and physical distance between the two capital cities are introduced in Specification 5.[19] The estimated additional effect of fiscal consolidation on bilateral exports in a currency union is barely affected by the new interaction terms (Columns 1 to 3). Similarly, the effects of a partner country consolidation on bilateral imports in a currency union are unchanged (Columns 4 to 6). Panel B decomposes further the effects of exchange rate arrangements. Consolidation efforts in the export market are interacted with two dummy variables taking value one if

19. For example, the added terms are: $\sum_{l=1,2} \rho_{rl} \Delta e_{ijt-l} RTA_{ijt-l} + \sum_{k=0,1,2} [\beta_{rk} \Delta F_{jt-k} + \alpha_{rk}] RTA_{ijt-k}$, in the case of regional trade agreement (RTA_{ijt}). The logarithm of the distance is introduced in deviation from its sample average.

country *i* or country *j* belongs to any currency union.[20] The larger effect of fiscal consolidation on the imports from trading partners in a currency union appears driven by bilateral exchange rate arrangements (Columns 1 to 3). By contrast, the larger effect of fiscal consolidation on the exports towards trading partners in a currency union is mainly driven by the exchange rate arrangements of the consolidating countries (Columns 4 to 6).

Table 4. Robustness of the effects of exchange rate regimes and fiscal consolidations on bilateral trade

Effect of a one percentage point of GDP consolidation in country j

Dependent variable:	Growth in exports from i to j			Growth in imports of i from j		
Panel A.	(1)	(2)	(3)	(4)	(5)	(6)
Fiscal consolidation	-1.725***	-1.750***	-0.760	0.251	0.258	-0.243
(in export market, j)	(0.630)	(0.632)	(0.641)	(0.614)	(0.616)	(0.698)
Fiscal consolidation	-2.635**	-2.581**	-2.817***	2.520***	2.475***	2.546***
x Currency union	(1.048)	(1.052)	(1.050)	(0.924)	(0.922)	(0.929)
Fiscal consolidation	0.700	0.597	-1.132	-0.281	-0.189	0.776
x Regional trade agreement	(0.724)	(0.738)	(1.001)	(0.683)	(0.685)	(0.936)
Fiscal consolidation		1.009	-0.642		-0.811	0.040
x Neighbour countries		(0.695)	(0.863)		(0.516)	(0.730)
Fiscal consolidation			-1.300**			0.738*
x log distance			(0.572)			(0.441)
R2	0.351	0.352	0.355	0.437	0.437	0.437
Panel B.	(1)	(2)	(3)	(4)	(5)	(6)
Fiscal consolidation	-1.793**	-1.831**	-0.853	-0.315	-0.306	-0.738
(in export market, j)	(0.732)	(0.734)	(0.730)	(0.742)	(0.746)	(0.808)
Fiscal consolidation	-3.192**	-3.170**	-3.444***	0.913	0.878	1.054
x Currency union (CU)	(1.316)	(1.319)	(1.311)	(1.100)	(1.098)	(1.093)
Fiscal consolidation	0.250	0.286	0.439	1.487**	1.470**	1.347**
x Export market in CU (j)	(0.719)	(0.716)	(0.713)	(0.601)	(0.604)	(0.590)
Fiscal consolidation	0.360	0.371	0.314	0.764	0.774	0.743
x Country in CU (i)	(0.708)	(0.706)	(0.725)	(0.530)	(0.531)	(0.531)
Control variables[1]	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.353	0.353	0.357	0.438	0.438	0.438
Observations	14,521	14,521	14,521	14,521	14,521	14,521
Country pairs	561	561	561	561	561	561

Note: All specifications control for bilateral fixed effects, destination-year fixed effects, two lags of the dependent variable and two-lags of the explanatory variables and the currency union dummy as in Equation 5. Clustered standard errors in parentheses are robust to heteroskedasticity and within country-pair auto-correlation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

1. The controls variables are the same interaction terms as introduced in Panel A.

Source: OECD calculations.

50. One possible explanation for the larger contraction of GDP growth and bilateral exports in a currency union than among countries with flexible exchange rate arrangements could be that real exchange rates adjust more in currency union. This could be the case if downward price and wage rigidities are low, and if countries outside currency unions partly offset foreign fiscal shocks through monetary policy. However, fiscal consolidations appear to be associated with significant but smaller real exchange rate

20. The added terms to Specification 5 are: $\sum_{l=1,2} \rho_{pil} \Delta e_{ijt-l} Peg_{it-l} + \sum_{k=0,1,2} [\beta_{pik} \Delta F_{jt-k} + \alpha_{pk}] Peg_{it-k}$ for both countries *i* and *j*. Peg_{it} is a dummy variable taking value 1 if country *i* belongs to any currency union.

adjustments between members of a currency union than between countries with more flexible exchange rate arrangements.

Table 5. Bilateral exchange rates, exchange rate regimes, and action-based fiscal consolidations

Effect of a one percentage point of GDP consolidation in country j

	Dependent variable: bilateral growth in …						
	Nominal exch. rate	Relative GDP deflator	Real exch. rate	Relative CPI	Relative ULC	Relative effective: CPI	Relative effective: ULC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fiscal consolidation	2.047***	-0.077	2.473***	-0.017	0.193*	1.836***	2.336***
(in export market, j)	(0.116)	(0.173)	(0.259)	(0.053)	(0.116)	(0.122)	(0.149)
Fiscal consolidation	-1.178***	0.273*	-1.154***	0.072	0.241*	-0.989***	-1.210***
x Country in CU (j)	(0.157)	(0.149)	(0.220)	(0.164)	(0.135)	(0.158)	(0.192)
Fiscal consolidation	0.135	-0.045	-0.001	-0.008	-0.076	0.087	0.050
x Country in CU (i)	(0.220)	(0.143)	(0.289)	(0.093)	(0.120)	(0.173)	(0.197)
Fiscal consolidation	-0.791***	0.536***	-0.411	0.485***	0.962***	0.202	0.557**
x Currency union (i,j)	(0.234)	(0.122)	(0.282)	(0.137)	(0.178)	(0.205)	(0.242)
Fiscal consolidation in currency union[1]	0.213***	0.687***	0.908***	0.531***	1.321***	1.136***	1.733***
	(0.070)	(0.091)	(0.120)	(0.056)	(0.125)	(0.103)	(0.138)
R2	0.899	0.851	0.488	0.755	0.878	0.720	0.758
Observations	15,232	15,159	15,094	15,279	14,393	14,382	13,719
Country pairs	561	561	561	561	557	561	544

Note: All specifications control for bilateral fixed effects, destination-year fixed effects, two lags of the dependent variable and two-lags of the explanatory variables and the currency union dummy as in Equation 5. Clustered standard errors in parentheses are robust to heteroskedasticity and within country-pair auto-correlation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

1. Estimated effect of a 1 point GDP in the export market for an exporting country in the same currency union (the sum of the four estimated coefficients in the main panel).

