Revenue- versus Spending-based Fiscal Consolidation Announcements

Multipliers and Follow-up

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Revenue- versus spending-based fiscal consolidation announcements: Multipliers and follow-up☆

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ABSTRACT

Using a new narrative dataset on fiscal consolidation *announcements* for thirteen EU countries over the period 1978–2013, a panel VAR analysis shows that revenue-based announcements appear more credible, but affect economic activity more adversely than do spending-based announcements. Higher revenue multipliers and, to a lesser extent, larger actual follow-up following a revenue-based announcement help to explain the difference. The uniqueness of our dataset allows to control for anticipation effects of budgetary implementation and variables that respond quickly to news. The main findings are similar if we include in the specification open-economy variables.

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1. Introduction

What are the macroeconomic effects of fiscal consolidation plans? How do they differ between revenue-based and spending-based consolidations and, if they differ, then why? In recent years a number of papers (Guajardo et al., 2014, and Alesina et al. 2015a and 2015b) have tried to address these questions starting from the annual narrative dataset constructed by Devries et al. (2011). A robust result in the literature based on this dataset is that revenue-based consolidations are more harmful for output than expenditure-based consolidations. Different explanations have been offered for this finding. Guajardo et al. (2014) suggest that spending-based consolidations tend to be accompanied by monetary policy accommodation. They may also be accompanied by other accommodating policies such as labor and goods market liberalization. Alesina et al. (2015a, 2015b) show that spending-based consolidations boost business confidence and private investment. Relatedly, it has been argued that, because they are politically more costly, spending-based consolidations provide a stronger signal to the private sector that the government intends to improve its budgetary situation (Ardagna, 2004).[2] Expanding the narrative dataset of Devries et al. (2011), Alesina et al. (2017) confirm the heterogeneous effects of spending- versus revenue-based consolidation plans, while controlling for monetary policy. They offer an alternative explanation for this heterogeneity in the context of a standard New-Keynesian model by demonstrating that the relatively more favorable output effect of spending-based consolidation increases with the degree of persistence of the fiscal measures. Measures taking in the context of spending-based consolidations tend to be highly persistent.

Using a unique dataset identifying the precise moment of consolidation *announcements,* this paper explores differences in macroeconomic responses following *announcements* of revenue-based versus spending-based consolidations in the European Union (EU). Our dataset is *quarterly* instead of annual, as is common in the literature. Hence, we can control for anticipation effects of budgetary implementation and variables that respond quickly to news, such as asset prices and confidence indicators, allowing for proper inference if these effects do indeed play a role. We find that economic activity reacts in a markedly more negative way to a revenue-based than a spending-based announcement, and we show that higher revenue multipliers and, to a lesser extent, larger follow-up in actual consolidation under the former help to explain the difference. These findings are complementary to the existing literature.

Differences in follow-up may arise for different reasons. For political reasons governments may find it more difficult to stick to promises to reduce spending, because the benefits of spending are usually more concentrated among certain groups in the population, who therefore have a greater interest in fighting plans to reduce the spending they benefit from, while tax increases can be more thinly spread over the population and the net benefit of resistance is likely smaller.[3,4] Also overoptimistic GDP projections associated with consolidation announcements may increase the gap in follow-up. If GDP growth falls short of its projection, both nominal revenues (numerator) and nominal GDP (denominator) fall relative to their projections, leaving their ratio roughly in line with its projection. By contrast, a slightly negative spending elasticity reinforces the denominator effect and, hence, a projected spending reduction will be partially offset.

Because our dataset makes it possible to capture the short-term response of the exchange rate (a jump variable) following a consolidation announcement, it is particularly suited also to analyze an open-economy specification of our model. We find that our main results are similar for both a closed-economy specification and one extended with open-economy variables, such as exports, imports and the exchange rate. The open-economy variables respond in line with standard mechanisms. Following a consolidation announcement, the real effective exchange rate depreciates and the trade balance improves. This improvement results largely from falling imports in the case of a revenues-based announcement and from rising exports following a spending-based announcement. Distinguishing floating and fixed exchange rate regimes, we observe some differences. GDP and private consumption respond in a rather similar way following a revenue-based announcement. Following a spending-based announcement, they stay flat under a fixed regime, but fall under a float. Our estimates suggest that larger follow-up in terms of improving the public balance under a float helps to explain the difference.

Our analysis proceeds in a number of steps. First, we provide evidence of differences in follow-up of revenue- versus spending-based consolidation plans by *directly* comparing *ex-post* actual fiscal data from the OECD with the *annual* narratively-identified consolidation plans of Devries et al. (2011) and Alesina et al. (2015a, 2015b). We do this by very carefully matching the narrative measures with the appropriate variables for the *ex-post* outcomes. We find a systematic shortfall of the latter relative to the narrative measures for spending-based measures. The average shortfall is substantially smaller for revenue-based measures. This finding motivates our ensuing deeper empirical analysis into the differential effects of spending-based versus revenue-based consolidation plans. To this end, we construct our narrative dataset of fiscal consolidation *announcements* for thirteen EU countries over the period 1978–2013. The dataset is based on assigning consolidation information as accurately as possible to the *month* in which it first becomes publicly available.

[2] The argument is related to Cukierman and Tommasi (1998) who argue that political decisions that are at odds with the preferences of the natural constituency of a party are most credible.

[3] The mechanism is analogous to that underlying Von Hagen and Harden's (1995) model in which spending ministers enjoy the benefit of a greater allocation of resources to their own ministry, while the cost in terms of higher taxes is borne by everyone. With a weak finance minister, this may easily lead to sub-optimally high spending from a social-planner perspective.

[4] Indirect evidence on general strikes reported in Appendix C.2 suggest that these are more likely to be triggered by plans to cut spending than plans to raise taxes.

We then enter the consolidation announcements as shocks into a quarterly (Bayesian) panel vector auto-regression (VAR). By using properly-timed announcements we can thus account for potential private sector anticipatory behavior and movements in "jump" variables that may take place between the moment the plan becomes public information and its actual implementation. Our Bayesian estimation approach is particularly suited for handling the larger-scale panel VARs that we deploy.

Our panel VAR shows that announcements of revenue-based versus spending-based consolidations produce very different economic responses. Following a revenue-based announcement, GDP, consumption and consumer confidence decline significantly, while the long-term interest rate rises significantly. By contrast, after a spending-based consolidation announcement none of these variables exhibit a material reaction. We also observe that revenue-based consolidation announcements lead on average to a larger follow-up in terms of actual revenues than do spending-based consolidation announcements in terms of actual spending. These findings are robust to a large number of alterations to the baseline specification.