Source: OECD calculations.

51. Table 5 reports the effects of fiscal consolidations on different measures of bilateral exchange rates and relative prices. When both countries are floating, the bilateral nominal exchange rate appreciates by 2 percentage points for a fiscal consolidation of 1 percent of GDP in the partner country (Table 5, Column 1). The change in relative exchange rate is substantially smaller, 0.8 percentage points (2-1.2=0.8), when the partner country is in a currency union, and nearly zero when the two countries are in the same currency union (2-1.2+0.1-0.8=0.2).[21] By contrast, the adjustment in relative prices in currency unions, as measured by the GDP deflator, relative Consumer Price Indices – CPI –, or relative Unit Labour Costs – ULC-, is much larger than among other countries (Columns 2, 4 and 5). This implies a positive adjustment of the bilateral real exchange rate in currency unions by 0.9 percentage point when a trading partner consolidates by 1 percent of GDP.[22] This effect is much smaller than among countries with flexible exchange rates where the bilateral real exchange rate increases by 2.5 percentage points (Column 3). This picture is not affected by the use of effective exchange rates. Columns 6 and 7 report the relative growth of competitiveness-weighted consumer prices and unit labour costs for the overall economy in dollar terms. The competitiveness weights take into account the structure of competition in both export and import

21. Changes in bilateral exchange rates are measured as: $\Delta e_{ijt}=[(\log(EXCH_{it}/EXCH_{jt})-(\log(EXCH_{it-1}/EXCH_{jt-1})]$ x 100 where $EXCH_{it}$ is the dollar value of the local currency unit taken from the OECD Economic Outlook database. Positive values of Δe_{ijt} indicate a relative appreciation of currency *i* with respect to currency *j*.

22. Bilateral real exchange rates are computed using nominal exchange rates and relative GDP deflators.

markets. The relative changes of effective real exchange rates appear smaller between members of a currency union than among countries with more flexible exchange rate arrangements.

52. Taken together the results of Tables 2 to 5 suggest that the cross-country spillovers of fiscal consolidations are more detrimental to growth in currency unions than among countries with more flexible exchange rate regimes. This result cannot be explained by larger real exchange rate adjustments in currency unions than among countries with flexible exchange rate regimes and the loss of monetary autonomy associated with a pegged exchange rate regime.[23] Following a fiscal consolidation in a currency union, some pegged exchange rates considered as currency unions are re-aligned but nominal exchange rate adjustments remain close to zero. However, changes in relative prices and unit labour costs in currency unions mean that real exchange rate adjustments are significant. Therefore, the larger spillover effects of fiscal consolidations on GDP growth could be explained by a higher price elasticity of trade flows in currency unions than among countries with more flexible exchange rate regimes. In the medium term, the effects of fiscal consolidations on real effective exchange rate arrangements are equalised across currency unions and countries with more flexible exchange rate regimes, while the response of exports to foreign fiscal consolidation increases significantly outside currency unions (Appendix Tables A5 and A6).

5.2. Economic downturns and fiscal spillovers

53. The effects of foreign fiscal policies on domestic output could also be larger when the domestic economy or the foreign export markets are experiencing relatively severe slack. This effect is measured by adding to Specification 3 an interaction term between the foreign fiscal shock variable and a dummy variable taking a value of 1 during periods of domestic slack. The latter are defined as periods when the domestic unemployment rate is above its 67th percentile over the 1978-2009 period. Alternatively, periods of slack are defined as periods when the output gap is below its 33rd percentile over the 1978-2009 period. The two indicators, S_{it}, characterise the amount of slack in the exporting economy. The foreign fiscal shocks are decomposed into two parts: a first part occurring during economic downturns and another part during "normal times". Lagged measures of downturns are used to minimise contemporaneous correlation with domestic growth and Equation 1 becomes:

$$\Delta TF_{it} = \sum_{j,j\neq i}\left(\frac{1}{20}\sum_{s=1990}^{2009}\frac{exp_{ijs}}{exp_{is}}\right)\Delta F_{jt} \times S_{it-1} + \sum_{j,j\neq i}\left(\frac{1}{20}\sum_{s=1990}^{2009}\frac{exp_{ijs}}{exp_{is}}\right)\Delta F_{jt} \times (1 - S_{it-1}) \; . \qquad (6)$$

54. Table 6 reports the estimated effects of fiscal spillovers in normal times and during economic downturns. The analysis includes the non-interacted lagged dummy variables characterising the periods of slack to capture the direct effects of economic slack on domestic output growth.[24] In the short term, the estimated effect of a shock to foreign spending appears marginally larger during economic downturns than in normal times (Panel A, Column 1). This pattern holds for the two indicators of economic slack, but the differences between the normal times and periods of domestic slack are not statistically significant.

55. Downturns in export markets may also affect the size of the estimated effects. During economic downturns in export markets, government spending may have a larger effect on foreign economies as public spending partly substitute for private demand. The larger effect of foreign fiscal policy on foreign growth may further dampen imports. However, foreign monetary policy may be more accommodative if fiscal consolidation episodes occur during economic downturns. This would reduce the adverse effects of fiscal consolidations on imports. Therefore, the effects of foreign fiscal consolidations when foreign countries are in periods of slack could be smaller or larger than in "normal times".

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23. Short-term interest rate differentials also appear to react similarly to fiscal consolidations in currency unions compared to countries with more flexible exchange rates (unreported).

24. More precisely, the estimated equation adds $\gamma_1 S_{it-1}+\gamma_2 S_{it-2}+\gamma_3 S_{it-3}$ to Specification 3.

Table 6. Domestic downturns and action-based fiscal consolidation spillovers

Effect of an average one percentage point of GDP consolidation in export markets on domestic growth

	Dependent variable: Real GDP growth					
Measure of slack:	A. Unemployment rate			B. Output gap		
Fiscal shocks:	Overall	Spending	Revenue	Overall	Spending	Revenue
	(1)	(2)	(3)	(4)	(5)	(6)
Contemporaneous effect						
Fiscal spillovers	-1.458*	-2.804***	-0.201	-0.845	-2.477***	1.650
in normal times	(0.785)	(0.542)	(1.387)	(0.858)	(0.774)	(1.457)
Fiscal spillovers	-1.527	-2.965***	-0.065	-1.448	-3.230***	0.539
in a period of slack	(1.047)	(1.058)	(1.720)	(0.955)	(0.963)	(1.522)
3-year average effect						
Fiscal spillovers	-2.040***	-2.499**	-2.474	-1.193	-1.825	0.006
in normal times	(0.784)	(0.980)	(1.626)	(0.929)	(1.335)	(1.617)
Fiscal spillovers	-1.757	-1.777	-2.057	-1.261	-2.396**	0.290
in a period of slack	(1.697)	(1.973)	(3.083)	(0.984)	(1.160)	(2.066)
R2	0.564	0.569	0.563	0.605	0.608	0.602
Observations	884	884	884	853	853	853
Countries	34	34	34	34	34	34

Note: All specifications control for country and year fixed effects, lagged (real) GDP growth in t-1 and t-2, and indicators of economic slack in t-1, t-2 and t-3. Baseline controls also include lagged unemployment rate, occurrence of systemic banking crises and real GDP growth in export markets. Standard errors in parentheses are robust to heteroskedasticity and within country autocorrelation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

Source: OECD calculations.