We then investigate the sources of the differences in economic activity following the two announcement types. We decompose cumulative output responses into cumulative multipliers to the fiscal instrument and follow-up of the instrument to the consolidation announcement. We find that a larger cumulative multiplier for given implementation of revenue measures and, to a lesser extent, a larger degree of implementation of revenue measures following a revenue-based announcement contribute to explaining the difference in the cumulative output responses. For example, normalizing the follow-up in both cases to 1% of GDP, two years after a consolidation announcement GDP is between 1.5 and 2% lower after a revenue-based than after a spending-based announcement. Follow-up is about 1 percentage point of GDP higher both in terms of primary balance and in terms of the own instrument after a revenue-based announcement. It is important to realize that, while due to stronger negative multiplier effects economic activity falls more following a revenue-based consolidation announcement, this does not necessarily imply that spending-based consolidations are preferred to revenue-based consolidations. In fact, if the public budget is on a clearly unsustainable trajectory, announcing a revenue-based consolidation with a higher expected degree of implementation may be preferable.

Our next step is to extend our closed-economy specification to an open-economy specification. The usefulness of this two-step structure is that it allows us to explore explicitly the role of open-economy variables in driving the differences in the responses to the two types of consolidation announcements. However, we find that the differences in these responses are preserved in the open-economy framework, although in the case of spending-based announcements the average responses hide some differences between floating and fixed exchange rate regimes.

The remainder of this paper is structured as follows. Section 2 lays out the predictions of standard theoretical frameworks of the effects of revenue- and spending-based consolidations on the economy. It also links this paper to other relevant strands in the literature. As a stepping stone for the ensuing analysis, Section 3 investigates the realization of *annual* fiscal consolidation plans identified in *existing* datasets by directly comparing these plans with *ex-post* data on revenues and spending. Section 4 describes our dataset of fiscal consolidation announcements. Section 5 contains the panel VAR analysis to explore the roles of differences in follow-up and in fiscal multipliers for the asymmetric economic performance following the two types of plan announcements. Section 6 extends the analysis to include open-economy variables. Finally, Section 7 concludes the main text. The Appendices and a separate Data Construction Appendix are available from the journal's website.

2. Conceptual theoretical framework and related literature

2.1. Conceptual theoretical framework

The Great Recession has motivated a large amount of work estimating the sign and magnitude of fiscal multipliers. Empirical evidence generally shows that positive revenue shocks are contractionary (Blanchard and Perotti, 2002; Romer and Romer, 2010; Barro and Redlick, 2011), with output multipliers ranging between −0.5 and −5.[5] Reductions in public wage expenditures lower disposable income directly, while reductions in non-wage public spending on goods and services lower disposable income by depressing the demand for private sector output and, hence, income generated in the private sector. These results are confirmed for narratively-identified consolidation measures: for a panel of OECD countries Guajardo et al. (2014) find that both the revenues and spending measures are associated with reductions in consumption and GDP. However, there is evidence (e.g. Guajardo et al., 2014, and Alesina et al. 2015a and 2015b) that spending-based consolidations are less harmful in terms of economic activity than are revenue-based consolidations.

While we do not present a formal model, this subsection offers a conceptual discussion of the differential consequences of revenue- versus spending-based consolidation plans. We start with a closed-economy setting, followed by a discussion of an open-economy framework.

2.1.1. A closed-economy setting

It is impossible to do justice here to all contributions analyzing fiscal consolidations. That said, the literature that explicitly compares the theoretical implications of revenue- versus spending-based consolidations is rather limited.

In a standard Keynesian closed-economy setting with individuals consuming their disposable income, the government purchases multiplier exceeds the tax multiplier. This framework ignores that at least a substantial fraction of individuals is

[5] Since the turn of the century a substantial amount of effort has been devoted to estimating fiscal multipliers. Examples of other contributions are Beetsma et al. (2008), Bénétrix and Lane (2009), Beetsma and Giuliodori (2011), Auerbach and Gorodnichenko (2012), Corsetti et al. (2012) and Ilzetzki et al. (2013).

forward-looking and makes intertemporal trade-offs. In a simple intertemporal neoclassical setting, the negative output effects of revenue-based consolidation may be worse than those of a spending-based consolidation. Suppose that, given revenues, spending is growing in an unsustainable way, while losses from tax distortions increase in a non-linear way, then a spending-based consolidation would restore sustainability right away, while a revenue-based consolidation might require further tax increases in the future with the associated larger losses from distortions. Anticipating this course of events, consumption and output would react more favorably to a spending-based than to a revenue-based consolidation (see Alesina et al., 2019a).

In Baxter and King (1993) a permanent increase in non-productive government purchases financed by lump-sum taxes produces a static negative effect on consumption, but, because leisure falls, output rises. An additional dynamic effect is generated in the case of spending on public investment due to the rise in the marginal productivity of capital. Output multipliers of spending can exceed one both in the short- and the long-run when the capital-labor and wage-rental ratio have returned to their original levels. Compared to lump-sum tax financing, financing of spending with a distortionary output tax lowers labor supply (in the presence of pre-existing transfers) and investment, thereby also reducing output, which in turn requires a further tax increase. Hence, multipliers depend on the composition of the changes in revenues and spending.[6]

While a spending increase raises output in a New-Keynesian setting, price stickiness alone may not be enough for a positive effect on private consumption. However, with a sufficient fraction of rule-of-thumb consumers both output and private consumption rise, as Galí et al. (2007) demonstrate. They also show that the spending multiplier falls with persistence of the spending shock. Such persistence is a crucial determinant of the relative effects of spending- versus revenue shocks in the new-Keynesian model of Alesina et al. (2017). They point out that spending reductions in the consolidation plans they (and we) study are usually permanent. A government spending cut causes a negative demand effect. With sticky prices, output and employment fall. The more persistent is the cut, the lower will be future taxes, implying a larger positive wealth effect on private consumption and, hence, the reduction contraction of output and employment will be smaller. Higher taxes cause larger labor distortions, leading firms to cut back on labor, hence falling output.

Other channels may play a role as well. An austerity plan that effectively stabilizes the debt may boost investors' confidence, leading to a surge in private investment (Alesina et al., 2019b). Spending-based plans are more likely to stabilize the public debt, because increases in taxes do not stop the growth of spending. Moreover, if entrepreneurs and investors expect taxes to go up in the future, they will invest less today, as they expect profits to be more heavily taxed in the future and heavier taxes on consumers depress future sales.

2.1.2. Open economy extensions

Extending the standard Keynesian setting to an open economy with perfect capital mobility and fully flexible exchange rates, a fiscal contraction of either type, via spending or revenues, is offset by an exchange depreciation, leaving output unaffected. With a fixed exchange rate the negative effect from a public spending decrease exceeds that of a revenue increase, because the marginal propensity to consume is less than one. However, switching to a New-Keynesian setting, Alesina et al. (2017) demonstrate with simulations that an extension of their New-Keynesian model to an open-economy setting with goods trade and an incomplete international asset market does not alter the conclusion that a spending-based consolidation has a less detrimental effect on economic activity than a revenue-based consolidation. This is the case for both flexible and fixed exchange rates. The result is robust in spite of the potentially different real exchange rate responses, which may depend on the exchange rate regime, the dynamics of international real interest rates differentials and the monetary policy rule. Estimates by Bénétrix and Lane (2013) suggest that the real exchange rate response to government spending shocks depends on the exchange rate regime, with a reduction in spending giving rise to a real depreciation for EMU countries and a real appreciation for a group of major floaters. The latter findings are also confirmed by Ravn et al. (2012).

2.2. Other related literature

This paper relates to several other strands of the literature. A first strand consists of empirical studies that document sizable and systematic deviations of actual implementation from fiscal plans. Examples are Jonung and Larch (2006), Beetsma et al. (2009), Von Hagen (2010), Pina and Venes (2011), Cimadomo (2012), Beetsma et al. (2013), De Castro et al. (2013) and Debrun and Kinda (2017).[7] Using data from the EU's Stability and Convergence Programs, Beetsma et al. (2009) show that actual budgetary adjustment falls systematically short of planned adjustment, and that the shortfall increases with the projection horizon. Pina and Venes (2011) employ EU Excessive Deficit Procedure reporting data to conclude that budget balance forecasting errors are responsive to fiscal institutions and opportunistic political motivations. A related conclusion is reached by Beetsma et al. (2013), who find that institutional quality – as measured by the tightness of national fiscal rules, the medium-term budgetary framework or budgetary transparency – improves budgetary forecasting in the EU. De Castro et al. (2013) find that preliminary deficit data are gradually adjusted, such that later data vintages report a larger deficit for a given year. Countries try to systematically exploit the margins of acceptable reporting, but are subsequently corrected by Eurostat. Frankel and Schreger (2013) report particularly strong over-optimism when the deficit exceeds the 3% of GDP limit at the moment that the forecast is

[6] The effects of taxes may also depend on their initial level, because of increasing distortions and disincentive effects at higher levels of taxation. For example, Gunter et al. (2019) find more negative tax multipliers for EU countries than for lower-income countries, which may be explained by the higher initial tax rate in the former group. In our empirical analysis, we constrain tax multipliers to be constant, which seems a reasonable approximation for our group of reasonably comparable countries.

[7] Cimadomo (2012) shows that OECD countries often plan a counter-cyclical fiscal stance, while fiscal outcomes tend to point towards a-cyclicality or pro-cyclicality.

constructed. For a broad panel of narratively-identified consolidation episodes across countries, Gupta et al. (2017) show that promise gaps are on average sizable. Both economic and political factors contribute to the gaps.

A second strand is the growing body of work that explores the role of *news* for short-term economic dynamics. New information about future (economic) developments affects the expectations of private sector agents, who adjust their behavior in anticipation of the future state of the economy (Beaudry and Portier, 2014). Expectations of fiscal consolidations may either moderate or exacerbate the contractionary effect of the actual measures on the real economy. Under the "expansionary austerity" view, if private agents realize that consolidation will prevent a future increase in taxation, fiscal adjustment now will boost optimism about the economy and thus act as a stimulating economic force (Blanchard, 1990; Giavazzi and Pagano, 1990, and Alesina and Ardagna, 2010). By contrast, Akerlof and Shiller (2009) posit the existence of a "confidence multiplier", which may amplify the Keynesian effects of fiscal policy. Indeed, Bachmann and Sims (2012) find that during recessions in the United States the "confidence multiplier" reinforces the Keynesian effects of higher government spending. Further, Ramey (2011) and Mertens and Ravn (2010, 2012) show that anticipation effects can play an important role in the identification of structural fiscal shocks and that incorporating narrative shocks produces empirical results different from those based on standard techniques. Our dataset of fiscal consolidation announcements is particularly suited to addressing anticipation effects. From a methodological viewpoint, our work uses explicitly-identified shocks (as, for instance, in Brückner and Pappa, 2015) to explore the link between news and short-term economic dynamics. Hence, it belongs to the literature deploying narratively-identified fiscal VAR models, using consolidation announcements as shocks.

Finally, our paper relates to recent work on the relationship between fiscal consolidations and sovereign yields. De Jong (2018) finds evidence that new information hinting at an improvement of the Dutch public budget reduces sovereign spreads against Germany. For a panel based on a broad sample of advanced and emerging economies, Born et al., 2020 find that the effect of a cut in government consumption on the sovereign spread against a "riskless" reference country typically depends on the state of the economy. Similarly, for a panel of emerging economies experiencing high sovereign spreads or under an IMF program, David et al. (2019) report a significant drop in those spreads after news about the approval of austerity measures by the legislature.

3. *Ex-post* deviations from real-time fiscal consolidation measures

As a stepping stone to our ensuing analysis, this section explores the extent to which *ex-post* annual fiscal changes correspond to the annual fiscal consolidation measures narratively-identified by Devries et al. (2011) and Alesina et al. (2015a, 2015b) in their expansion of the dataset of Devries et al. (2011). The dataset of Alesina et al. covers thirteen EU countries. For Austria, Belgium, Denmark, France, Germany, Ireland, Italy, Portugal, Spain and the United Kingdom the sample spans the period 1978–2013, whereas for Finland, Sweden and the Netherlands it covers the period 1978–2008. Evidence of a systematic difference in the follow-up of the narratively-identified revenue and spending measures helps us to motivate the econometric analysis in Section 5, which will be based on our new dataset of fiscal consolidation *announcements* to be described in Section 4, and in which we investigate the sources of the differences in economic responses following revenue- and spending-based announcements. An important source will be differences in follow-up.

3.1. Matching of ex-post data with the narrative consolidation data

The annual fiscal consolidation measures in the dataset of Devries et al. (2011) are narratively selected from policy documents such that their primary motivation is sustainability of the public budget and not a response to the business cycle. The identified measures together with their estimated budgetary impact reflect the "intentions and actions" of policymakers as described in a wide range of contemporaneous policy documents.[8] Alesina et al. (2015a, 2015b) distinguish between anticipated and unanticipated implementations and, in extending the dataset for the period 2009–2013, they follow the same approach as Devries et al. (2011). An important source of information used in particular by Alesina et al. (2015a, 2015b) are the Stability and Convergence Programs submitted by EU member states. These documents contain both forecasts of the effects of fiscal plans for the coming years and real-time estimates of the impact of the measures taken in the current and preceding years. Therefore, in both the narrative dataset of Devries et al. (2011) and in its extension, the intended magnitude of a fiscal consolidation represents a mixture of forecasts and first-release data.

We compare changes in actual (i.e., *ex-post*) public revenues and spending with the estimated budgetary impact of the narratively-identified consolidation measures by Devries et al. (2011) and Alesina et al. (2015a, 2015b) for each year. The comparison is served best by matching as well as possible the concepts of revenues and spending used in the narrative identification with *ex-post* actual revenues and spending. Because there is no obvious one-to-one correspondence between the revenue and spending consolidation plans and the respective *ex-post* measures, we will compare the narratively-identified consolidation measures with various alternative (e.g. from the most comprehensive to more narrow definitions) *ex-post* budgetary measures. Appendix A contains a full description of the annual data used in this section.

[8] The recorded budgetary impact is the estimated change in budgetary savings accounted for by all the measures implemented in a given year. The sources include Stability and Convergence Programs submitted by the governments to the European Commission, OECD Economic Surveys, IMF Staff Reports, IMF Recent Economic Development reports, official budget documents, etcetera.