56. Table 7 examines if downturns in export markets have a significant effect on the estimated spillovers on output. The specifications replace the indicator of domestic slack, S_{it-1}, by the same indicator for the seventeen export markets, S_{jt-1}, in Equation 6. When the unemployment rate is used as an indicator of economic slack, there is no marked difference between short-term fiscal spillovers in "normal times" and during period of economic slack (Panel A). By contrast, there is a marked difference between "normal times" and economic downturns when the output gap is used as indicator (Panel B). The estimated spillovers of fiscal consolidations on growth are larger during periods of large negative output gaps. For example, in a depressed foreign economy, spending cuts of 1 percent of GDP in average are associated with a reduction of domestic output by 4 percentage points in the short term. The effects of fiscal consolidations during downturns are also larger on the medium term for spending cuts and revenue increases. Taken at face value, the estimated effects of foreign spending shocks suggest that spending cuts of 1 percent of GDP in average are associated with a 3.5 percentage point decrease in GDP over three years during periods of export market slack.

57. The interpretation of these results is complicated by the policies associated with fiscal consolidations that may differ in good and bad times. If there are specific monetary and exchange rate policies that systematically accompany cuts in government spending during downturns, their effects would be picked up by the estimated coefficients. For example, governments consolidating during downturns may design consolidation packages so as to direct part of the efforts towards foreign activity, while governments consolidating during overheating periods would primarily target the domestic economy. However, the results are in line with previous empirical evidence suggesting a larger impact from fiscal policy during downturns using regional variations and neutralising the effects of national monetary and exchange rate policies. Nakamura and Steinsson (2012) report a government spending multiplier of approximately 1.5, reaching 3.5 to 4.5 during period of economic slack. Shoag (2012) estimates that an additional 1 dollar of spending in the face of economic slack generates 3 to 3.5 dollars of income, while the comparable effect is only 1.6 to 1.4 per dollar of spending in more favourable economic conditions.

Table 7. Foreign downturns and action-based fiscal consolidation spillovers

Effect of an average one percentage point of GDP consolidation in export markets on domestic growth

	Dependent variable: Real GDP growth					
Measure of slack:	A. Unemployment rate			B. Output gap		
Fiscal shocks:	Overall	Spending	Revenue	Overall	Spending	Revenue
	(1)	(2)	(3)	(4)	(5)	(6)
Contemporaneous effect						
Fiscal spillovers	-1.425*	-2.972**	-0.572	-0.348	-1.505*	0.596
in normal times	(0.838)	(1.176)	(1.686)	(0.681)	(0.834)	(1.322)
Fiscal spillovers	-1.510*	-2.900***	0.149	-3.241***	-4.068***	-1.756
in a period of slack	(0.887)	(0.602)	(1.192)	(1.008)	(0.684)	(1.636)
3-year average effect						
Fiscal spillovers	-2.022	-3.140*	-2.631	-0.145	-0.876	0.228
in normal times	(1.304)	(1.837)	(2.563)	(0.962)	(1.496)	(2.021)
Fiscal spillovers	-1.567	-1.808	-1.546	-4.437***	-3.545***	-6.802***
in a period of slack	(0.957)	(1.215)	(1.684)	(1.269)	(1.107)	(2.082)
R2	0.559	0.564	0.558	0.565	0.567	0.561
Observations	885	885	885	885	885	885
Countries	34	34	34	34	34	34

Note: All specifications control for country and year fixed effects, as well as lagged (real) GDP growth in t-1 and t-2. Baseline controls also include lagged unemployment rate, occurrence of systemic banking crises and real GDP growth in export markets. Standard errors in parentheses are robust to heteroskedasticity and within country autocorrelation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

Source: OECD calculations.

6. Robustness checks

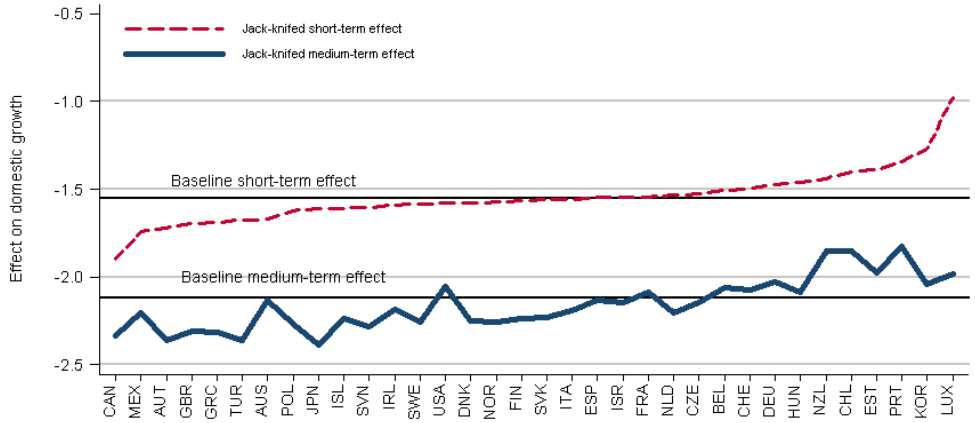
58. The effects of fiscal spillovers on domestic growth are robust to a wide range of specification checks. This section examines the effects of fiscal spillovers across different sample of countries and time periods, as well as the use of alternative panel data estimators. It further investigates the spillover effects of fiscal shocks on labour markets, private consumption and investment.