3.2. A simple accounting framework

We employ a simple accounting framework for the comparison between *ex-post* and planned fiscal changes. The starting point is the following expression:

$$\left(\frac{X_t^f}{Y_t^f}-\frac{X_{t-1}^f}{Y_{t-1}^f}\right)-\left(\frac{X_t^h}{Y_t^h}-\frac{X_{t-1}^h}{Y_{t-1}^h}\right), \text{for } X=T,G \tag{1}$$

where T is nominal government revenues and G is nominal government spending. Here, $\left(\frac{X_t^f}{Y_t^f}-\frac{X_{t-1}^f}{Y_{t-1}^f}\right)$ is the change in component X as a share of nominal GDP calculated *ex-post* using the *final* data vintage of the OECD Economic Outlook, while $\left(\frac{X_t^h}{Y_t^h}-\frac{X_{t-1}^h}{Y_{t-1}^h}\right)$ is the amount of consolidation in component X as a share of nominal GDP announced in year $h \le t-1$, which is obtained from the narrative consolidation dataset. Because consolidations concern discretionary measures to revenues and spending, we also calculate the *ex-post* deviations of the cyclically-adjusted part of component X:

$$\left(\left(\frac{X_t^f}{Y_t^f}\right)^{CA}-\left(\frac{X_{t-1}^f}{Y_{t-1}^f}\right)^{CA}\right)-\left(\frac{X_t^h}{Y_t^h}-\frac{X_{t-1}^h}{Y_{t-1}^h}\right), \text{for } X=T,G \tag{2}$$

where superscript "*CA*" indicates the cyclically-adjusted component, which we obtain directly from the OECD Economic Outlook. The problems with cyclically-adjusting fiscal variables are well-known. However, these provide the conceptually more appropriate variants to evaluate in terms of follow-up. Moreover, the results will be very similar to those for the non-adjusted variants.

3.3. Results of the comparison

Table 1 reports the *ex-post* deviations of actual revenues from planned increases averaged per country over the consolidation years identified by Devries et al. (2011) and Alesina et al. (2015a, 2015b) and averaged over all consolidation episodes in our EU dataset. Similarly, Table 2 reports the *ex-post* deviations of actual expenditures from planned reductions. As pointed out above, there is no unique one-to-one correspondence between the actual revenue and spending measures constructed from the OECD dataset and the composition of the consolidation plans identified by Devries et al. (2011) and Alesina et al. (2015a, 2015b). However, the conclusions of the comparison of the shortfalls for revenues and spending are the same regardless of the alternative budgetary aggregates we use. For the most comprehensive measure of revenues, "Total receipts, excluding gross interest receipts" (which should cover all the items contained in the consolidation plans), we observe that the average shortfall over all consolidations is 0.15% of GDP. For the other revenues measures, i.e. "Current receipts, excluding gross interest receipts", its cyclically-adjusted version, and "Total revenues, narrow definition", the average shortfalls are slightly larger (up to a maximum of roughly 0.18% of GDP).

The finding that the average shortfall is similar in all variants may be remarkable at first sight, as revenue bases are highly procyclical. However, two factors reduce the role of this effect in calculating the average shortfall. First, the two terms in brackets in (1) are based on *changes*. Because of the persistence in the business cycle, the cyclical part in the two components of the first term in brackets in (1) is persistent. Hence, taking the difference between these components brings this first term close to the first term in brackets in (2). Second, we compute the average shortfall over all business cycle situations, which reduces the impact of cyclical fluctuations further. Recall that Devries et al. (2011) and Alesina et al. (2015a, 2015b) identify consolidation measures *not* motivated by the business cycle situation.

The average shortfalls of spending are substantially larger than those of revenues. For the most comprehensive measure, "Total disbursements, excluding gross interest payments", the average figure is 0.50% of GDP. For the other measures, i.e. "Current disbursements, excluding gross interest payments", its cyclically-adjusted version,[9] and "Total expenditure, narrow definition", the average deviations are even larger. While the average size of planned spending measures in a consolidation (0.85% of GDP) exceeds the average size of planned revenues measures in a consolidation (0.51% of GDP), we find that the average shortfalls from planned spending reductions are proportionally larger than the average shortfalls from planned revenues measures. Based on the average shortfall of revenue measures, we would have expected an average shortfall of spending measures of (0.15/0.51)*0.85 = 0.25% of GDP, half of the actual figure of 0.50% of GDP.[10]

Looking at the individual countries, where we average over the consolidation years, we observe that for the most comprehensive revenues measure, only 5 out of 13 countries exhibit a shortfall. This contrasts with the most comprehensive spending measure, for which we find that 10 out of 13 countries exhibit a shortfall. For the other revenue and spending measures we register higher fractions of shortfalls, but the spending measure is always characterized by weaker follow-up than the corresponding revenue measure.

[9] The cyclical component of spending is limited compared to that of revenues. However, there is still some cyclicality, mostly linked to unemployment benefit payments.

[10] Appendix C discusses two potentially complementary ways in which systematic lack of follow-up from announced consolidation plans may arise. One arises from overoptimistic growth projections. This is what we refer to as "passive non-follow-up". For a given degree of over optimism about growth, passive non-follow-up is larger for spending- than for revenue-based announcements. The other is what we refer to as "active non-follow-up", which arises from governments simply not implementing announced measures.

Table 1
Average of *ex-post* deviations for revenues in percent of GDP.

	D_TREV	D_CREV	D_CACREV	D_NREV
Austria	0.251 (9)	0.045 (6)	−0.001 (6)	0.293 (9)
Belgium	0.007 (13)	−0.044 (13)	0.025 (10)	−0.027 (13)
Denmark	0.456 (8)	0.492 (8)	−0.105 (4)	0.575 (8)
Finland	0.126 (3)	0.133 (3)	−0.331 (3)	0.180 (3)
France	0.123 (11)	0.089 (11)	−0.022 (10)	0.090 (11)
Germany	0.058 (13)	0.042 (13)	−0.000 (13)	0.046 (13)
Ireland	−1.818 (5)	−1.648 (5)	−1.552 (5)	−1.786 (5)
Italy	−0.446 (16)	−0.365 (16)	−0.372 (16)	−0.435 (16)
Netherlands	0.207 (9)	0.204 (9)	0.214 (7)	0.211 (9)
Portugal	−0.069 (10)	−0.103 (10)	−0.113 (9)	−0.280 (10)
Spain	−0.253 (12)	−0.251 (12)	−0.174 (10)	−0.366 (12)
Sweden	−0.381 (7)	−0.385 (7)	−0.686 (6)	−0.340 (7)
UK	0.369 (13)	0.370 (13)	0.072 (9)	0.304 (13)
Average	−0.154 (108)	−0.146 (108)	−0.184 (108)	−0.173 (108)

Notes: (i) A *negative* number means a shortfall of actual implementation from the plan. (ii) Averages are calculated over all consolidation years per country or over all (country, consolidation year) combinations. (iii) D_TREV = deviations based on "Total receipts, excluding gross interest receipts", D_CREV = deviations based on "Current receipts, excluding gross interest receipts", D_CACREV = deviations based on cyclically-adjusted "Current receipts, excluding gross interest receipts", and D_NREV = deviations based on "Total revenues, narrow definition". (iv) The number in brackets is the number of consolidation observations per country. (v) For definitions and construction of variables, see Appendix A.