6.1. Robustness to the sample of countries and time-period

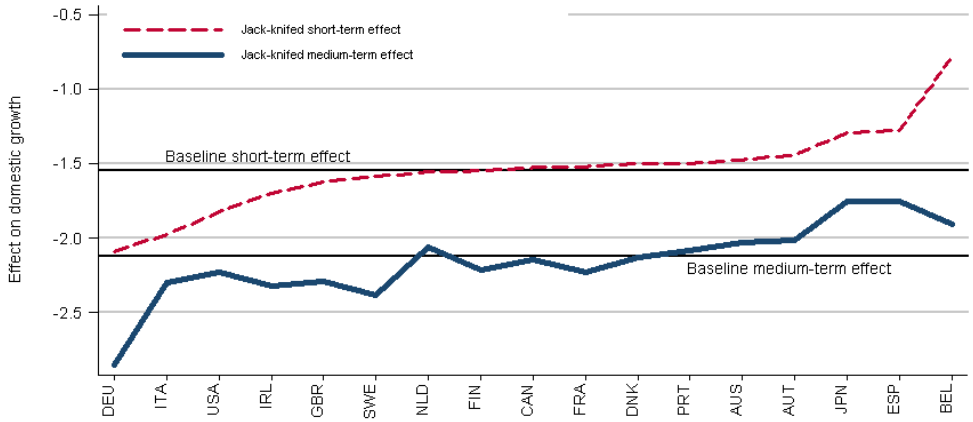
59. The effects of fiscal spillovers on domestic growth are robust to different samples of countries and to different sample of export-market countries. Figure 7 Panel A estimates the baseline specification (Table 1 Column 1) excluding the OECD countries one-by-one. This process identifies countries that are relatively more sensitive to fiscal spillovers from countries that are relatively insulated. As the action-based dataset covers a different share of exports for each country, the possibility of heterogeneity in spillover effects could be one concern. Canada and Mexico appear relatively insulated from foreign fiscal shocks, while small open economies such as Portugal, Estonia and Luxembourg would seem more sensitive to their trading partner fiscal policies. However, there is no significant outlier. All the estimates are within one standard error of the baseline. Panel B reports the results of excluding one-by-one the fiscal policies of the seventeen export markets documented in Devries *et al.* (2011). The estimated effects for the different samples are in the same range as in Panel A. They also confirm the model-based results of Ivanova and Weber (2011). Fiscal policy in Germany has relatively weak spillover effects through trade. By contrast, Spain, Belgium and Japan have relatively strong fiscal spillovers on their trading partners.

Figure 7. Robustness of the effect on domestic growth to the country and period sample

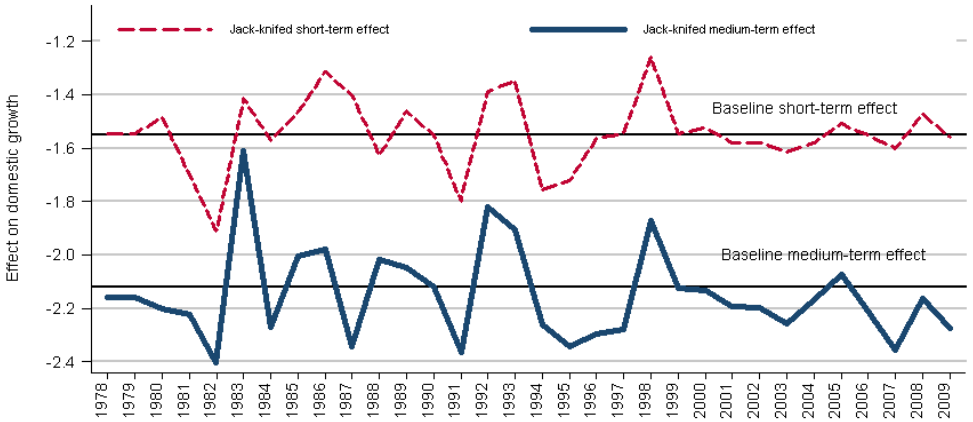
A. Jack-knifed country sample: impact of a fiscal contraction of 1 percentage point of GDP in export markets



B. Jack-knifed export-market sample: impact of a fiscal contraction of 1 percentage point of GDP in export markets



C. Jack-knifed period sample: impact of a fiscal contraction of 1 percentage point of GDP in export markets



Note: The Figure reports the effect of an export-weighted consolidation package of 1 percentage point of GDP. All specifications control for country and year fixed effects, as well as lagged GDP growth in t-1 and t-2. Baseline controls also include lagged unemployment rate, occurrence of systemic banking crises and real GDP growth in export markets. The two horizontal solid lines display the baseline point estimates reported in Table 1 Column 1.

Panel A, countries are excluded one-by-one and ranked according to the estimated short-term effect in the sample excluding them. Panel B, each of the 17 export-markets are excluded one-by-one and ranked according to the estimated short-term effects for the whole sample of OECD countries. Panel C, one-year periods are excluded one-by-one.

Source: OECD calculations.

60. Figure 7 Panel C reports the results of excluding one-by-one the years from 1978 to 2009. The estimated effects are again stable. Spillovers of fiscal consolidations have been relatively high during the global recessions of the early 1980s and 1990s, as well as in 1998 during the Asian crisis. The larger spillover effects observed in the early 1980s and 1990s also coincide with periods of concomitant consolidations across countries (Figures 1 and 2). By contrast, fiscal consolidation spillovers have been relatively low during periods of economic booms in the early 2000s and mid-1990s.

6.2. Alternative estimators and export weights

61. Table 8 examines further the robustness of the effects of fiscal spillovers on output. First, Panel A considers different estimators. Static models excluding the lags of the dependent variable, and the baseline model with a longer lag structure are estimated. The baseline model is also estimated in first-differences and using the Anderson-Hsiao dynamic panel data estimator. The Anderson-Hsiao procedure addresses the possibility of bias due to the presence of a lagged dependent variable in Specification 3, but the identification becomes dependent on arbitrary lag-length restrictions. Given the large standard errors, all estimators provide statistically similar estimates.

62. Second, Panel B tests the sensitivity of the baseline specification to the initial control variables. The model is estimated including further controls for the domestic public debt-to-GDP ratio and contemporaneous growth in export markets, as well as omitting the baseline controls. The three specifications provide again similar estimates to the ones reported in Table 1 Column 1. They also confirm that fiscal consolidations in trading partner countries tend to have an effect above their impact on trading partners' GDP growth. Indeed, fiscal consolidations tend to decrease imports but also to increase the trade-competitiveness of the consolidating countries, raising their exports in currency unions (Section 5).

63. Third, Panel C explores two major sources of heterogeneity, the differences in the size of the economies and their openness to trade. The baseline model is alternatively estimated interacting the fiscal spillover shocks and the short-run dynamics of output with a dummy variable for the 17 largest countries, and a dummy variable for the 17 most open economies. The outpout responses to fiscal spillovers appear of similar magnitude across economies of different size. When countries are hit by fiscal spillover shocks, GDP growth decreases significantly on impact in more open economies, while in the case of more closed economies the decrease in GDP becomes significant over the medium term.

64. Fourth, Panel D uses different trade weights for the fiscal spillovers. In the baseline specification, bilateral exports are taken from the UNCTAD COMTRADE dataset. As a robustness check two sets of weights were computed using the IMF Direction of Trade Statistics (DOTS). These weights cover the entire estimation period 1978-2009 or a fixed year (2005). In both specifications of fiscal spillovers, the results are in line with the estimates in Table 1 Column 1.

65. Finally, Panel E addresses the robustness of the main results to third-party countries that may also be affected by fiscal spillovers. As emphasised by Ivanova and Weber (2012), direct relationships between trading partners represent an incomplete picture of international spillovers. The impact of fiscal shocks through trading partners could be further amplified by second round effects. These indirect fiscal shocks are computed as an average of the fiscal shocks in the exports markets of the countries towards whom country *i* exports:

$$\Delta TTF_{it-l} = \sum_{j \neq i} \left(\frac{1}{20} \sum_{s=1990}^{2009} \frac{exp_{ijs}}{exp_{is}} \right) \left\{ \sum_{k \neq i, k \neq j} \left(\frac{1}{20} \sum_{s=1990}^{2009} \frac{exp_{jks}}{exp_{js}} \right) \Delta F_{kt-l} \right\} \quad , \tag{7}$$

where the second term in curly brackets reflects that when the export markets (*k*) of country *j* enter fiscal consolidation, this may reduce its demand for the goods produced by country *i*. This gives a clearer picture of the full Keynesian effects of fiscal policy. Two specifications are estimated. First, the third-party

spillover shocks are included as controls. Second, assuming that third-party shocks may diffuse to the domestic economy, they are added to the direct spillover shocks to the domestic economy. In the first case, the estimated spillover effects increase slightly as third-party countries partly act as a buffer against external shocks. In the latter case, the estimated spillover effects are in line with those previously estimated, suggesting that fiscal policies shock are partly transmitted from third-party countries.

Table 8. Robustness of the effect on domestic growth to the econometric specification

Effect of an average one percentage point GDP consolidation in export markets

Dependent variable:	Real GDP growth	
	Short-term effect	Medium-term effect
Estimation approach	(1)	(2)
A. Alternative estimators		
Baseline	-1.547*	-2.149***
	(0.776)	(0.819)
Static Model	-1.238	-1.699**
(no lagged dependent variable)	(0.824)	(0.852)
Baseline with 4 lags of dependent	-1.358*	-2.005**
variable and fiscal spillovers	(0.798)	(0.779)
Baseline estimated in	-1.801**	-1.631***
first-differences	(0.776)	(0.550)
Anderson-Hsiao dynamic panel	-3.297***	-3.653***
data estimator[1]	(0.914)	(0.907)
B. Additional control variables		
Lagged government debt-to-GDP	-1.371	-2.132**
(in t-1 and t-2)	(0.908)	(0.957)
Contemporaneous growth in	-1.252*	-1.893**
Export markets	(0.720)	(0.762)
Baseline without controls	-1.565*	-2.099**
(only lagged growth and spillovers)	(0.825)	(0.831)
C. Heterogeneity across country size and openness to trade		
Baseline (17 largest economies)	-1.614	-3.230***
	(0.977)	(1.224)
Baseline (17 smallest economies)	-1.686*	-1.878*
	(0.866)	(0.983)
Baseline (17 most open economies)	-1.938**	-2.438***
	(0.823)	(0.835)
Baseline (17 least open economies)	-1.069	-2.388*
	(0.962)	(1.316)
D. Different trade weights		
IMF DOTS average 1978-2009	-1.028	-1.935*
	(0.816)	(0.997)
IMF DOTS 2005	-1.054	-2.093**
	(0.799)	(0.951)
E. Third-party countries		
Controlling for third-party effect	-2.035**	-2.476***
	(0.887)	(0.855)
Lagged third-party effect included	-1.408*	-2.140***
in fiscal spillover shocks	(0.793)	(0.800)

Note: All specifications control for country and year fixed effects, as well as lagged (real) GDP growth in t-1 and t-2. Baseline controls also include lagged unemployment rate, occurrence of systemic banking crises and real GDP growth in export markets. Standard errors in parentheses are robust to heteroskedasticity and within country autocorrelation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

1. In the first-differenced equation, the two year lag of the dependent variable is the instrument for its lagged first-difference.

Source: OECD calculations.

6.3. Fiscal spillovers, employment, private consumption and investment

66. The above results suggest that fiscal consolidation spillovers have large contractionary effects on the domestic economy when fiscal consolidations occur in several trading partners. This subsection examines the impact of foreign fiscal consolidations on labour markets and two other indicators of economic activity, real private consumption and real private investment.

67. Table 9 reports the effect of fiscal spillovers on domestic employment. Though the overall impact of fiscal spillovers is insignificant (Column 1), spending-based fiscal consolidations have large and significant spillovers on domestic employment (Column 2). Taken at face value, the estimates suggest that domestic employment decreases by around 1.5 percent in the short term and 2.3 percent over three years when the main export markets cut government spending by an average of 1 percent of GDP. This would lead to an increase in the unemployment rate by 13 percent, or 1.5 percentage points in the current euro area situation with an unemployment rate of around 11 percent (Column 5 and OECD, 2013).

Table 9. Spillovers of action-based fiscal consolidations and labour markets

Effect of an average one percentage point GDP consolidation in export markets

Dependent variable:	Growth in employment			Growth in unemployment rate		
Weighting of fiscal shocks:	Equation 1			Equation 1		
Fiscal shocks:	Overall	Spending	Revenue	Overall	Spending	Revenue
	(1)	(2)	(3)	(4)	(5)	(6)
Contemporaneous effect						
Fiscal spillovers	-0.686	-1.548**	0.247	7.682*	13.302***	2.942
	(0.487)	(0.630)	(0.943)	(3.894)	(4.735)	(5.870)
3-year average effect						
Fiscal spillovers	-0.817	-2.282*	0.911	11.180*	13.250	10.690
	(0.869)	(1.285)	(1.008)	(5.962)	(8.989)	(8.886)
R2	0.432	0.435	0.431	0.484	0.482	0.481
Observations	859	859	859	885	885	885
Countries	33	33	33	34	34	34

Note: All specifications control for country and year fixed effects, as well as lagged (real) GDP growth and employment (unemployment rate) growth in t-1 and t-2. Baseline controls also include lagged occurrence of systemic banking crises and real GDP growth in export markets. Standard errors in parentheses are robust to heteroskedasticity and within country autocorrelation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

Source: OECD calculations.