Table 2
Average *ex-post* deviations for expenditures in percent of GDP.

	D_TEXP	D_CEXP	D_CACEXP	D_NEXP
Austria	0.348 (10)	0.495 (10)	0.086 (7)	0.426 (10)
Belgium	0.438 (15)	0.683 (15)	0.763 (11)	0.588 (15)
Denmark	−0.048 (6)	0.228 (6)	0.307 (3)	0.202 (6)
Finland	1.549 (6)	1.684(6)	1.621 (6)	1.715 (6)
France	0.756 (9)	0.879 (9)	0.792 (9)	0.768 (9)
Germany	0.204 (13)	0.138 (13)	0.277 (13)	0.147 (13)
Ireland	0.686 (5)	1.713 (5)	0.894 (5)	1.034 (5)
Italy	1.062 (15)	1.211 (15)	1.130 (15)	1.064 (15)
Netherlands	0.957 (11)	1.247(11)	0.663 (6)	0.982 (11)
Portugal	0.532 (10)	1.195 (10)	0.984 (9)	0.762 (10)
Spain	0.889 (13)	1.390 (13)	1.034 (12)	1.118 (13)
Sweden	−0.709 (7)	−0.472 (5)	0.368 (6)	0.204 (7)
UK	−0.302 (14)	0.022 (14)	−0.207 (10)	−0.087 (14)
Average	0.501 (111)	0.768 (111)	0.684 (111)	0.645 (111)

Notes: (i) A *positive* number means a shortfall of actual implementation from the plan. (ii) D_TEXP = deviations based on "Total disbursements, excluding gross interest payments", D_CEXP = deviations based on "Current disbursements, excluding gross interest payments", D_CACEXP = deviations based on cyclically-adjusted "Current disbursements, excluding gross interest payments", and D_NEXP = deviations based on "Total expenditure, narrow definition". (iii) For definitions and construction of variables, see Appendix A. (iv) Further, see the *Notes* to Table 1.

4. A new dataset of fiscal consolidation announcements

Announcements of fiscal consolidations may affect the private sector and the financial markets before the actual consolidation measures are executed, whether in full or only partially. For example, confidence indicators may respond as soon as an announcement becomes public and they may internalize the actual follow-up of the fiscal authorities and the responses of the macro-economy to an announcement. The response of confidence could potentially also act as a separate channel mediating the reaction of the macro-economy to an announcement. Accounting for anticipatory behavior requires us to identify in the best possible way the precise moment of an announcement. In this section we discuss how we construct our novel dataset on *announcements* of fiscal austerity measures.

Our dataset covers the thirteen EU countries mentioned earlier over the period 1978–2013. The announcements for the subsample period 1978–2008 are based on the narratively-identified consolidation measures documented at the annual frequency in Devries et al. (2011), while the announcements for the subsample period 2009–2013 are based on the consolidation measures narratively identified by Alesina et al. (2015a, 2015b) for ten out of the aforementioned thirteen EU countries over this period. Using narrative identification from official contemporaneous government documents we expand their sample with Finland, the Netherlands and Sweden over the period 2009–2013.

We map the narratively-identified annual consolidation measures into moments of announcements. In some instances, Devries et al. (2011) already provide the announcement dates, and in those cases we use these. In the other cases we work as follows. We start from the total implementation in a given year and identify all the announcements behind this total – it may be the result of a number of measures announced at different points in time. For each measure, using official documents, we identify the *month*

when it is first officially mentioned or proposed by the government. Appendix B provides further details and contains some examples. The online Data Construction Appendix contains the detailed mapping from each consolidation measure to its announcement.

We also quantify the magnitude of the measures. We do this by extracting, cross-checking and combining information from a variety of official documents, such as the OECD Economic Surveys, the OECD (2011, 2012) reports on restoring the public finances, national budgets, EU Stability and Convergence Plans, as well as from newspaper articles. The documents contain information on the projected effects of the various measures. By grouping the measures according to the date of their first official mention, we record the size of the announcement on that date as the sum of the budgetary effects of the various individual measures announced on that date. Concretely, the magnitude of the announcement on a given date is the sum of the marginal impacts on the primary balance in percent of GDP between now and up to six years ahead of all new measures announced on that date. To give an example purely for the purpose of illustration, suppose two new measures are announced in September of year *t-1*. Measure 1 is expected to have a positive marginal effect of 0.5% of GDP on the primary balance from year t onwards, while Measure 2 is expected to have a negative marginal effect on the primary balance of 0.2% of GDP from year $t + 1$ onwards. Then, the value of the announcement that we record for September of year *t-1* is 0.5–0.2 = 0.3% of GDP.[11]

The resulting set of announcements constructed at the *monthly* frequency is aggregated to the *quarterly* frequency. The main reasons for this conversion are twofold. Firstly, macroeconomic and fiscal variables are (at best) only available at quarterly frequency. Secondly, we aim at mitigating potential anticipation effects associated with information becoming available before the official consolidation announcement. It may be the case that a measure receives media attention before the first official announcement, for example, because information from discussions at the government level or in ministries is leaked to the press. However, pinpointing the first moments of media attention to such measures is virtually unfeasible given the coverage of the data in terms of countries and sample period. Moreover, initial discussions in the media generally provide only little information about the size and the composition of the measures. By aggregating the monthly announcements to the quarterly frequency, we reduce the problem of potential anticipation effects associated with fiscal news, because fiscal news that is leaked to the media and the official release of fiscal news are more likely to occur in the same period. To further address the potential anticipation effects associated with premature media leakages, we assign any announcement made in the first month of a quarter to the preceding quarter.[12]

It is worth mentioning that, owing to inaccuracies in the narrative data sources, the actual value assigned to an announcement can be a mix of *ex-ante* forecasts and real-time estimates of the impact of the measures on the primary balance.[13] Hence, the assigned value to the announcement potentially measures the pure shock value of the consolidation plan with some error. Nevertheless, reporting a value has a substantial advantage over merely reporting a simple dummy for a fiscal announcement. Despite potential concerns about measurement errors, using values implies that less information is thrown away, and it allows us to exploit the possibility that announcements of larger consolidations elicit stronger responses than announcements of smaller consolidations. Moreover, it helps in more accurately classifying plans into whether they are revenue- or expenditure-based, namely not on the basis of the narrative description, but based on the relative estimated impact of the revenue versus the expenditure measures. Finally, of particular importance for this paper, it allows us to assess the degree of ensuing follow-up in actual measures. Summarizing, effectively our dataset extends the set of announcements used in Beetsma et al. (2015) with Finland, the Netherlands and Sweden for the additional years 2009–2013 and it assigns in most instances a value for the size of the announcement, instead of a simple dummy for the occurrence of the announcement as in Beetsma et al. (2015).