68. As domestic GDP and employment fall, domestic private consumption expenditures and private investment decline during episodes of fiscal consolidation in trading partner countries (Table 10). Domestic private consumption contracts by roughly 2 percentage points when the fiscal balance of the main export markets increases by an average of 1 percent of GDP (Column 1). The estimated contraction in real private investment of 4 percentage points is somewhat larger than the estimated contraction in private consumption and aggregate output but statistically insignificant (Column 4). As fiscal consolidations increase domestic private savings, they could increase investment abroad. Thus, the results on private investment tend to show that the potential response of capital flows is not systematically correlated with trade flows. This is in line with Feyrer and Shambaugh (2012) who report that tax-based consolidations in the United States have symmetric responses on investment across different countries in the rest of the world. This also provides suggestive evidence that fiscal consolidations in trading partner countries are not anticipated. The reason is that by the time fiscal consolidation occurs, the decline in real private investment should be small when the improvement of the export-weighted fiscal balance is anticipated in advance (Ramey, 2011). Taken together, the results of Tables 9 and 10 confirm that fiscal consolidation spillovers have large real effects on the domestic economy through trade.

Table 10. Spillovers of action-based fiscal consolidations, private consumption and investment

Effect of an average one percentage point GDP consolidation in export markets

Dependent variable: Growth in …	Real private consumption			Real private investment		
Weighting of fiscal shocks:		Equation 1			Equation 1	
Fiscal shocks:	Overall	Spending	Revenue	Overall	Spending	Revenue
	(1)	(2)	(3)	(4)	(5)	(6)
Contemporaneous effect						
Fiscal spillovers	-2.099*	-2.371	-2.549	-3.797	-6.704**	-2.052
	(1.052)	(1.438)	(2.367)	(2.605)	(2.783)	(5.489)
3-year average effect						
Fiscal spillovers	-1.634	-2.143	-1.260	-4.901	-7.005*	-4.414
	(1.047)	(1.397)	(2.457)	(3.468)	(4.156)	(6.487)
R2	0.401	0.401	0.400	0.327	0.328	0.326
Observations	878	878	878	819	819	819
Countries	34	34	34	28	28	28

Note: All specifications control for country and year fixed effects, as well as lagged (real) GDP growth and real domestic private comsumption or investment in t-1 and t-2. Baseline controls also include lagged occurrence of systemic banking crises and real GDP growth in export markets. Standard errors in parentheses are robust to heteroskedasticity and within country autocorrelation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

Source: OECD calculations.

Conclusion

69. This paper investigates the international spillovers of fiscal consolidations on output across OECD countries from 1978 to 2009 using bilateral trade linkages. The cross-border effects of fiscal consolidations are economically and statistically significant. Based on narrative records of fiscal consolidation episodes in seventeen advanced economies, the baseline estimates imply that an average of 1 percent of GDP consolidation in export markets is associated with a slowdown of domestic growth by 1.5 percentage points in the short term and around 2 percentage points over three years. The large negative spillovers on output growth estimated using action-based measures of fiscal consolidation contrast with the estimated positive impact of fiscal consolidation spillovers on growth when cyclically-adjusted fiscal outcomes are used to measure fiscal policies. These contrasting estimates mirror the different domestic multipliers identified by the two methodologies (Guajardo *et al.*, 2011).

70. Cross-country spillovers of fiscal consolidation appear more detrimental to output growth during economic downturns in export markets than in normal times. The spillovers of fiscal shocks also differ across exchange rate arrangements. Under flexible exchange rate regimes, the nominal exchange rate appreciates on impact when a trading partner consolidates, while in currency unions the real exchange rate adjustment occurs through a slower process of price and wage compression. However, fiscal consolidations are found to be associated with larger contemporaneous spillovers on output between members of a currency union than between countries with more flexible exchange rate regimes. Further investigations showed that this result is not due to a larger real exchange adjustment in currency unions but rather to a higher sensitivity of trade flows to relative price changes in such unions. This may reflect the strong degree of economic integration among countries sharing currencies or having pegged exchange rates. Indeed, bilateral exports decrease more sharply in currency unions following a fiscal consolidation in another member country than among countries with more flexible exchange rate arrangements. Furthermore, bilateral imports only increase between currency-union members in the short run. The time pattern of fiscal consolidation spillovers across exchange rate arrangements is consistent with the increased response of the current account to domestic fiscal consolidation in euro area countries after the euro adoption estimated by Bluedorn and Leigh (2011).

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APPENDIX

Table A1. Definition of the main explanatory variables

Variable	Definition
Fiscal stance	
Action-based fiscal policies	Devries *et al.* (2011).
Cyclically-adjusted primary balance, primary spending, and revenues	OECD Economic Outlook 92 and different vintages (88, 84, 81, 72 and 61): - Cyclically-adjusted government primary balance, NLGXQU or NLGXQA. - Cyclically-adjusted primary spending, YPGTXQU or YPGXQA. - Cyclically adjusted current receipts, general government, YRGTQU or YRGQA.
Country level variables	
Real GDP growth	OECD Economic Outlook 92 and different vintages (88, 84, 81, 72 and 61).
Unemployment rate	OECD Economic Outlook 92 and different vintages (88, 84, 81, 72 and 61).
Employment	OECD Economic Outlook 92 and different vintages (88, 84, 81, 72 and 61).
Private Consumption and investment	OECD Economic Outlook 92 or other vintages (88, 84, 81, 72 and 61): private final consumption expenditure, volume (CPV) and real private investment (IPV).
Output gap	OECD Economic Outlook 92 and different vintages (88, 84, 81, 72 and 61).
Systemic Banking crises	Ongoing crises as reported by Laeven and Valencia (2012).
Debt-to-GDP ratio	OECD Economic Outlook 92 and different vintages (88, 84, 81, 72 and 61). The remaining missing values are filled with the data of Mauro *et al.* (2013).
Exchange rate arrangements	
Euro area dummy	The Euro area dummy takes value 1 from 1999 and 0 otherwise for Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain. The Euro area dummy takes value 1 from 2001 for Greece, from 2007 for Slovenia, and from 2009 for Slovakia, and 0 otherwise.
Bilateral currency union	Currency union are taken from de Sousa (2012)'s update of Glick and Rose (2002).
Peg dummy	From Ilzeztki *et al*. (2011) based on Reinhart and Rogoff (2004).
Floating dummy	From Ilzeztki *et al*. (2011) based on Reinhart and Rogoff (2004). It is defined as the complement of the peg dummy.
Bilateral variables	
Bilateral export growth	$\Delta e_{ijt}=[(\log(EXP_{ijt})-\log(EXP_{ijt-1})]$ x 100, where EXP_{ijt} is the exports from country i to country j in USD from the IMF DOTS statistics. Exports are reported free on board (FOB) while imports are reported costs including insurance and freight (CIF), with a 10% difference in average. As in Head *et al*. (2010), mirrors flows are used to obtain a better approximation of exports using the formula: $EXP_{ijt}=\max(TXG_{ijt}, TMG_{ijt}/1.10)$ where TXG is the value of exports and TMG is the value of imports from IMF DOTS (variables TXG and TMG).
Bilateral import growth	$\Delta e_{ijt}=[(\log(IMP_{ijt})-\log(IMP_{ijt-1})]$ x 100, where IMP_{ijt} is the exports from country j to country i in USD from the IMF DOTS statistics computed as above.
Bilateral nominal exchange rate	$EXCH_{it}/EXCH_{jt}$ OECD Economic Outlook 92 and different vintages (88, 84, 81, 72 and 61)..
Bilateral real exchange rate	$EXCH_{it}/EXCH_{jt}$ OECD Economic Outlook 92 and different vintages (88, 84, 81, 72 and 61) deflated by relative GDP deflator (PGDP).
Bilateral CPI and ULC	X_{it}/X_{jt} where X is the consumer price index (CPI) or unit labour costs (ULC) from the OECD Economic Outlook 92 and different vintages (88, 84, 81, 72 and 61).
Competitive positions: relative consumer prices and relative unit labour costs	Competitiveness-weighted relative consumer prices and unit labour costs for the overall economy in dollar terms. Competitiveness weights take into account the structure of competition in both export and import markets of the goods sector of 49 countries. An increase in the index indicates a real effective appreciation and a corresponding deterioration of the competitive position. OECD Main Economic Indicators (MEI).
Regional trade agreements	Bilateral regional trade agreements are taken from de Sousa (2012).
Bilateral distance	Distance between capital cities, as reported in Mayer and Zignago (2011).
Neighbour countries	Mayer and Zignago (2011).