Table 3 reports the magnitudes of the announced consolidation plans. Note that the figures refer to the average annual size of the plans, while the plans themselves are dated to the quarter in which their announcement takes place, as described above. In total we have 211 fiscal consolidation announcements. For 180 of them we are also able to establish the magnitude of their impact on the primary balance. The cumulative annual impact of the measures on the primary balance ranges between 0% and 9.3% of GDP over a maximum period of 6 years, with an average value of 1.37% of GDP in our country sample.[14] The average spending-based content is 0.85% of GDP and the average revenue-based content is 0.51% of GDP. The cross-country average horizon of the consolidation plans ranges between 1.3 and 2.3 years.

Most consolidation plans combine measures on both the revenue and the expenditure side of the budget, which is why in Table 4, following the existing literature, we classify announcements as "revenue-based" if more than 50% of the total announced budgetary impact comes from the revenue side, while, if more than 50% comes from the expenditure side, the plan is classified as

[11] Since the different components of the announcement would materialize in different years, one might legitimately ask whether they should not be discounted. However, given that the time space between these components is at a maximum a few years and in most cases less, the effect of discounting would be very small and, hence, we abstain from discounting.

[12] We find that our results are robust to assigning the announcement to the quarter in which it officially takes place. Incidentally, Ramey (2011) also carries out an adjustment in the quarterly timing of the weekly defense shock. If the news occurs in the final two weeks of a quarter, it is assigned to the following quarter based on the assumption that it occurs too late to have a material effect on macroeconomic aggregates in the quarter in which it originates.

[13] Most of the time, our sources (mainly the OECD Economic Surveys) provide an estimated impact of a plan at the moment of its announcement. However, there are instances when we do not have information about the estimated impact of an announced plan. In those cases, we use the impact as recorded by the EU's Stability and Convergence programs or IMF or OECD documents, some of which may have been issued after the consolidation started, thereby potentially providing a real-time assessment of the impact of a plan.

[14] The largest consolidations were announced for Ireland 2010:Q4 (9.3% of GDP), Sweden 1994:Q3 (8.4% of GDP) and Portugal 2011:Q3 (6.1% of GDP). Excluding these three consolidations, the average announcement has a value of 1.26% of GDP. For the average announcement, the cumulative impact of the revenue measures is 0.47% of GDP and that of the expenditure measures is 0.78% of GDP.

Table 3
Summary statistics of fiscal announcement data.

	Number of consolidation plans	Average annual size - all measures	Average annual size – spending measures	Average annual size – revenue measures	Average horizon (years) of consolidation plans
Austria	7	1.98	1.21	0.77	2.3
Belgium	18	1.14	0.68	0.46	1.5
Denmark	6	1.35	0.85	0.50	1.5
Finland	10	1.47	1.37	0.10	1.6
France	15	0.87	0.44	0.43	1.8
Germany	16	0.92	0.56	0.36	1.7
Ireland	15	2.05	1.10	0.95	1.3
Italy	25	1.31	0.74	0.57	2.0
Netherlands	22	1.17	0.99	0.18	1.3
Portugal	10	2.09	1.19	0.90	1.8
Spain	19	1.57	0.91	0.66	1.7
Sweden	5	2.38	1.57	0.80	2.0
UK	12	0.79	0.41	0.39	2.3
Total	180	1.37	0.85	0.51	1.7

Table 4
Announcements according to the predominance of their instruments.

	Spending-based	Revenue-based	Equal	Total
Austria	5	2	0	7
Belgium	8	8	2	18
Denmark	2	3	1	6
Finland	8	2	0	10
France	10	5	0	15
Germany	10	6	0	16
Ireland	8	6	1	15
Italy	15	9	1	25
Netherlands	19	3	0	22
Portugal	5	5	0	10
Spain	11	8	0	19
Sweden	5	0	0	5
UK	8	4	0	12
Total	114	61	5	180

"spending-based". The five cases in which the division between spending and revenue measures is equal will be dropped from the sample, whenever we study the two subsamples of spending- and revenue-based announcements separately.

As Table 4 shows, the majority of the announcements in our sample are spending-based. Based on our data, though not reported in the tables, we find that the average spending-based plan announcement has a size of 1.42% of GDP, with an impact of 1.14% of GDP on the spending side and 0.28% on the revenue side. The average revenue-based plan announcement has a value of 1.26% of GDP, with an impact of 0.31% of GDP on the spending side and 0.95% of GDP on the revenue side.

5. Panel VAR analysis of role of follow-up and multipliers

In Section 3 we have documented that follow-up is weaker for spending-based than for revenue-based consolidation plans. That analysis provides a stepping stone to this section, in which we, using the new dataset constructed in the previous section, investigate the economy's responses to announcements of consolidation plans in a panel VAR, while accounting for anticipation effects. We first show that revenue-based consolidation announcements have more adverse consequences for the economy than spending-based consolidation announcements. We then disentangle the roles of differences in multipliers and in follow-up for this finding.

5.1. The empirical specification

We estimate a quarterly Bayesian panel VAR model of the format:

$$Z_{i,t} = \alpha_i + \beta_i t + \gamma d_t + \sum_{l=1}^{L} A_l Z_{i,t-l} + u_{i,t}, \tag{3}$$

where i indicates the country and t the quarter, $Z_{i,t}$ is a vector of endogenous variables, α_i is a country-fixed effect, β_i is the coefficient of a country-specific linear time trend, d_t a vector of seasonal dummies with coefficient vector γ and $u_{i,t} \sim N(0,\Omega)$ a vector of zero-mean, stationary reduced-form disturbances. L represents the number of lags included in the panel VAR and A_l is the matrix of coefficients

associated with the l^{th} lag of the endogenous variables. The baseline specification focuses on a closed economy and features the following vector of endogenous variables:

$$Z_{i,t} = \left[F_{i,t}, \tau_{i,t}, g_{i,t}, y_{i,t}, c_{i,t}, LTI_{i,t}, CCONF_{i,t}\right]'.$$

Here, $F_{i,t}$ is the fiscal consolidation announcement in percent of GDP, $\tau_{i,t}$ and $g_{i,t}$ are nominal government revenues, respectively nominal government expenditures, in percent of nominal GDP, $y_{i,t}$ is the logarithm of real GDP (henceforth, "GDP"), $c_{i,t}$ is the logarithm of real private consumption (henceforth, "consumption" or "private consumption"), $LTI_{i,t}$ is the long-term interest rate in basis points and $CCONF_{i,t}$ is consumer confidence in percent deviation from its average.[15] The impulse responses should be interpreted as percent deviations from the original values, except in the case of government revenues and expenditures, where they are in terms of percentage point of GDP deviations from their original values, and in the case of interest rates, where they are in terms of basis point deviations from their original values. Importantly, because we are assessing the follow-up of consolidation announcements in terms of actual measures, the definitions of revenues and expenditures should correspond as closely as possible to the potential sets of measures included in the revenues respectively expenditure components of the fiscal consolidation. This implies in particular that $g_{i,t}$ will include transfers and is, hence, more broadly defined than merely government purchases.

Empirical identification of fiscal policy shocks may be hampered by anticipation effects: the private sector learns about a policy change and responds to it before it is actually implemented. The legislative lag is the period between the official announcement of the policy measure and its legal implementation. Because the official announcement often coincides with the presentation of the new budget, we expect the legislative lag to be short on average. The implementation lag concerns the time between signing the relevant legislation and the moment when the new legislation comes into force. The sum of the two lags together can range from a couple of months to some years from the official announcement of a policy measure (Leeper et al., 2013).[16] In addition, media coverage of a new policy measure sometimes predates its official announcement.[17] If anticipated changes in revenues and public spending prompt economic agents to respond before the fiscal measures are actually implemented, the innovations identified in a structural VAR do not correspond to the true timing of the shocks. Formally, the moving-average representation of the VAR system is not invertible (Leeper et al., 2013), leading to biased estimates.

Existing datasets based on the narrative identification of consolidation plans do not fully account for the combined effect of legislative and implementation lags in fiscal policy. For example, the annual dataset of Devries et al. (2011) assigns consolidation measures to the year when they are supposed to be implemented, regardless of the year when they are announced. Alesina et al. (2015a, 2015b) distinguish between unanticipated and anticipated measures to improve inference. For instance, the measures implemented in a given year are classified as unanticipated, if they had been announced in the preceding fall as part of a multiannual consolidation plan. However, the authors do not identify the exact moment of the consolidation announcement, which is critical to account for potential anticipation effects. Unlike these contributions, by timing austerity plans to the moment of their announcement in our data set, we can take explicit account of the anticipation effects during the plan's legislation and implementation phases. Hence, in contrast to Guajardo et al. (2014), for example, we allow macroeconomic variables to already respond to consolidation news before measures are actually implemented.

De Castro et al. (2013) and Jordà and Taylor (2016) find that the narrative shocks of Devries et al. (2011) can be predicted using a range of economic variables. Hence, it is conceivable that our fiscal consolidation announcements represent responses to past economic and financial conditions. We therefore identify the structural shocks by using a Cholesky decomposition of the residual covariance matrix:

$$\Omega = A_0 A_0'$$

where the contemporaneous impact matrix A_0 is lower triangular. Fiscal consolidation announcements are ordered first, allowing the austerity news to be predicted only by lags (of at least one quarter) of the economic and financial variables in the VAR. In doing so, the VAR equation corresponding to the fiscal consolidation announcements could be interpreted as a "policy announcement reaction function", with its residuals representing the discretionary fiscal consolidation news.[18] As demonstrated in Christiano et al. (1999), under a recursive identification the impulse responses of the endogenous variables in the block following the announcement shock are invariant to the ordering of these variables *vis-à-vis* each other.

We expect anticipation effects to work not only through real variables like output and consumption, but also through variables that may react immediately to announcements. These include asset prices, like the long-term interest rate, and variables capturing private sector confidence about the future course of the economy. Our dataset is uniquely placed to account for the potential role of such variables in the transmission of consolidation announcements towards the real economy. We do not take a position on whether there exists a true "confidence channel" through which private sector confidence affects the real economy or whether variables capturing confidence merely contain news about the future course of the economy. Both possibilities motivate us to

[15] Appendix A describes the quarterly budgetary and macroeconomic variables we use in this section.

[16] However, in our dataset in many instances announcements coincide with the new budget for the next year, in which the implementation of the announced package starts.

[17] By looking at military spending, Ramey (2011) finds that news reports about wars Granger-cause increases in defense spending, thus providing evidence of the anticipation of government spending shocks.

[18] In Section 5.3 we show that the results are robust when the consolidation announcement shock is included as an exogenous variable.

include the consumer confidence index in our set of baseline variables. It is based on whether or not surveyed individuals expect their personal and the general economic situation to improve or not.[19]

We opt for a baseline specification containing four lags of the endogenous variables, hence amounting to a maximum lag length of one year. As we show below, our main results are robust to different choices of the lag structure and other configurations of the deterministic components.

5.2. Baseline estimates

Following Bańbura et al. (2010), a Normal-Inverse Wishart prior distribution is used for the VAR parameters with the prior hyper-parameters set to reflect a loose prior belief. The posterior distribution is approximated using a Gibbs sampling algorithm described in Appendix D. We conduct 25,000 replications with the last 10,000 draws used for inference. The inefficiency factors reported in Appendix D provide evidence in favour of convergence. As is standard in Bayesian VAR papers, the figures report 68% error bands, which are approximately one standard-deviation intervals for a normal distribution. We estimate the panel VAR model on our sample of 13 European Union countries over the period 1978:Q1–2013:Q4.

Fig. 1 reports the baseline responses when all consolidation announcements are included. Here, and in the sequel, the shock, which takes place at time 0, is a consolidation announcement normalized to 1% of GDP. To save space and because they exhibit no persistence, we do not depict the impulse responses of the announcements themselves. We observe a highly-significant rise in public revenues of more than 0.15% of GDP after a year and a peak fall in public expenditures of roughly the same magnitude after three quarters. GDP responds with a fall that reaches a maximum of around 0.2% after about two-and-a-half years. Consumption exhibits a maximum deterioration of slightly less than 0.4% after about two years, while the long-term interest rate shows a positive jump on impact and peaks at 15 basis points after two quarters, after which it converges back to its steady state within about 4 years. Finally, consumer confidence jumps down on impact and declines by around 1.3% after half a year. Not surprisingly, because they are forward looking, the long-term interest rate and consumer confidence respond instantaneously to consolidation news and peak much earlier than the other variables.

Next, we split the news into announcements of revenue-based and spending-based plans (Fig. 2). These are included simultaneously in the VAR model with the revenue announcements ordered first. As the two announcement series are virtually uncorrelated, this ordering is innocuous (as we will show in our robustness analysis below). For both types of consolidation plan announcements, the shock is normalized to 1% of GDP. Clear differences show up. The announcement of a revenue-based plan produces a systematic increase in revenues reaching a maximum of about 0.6% of GDP after three quarters, while GDP and consumption exhibit reductions that reach maxima of around 1 and 1.5%, respectively, after about two years. The combination of GDP and consumption both falling is consistent with a New-Keynesian setting as in Galí et al. (2007) with a sufficiently-large fraction of rule-of-thumb consumers consuming disposable income. Public spending stays put, while the long-term interest rate peaks at a maximum of about 40 basis points after half a year. Consumer confidence falls by a maximum of almost 6% after half a year. Both may contribute to the fall in consumption.

Apart from public spending itself, which declines by a maximum of 0.20–0.25 percentage points of GDP, all the other responses following a spending-based announcement remain close to zero. In particular, GDP and consumption remain almost perfectly flat. The long-term interest rate reaches a peak of slightly more than 10 basis points. The final column of Fig. 2 shows that the confidence bands on the differences in the responses to the revenue- and spending-based plan announcements all deviate from zero. The difference in revenues between the plan types peaks at about 0.6% of GDP and that in expenditures at roughly 0.3% of GDP.[20] The difference between the GDP responses reaches a maximum of about 1% and that between the consumption responses of almost 1.5%. Hence, consistent with, among others, Alesina et al. (2017, 2019b), economic activity contracts more following a revenue-based than a spending-based consolidation. However, subsequent follow-up in terms of actual measures also differs between the announcement types. Finally, the maximum difference in the responses of the long-term interest rate is almost 30 basis points and that of consumer confidence is around 5%. In the case of spending-based announcements consumer confidence appears to behave consistently with the subsequent trajectory of the economy: the lack of movement in consumer confidence is consistent with the fact that economic activity hardly changes in the ensuing periods. In the case of revenue-based announcements, the deterioration of consumer confidence is in line with the ensuing deterioration of economic activity. Below we will see that the increase in the long-run interest rate is most likely attributable to an increase in the public debt (rather than a decrease).