Table A2. Descriptive statistics

	Mean (1)	Standard-Deviation (2)	Median (3)	Min (4)	Max (5)	Number of observations (6)
A. Domestic variables						
GDP growth	2.75	3.18	3.00	-15.33	11.60	1031
Unemployment rate	6.83	3.68	6.53	0.18	19.93	962
Unemployment rate growth	2.34	17.93	-0.25	-51.58	119.97	953
Employment growth	0.99	2.07	1.06	-10.06	23.91	900
Private consumption growth	2.63	3.38	2.63	-33.51	19.74	940
Private investment growth	2.82	9.97	3.62	-80.28	82.19	880
Ongoing banking crises	0.10	0.30	0.00	0.00	1.00	1088
Output gap	0.03	2.91	0.12	-11.02	13.33	932
Change in cyclically-adjusted primary budget balance / potential output	-0.07	1.42	0.00	-8.00	11.20	898
Change in cyclically-adjusted primary expenditures / potential output	-0.16	1.29	-0.15	-5.30	15.29	832
Change in cyclically-adjusted revenues / potential output	0.03	1.19	0.10	-5.54	6.13	833
Debt-to-GDP ratio	53.01	36.29	50.56	0.00	283.96	1008
Year	1993.5	9	1993.5	1978	2009	1088
B. Action-based fiscal spillovers (Equation 1)						
Aggregate shocks	0.22	0.23	0.13	-0.04	1.34	1088
Spending shocks	0.13	0.16	0.07	-0.01	1.33	1088
Tax shocks	0.09	0.12	0.04	-0.21	0.64	1088
C. Action-based fiscal spillovers (Equation 2)						
Aggregate shocks	0.10	0.13	0.05	-0.01	0.91	1023
Spending shocks	0.06	0.09	0.03	-0.01	0.53	1023
Tax shocks	0.04	0.07	0.02	-0.13	0.75	1023
D. Cyclically-adjusted fiscal spillovers (Equation 1)						
Aggregate shocks	-0.07	0.55	0.01	-2.99	1.52	1088
Aggregate shocks (consolidation)	0.29	0.24	0.24	0.00	1.90	1088
Spending shocks	-0.10	0.36	-0.06	-1.56	1.03	1088
Tax shocks	0.02	0.39	0.06	-2.02	1.22	1088
Residual spending shocks (Perotti, 1999)	0.00	0.25	0.00	-0.91	1.06	1088
E. Other foreign shocks (Equation 1)						
GDP growth	1.60	1.26	1.79	-4.40	6.05	1088

Note: The sample includes 34 OECD countries over the 1978-2009 period.

Source: OECD calculations.

Table A3. Detailed exchange rate arrangements and spillovers of fiscal consolidations on GDP growth

Effect of an average one percentage point of GDP consolidation in export markets on domestic growth

	Dependent variable: Real GDP growth					
Exchange rate arrangement:	A. Reinhart and Rogoff (2004) Binary measure			B. Reinhart and Rogoff (2004) Discrete measure		
Fiscal shocks:	Overall	Spending	Revenue	Overall	Spending	Revenue
	(1)	(2)	(3)	(4)	(5)	(6)
Contemporaneous effect						
Fiscal spillovers	-0.718	-2.760**	1.337*	0.286	-2.026	1.336
in a non-fixed regime	(0.941)	(1.130)	(0.758)	(1.297)	(1.848)	(1.852)
Fiscal spillovers	-2.214***	-2.900***	-2.466	-2.761***	-3.348***	-1.981
in a fixed regime	(0.518)	(0.447)	(1.681)	(0.593)	(0.546)	(1.569)
3-year average effect						
Fiscal spillovers	-2.196*	-3.484**	-0.822	-1.534	-3.071	-2.675
in a non-fixed regime	(1.276)	(1.695)	(1.145)	(1.718)	(2.523)	(2.645)
Fiscal spillovers	-1.368	-1.493*	-0.190	-2.347***	-2.233***	-2.212
in a fixed regime	(0.862)	(0.839)	(2.629)	(0.794)	(0.787)	(1.989)
R2	0.563	0.564	0.565	0.564	0.564	0.561
Observations	885	885	885	885	885	885
Countries	34	34	34	34	34	34

Note: All specifications control for country and year fixed effects, as well as lagged (real) GDP growth in t-1 and t-2. Baseline controls also include lagged occurrence of systemic banking crises and real GDP growth in export markets. Standard errors in parentheses are robust to heteroskedasticity and within country autocorrelation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

Source: OECD calculations.

Table A3 investigates the spillovers of fiscal consolidations on output across exchange rate arrangements using a discrete measure of the bilateral constraints on exchange rate movements. This measure is based on Reinhart and Rogoff's coarse classification (Reinhart and Rogoff, 2004). It goes from 1 (both countries are pegged), to 0 if one of the two countries is freely floating. It is the product of two country-specific variables taking values from 0 to 1:

- 1 for pegged exchange rate,
- 2/3 for narrow exchange rate bands,
- 1/3 for wide exchange rate bands,
- 0 for freely floating exchange rate.

This discrete measure provides better comparison groups for pairs of pegged countries and exploits a larger share of the variance between exchange rate arrangements than pairs of pegged countries. According to the constructed bilateral indicator, 66% of the country-pair observations have some constraints on their nominal exchange rate movements over the 1978-2009 period. This avoids relying only on a small number of policy changes such as the euro area implementation to estimate the effect of nominal exchange rate rigidity on fiscal spillovers. Panel A presents the baseline estimates (Table 2 of the main text), while Panel B presents the estimates based on the new bilateral indicator. Panel B confirms the baseline results. In the short run, exchange rate arrangements have a significant effect on the strength of fiscal spillovers: when nominal exchange rate movements are limited, fiscal spillovers are larger. By contrast, exchange rate arrangements do not play a clear role in the medium term.

Table A4 adresses endogeneity concerns about the determination of exchange rate arrangements. Exchange rate arrangements are not randomly chosen and this self-selection may partly bias the estimated

impact of fiscal shocks. Panels A and B use one- and two-year lags of the discrete measure of bilateral exchange rate arrangements. The qualitative pattern of the estimates remains the same.

Table A4. Lagged exchange rate arrangements and spillovers of fiscal consolidations on GDP growth

Effect of an average one percentage point of GDP consolidation in export markets on domestic growth

	Dependent variable: Real GDP growth					
Exchange rate arrangement:	A. Reinhart and Rogoff (2004) Discrete measure (t-1)			B. Reinhart and Rogoff (2004) Discrete measure (t-2)		
Fiscal shocks:	Overall	Spending	Revenue	Overall	Spending	Revenue
	(1)	(2)	(3)	(4)	(5)	(6)
Contemporaneous effect						
Fiscal spillovers	0.412	0.640	-1.211	0.798	0.961	-1.176
in a non-fixed regime	(0.775)	(0.736)	(2.036)	(0.888)	(0.834)	(2.003)
Fiscal spillovers	-2.882***	-3.417***	-2.155	-2.896***	-3.522***	-2.223
in a fixed regime	(0.613)	(0.656)	(1.605)	(0.494)	(0.576)	(1.478)
3-year average effect						
Fiscal spillovers	-1.471	-2.818	-2.396	-1.124	-2.230	-2.166
in a non-fixed regime	(1.710)	(2.418)	(2.732)	(1.561)	(2.058)	(2.685)
Fiscal spillovers	-2.518***	-2.364***	-2.576	-2.842***	-2.900***	-2.471
in a fixed regime	(0.817)	(0.825)	(2.067)	(0.698)	(0.870)	(2.044)
R2	0.564	0.563	0.561	0.563	0.564	0.561
Observations	885	885	885	885	885	885
Countries	34	34	34	34	34	34

Note: All specifications control for country and year fixed effects, as well as lagged (real) GDP growth in t-1 and t-2. Baseline controls also include lagged occurrence of systemic banking crises and real GDP growth in export markets. Standard errors in parentheses are robust to heteroskedasticity and within country autocorrelation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

Source: OECD calculations.

Table A5. Bilateral trade flows and action-based fiscal consolidations in the medium term

Effect of a one percentage point of GDP consolidation in country j

Dependent variable:	Growth in exports from i to j			Growth in imports of i from j		
Fiscal shocks:	Overall	Spending	Revenue	Overall	Spending	Revenue
	(1)	(2)	(3)	(4)	(5)	(6)
Contemporaneous effect						
Fiscal consolidation	-1.460***	-3.177***	-1.613**	-0.517	0.054	-1.073
In a non-fixed regime	(0.465)	(0.667)	(0.806)	(0.461)	(0.600)	(0.834)
Fiscal consolidation	-3.655***	-6.083***	-5.295***	2.563***	4.469***	3.760**
in a fixed regime[1]	(0.970)	(1.687)	(1.686)	(0.889)	(1.559)	(1.473)
3-year average effect						
Fiscal consolidation	-2.429****	-3.192***	-4.114***	-0.187	0.020	-0.153
In a non-fixed regime	(0.514)	(0.733)	(0.897)	(0.424)	(0.661)	(0.735)
Fiscal consolidation	-3.849***	-6.064***	-5.512***	1.265	2.627*	1.914
in a fixed regime[1]	(0.940)	(1.672)	(1.661)	(0.867)	(1.466)	(1.450)
R2	0.351	0.351	0.351	0.437	0.437	0.437
Observations	14,521	14,521	14,521	14,521	14,521	14,521
Countries	561	561	561	561	561	561

Note: All specifications control for bilateral fixed effects, destination-year fixed effects, two lags of the dependent variable and two-lags of the explanatory variables and the currency union dummy as in Equation 5. Clustered standard errors in parentheses are robust to heteroskedasticity and within country-pair auto-correlation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

1. Estimated effect of a 1 point GDP in the export market for an exporting country in the same currency union (the sum of the four estimated coefficients in the main panel of Table 4).

Source: OECD calculations.

Table A6. Bilateral exchange rates and action-based fiscal consolidations in the medium term

Effect of a one percentage point of GDP consolidation in country j

	Dependent variable: bilateral growth in …						
	Nominal exch. rate	Relative GDP deflator	Real exch. rate	Relative CPI	Relative ULC	Relative effective: CPI	Relative effective: ULC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Contemporaneous effect							
Fiscal consolidation	2.047***	-0.077	2.473***	-0.017	0.193*	1.836***	2.336***
In a non-fixed regime	(0.116)	(0.173)	(0.259)	(0.053)	(0.116)	(0.122)	(0.149)
Fiscal consolidation	0.213***	0.687***	0.908***	0.531***	1.321***	1.136***	1.733***
in a fixed regime[1]	(0.070)	(0.091)	(0.120)	(0.056)	(0.125)	(0.103)	(0.138)
3-year average effect							
Fiscal consolidation	2.210***	0.132	2.887***	0.043	0.483***	2.231***	2.936***
In a non-fixed regime	(0.178)	(0.140)	(0.225)	(0.109)	(0.128)	(0.156)	(0.176)
Fiscal consolidation	0.282	1.142***	1.575***	1.127***	2.374***	1.916***	3.127***
in a fixed regime[1]	(0.204)	(0.160)	(0.186)	(0.107)	(0.166)	(0.185)	(0.265)
R2	0.899	0.851	0.488	0.755	0.878	0.720	0.758
Observations	15,232	15,159	15,094	15,279	14,393	14,382	13,719
Country pairs	561	561	561	561	557	561	544

Note: All specifications control for bilateral fixed effects, destination-year fixed effects, two lags of the dependent variable and two-lags of the explanatory variables and the currency union dummy as in Equation 5. Clustered standard errors in parentheses are robust to heteroskedasticity and within country-pair auto-correlation. * denotes a significant estimate at the 10% level, ** at 5%, *** at 1%.

1. Estimated effect of a 1 point GDP in the export market for an exporting country in the same currency union (the sum of the four estimated coefficients in the main panel of Table 5).

Source: OECD calculations.

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