5.3. Robustness of the baseline

We investigate the robustness of our baseline estimates in various ways. For each robustness variant, Fig. 3 depicts the differences in revenue, expenditure and GDP responses between a revenue- and expenditure-based consolidation announcement (i.e., each row in Fig. 3 is the "transposed" analogue of the first three panels in the third column of Fig. 2). First, it could be argued that by including the period since the start of the global financial crisis we capture an atypical period, during which the responses

[19] This suggests that the consumer confidence indicator captures the role of news about the economy, rather than some non-fundamental driving force of the economy.

[20] Notice that the higher degree of follow-up to revenue-based announcements may be partially explained by the slowdown of activity. This is the difference in "passive follow-up" explained in Footnote 13 and Appendix C.

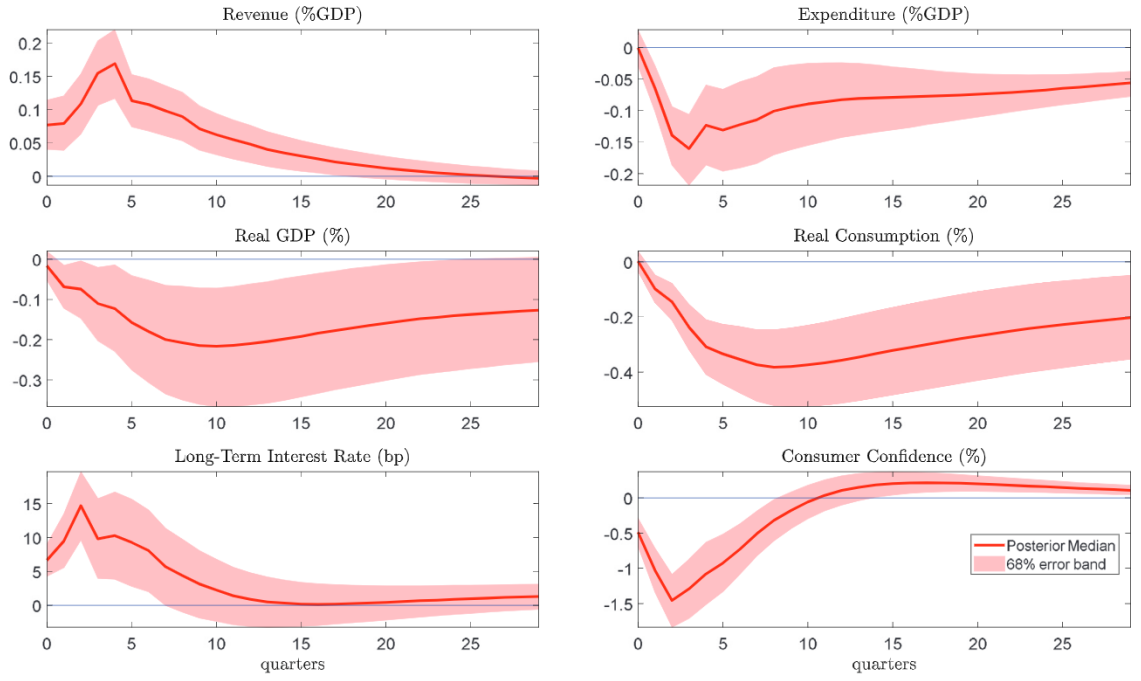

Fig. 1. Impulse responses baseline model – all consolidation plan announcements. Notes: (i) The consolidation announcement shock (not portrayed) always has a magnitude of 1% of GDP. (ii) The figure depicts median impulse responses and their 68% error band. (iii) The impulse responses for revenues and spending are deviations in percentage points of GDP from their original values; GDP, consumption and consumer confidence are in percent deviations from their original values; and the long-term interest rate is the deviation in basis points from its original value.

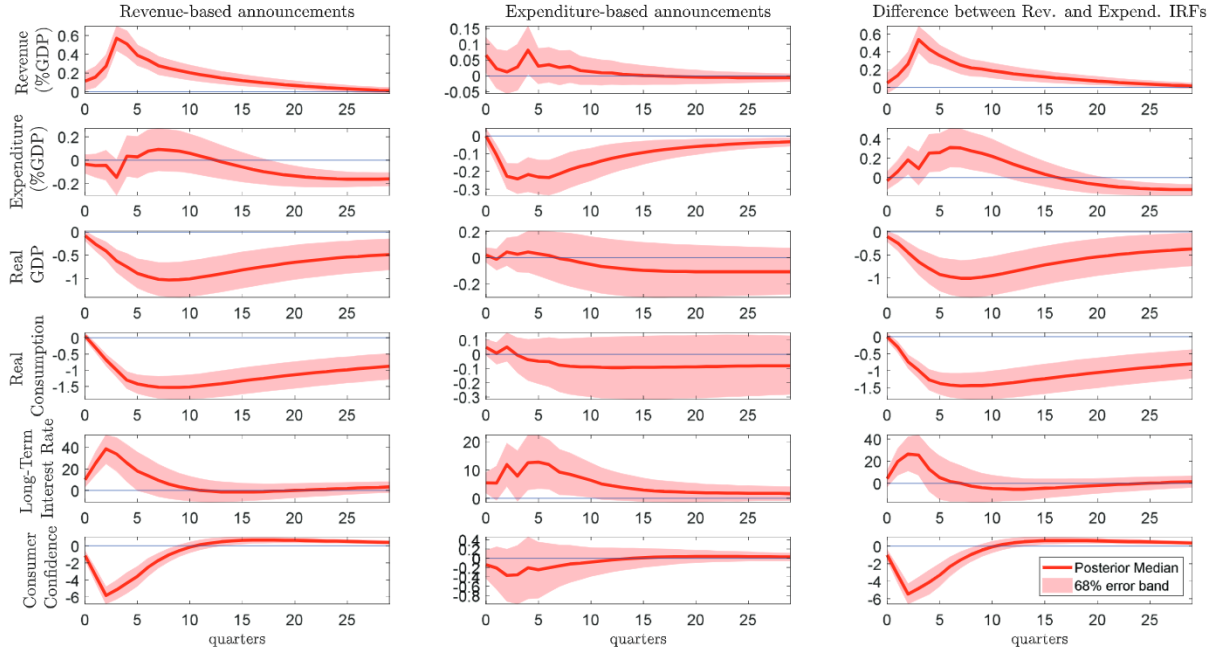

Fig. 2. Impulse responses baseline model – revenue- and spending-based plan announcements. Notes: See *Notes* to Fig. 1. Further, the first column depicts the impulse responses to revenue-based plan announcements, while the second column exhibits the impulse responses to spending-based plan announcements. The third column shows the differences in the impulse responses subtracting the second from the first column.

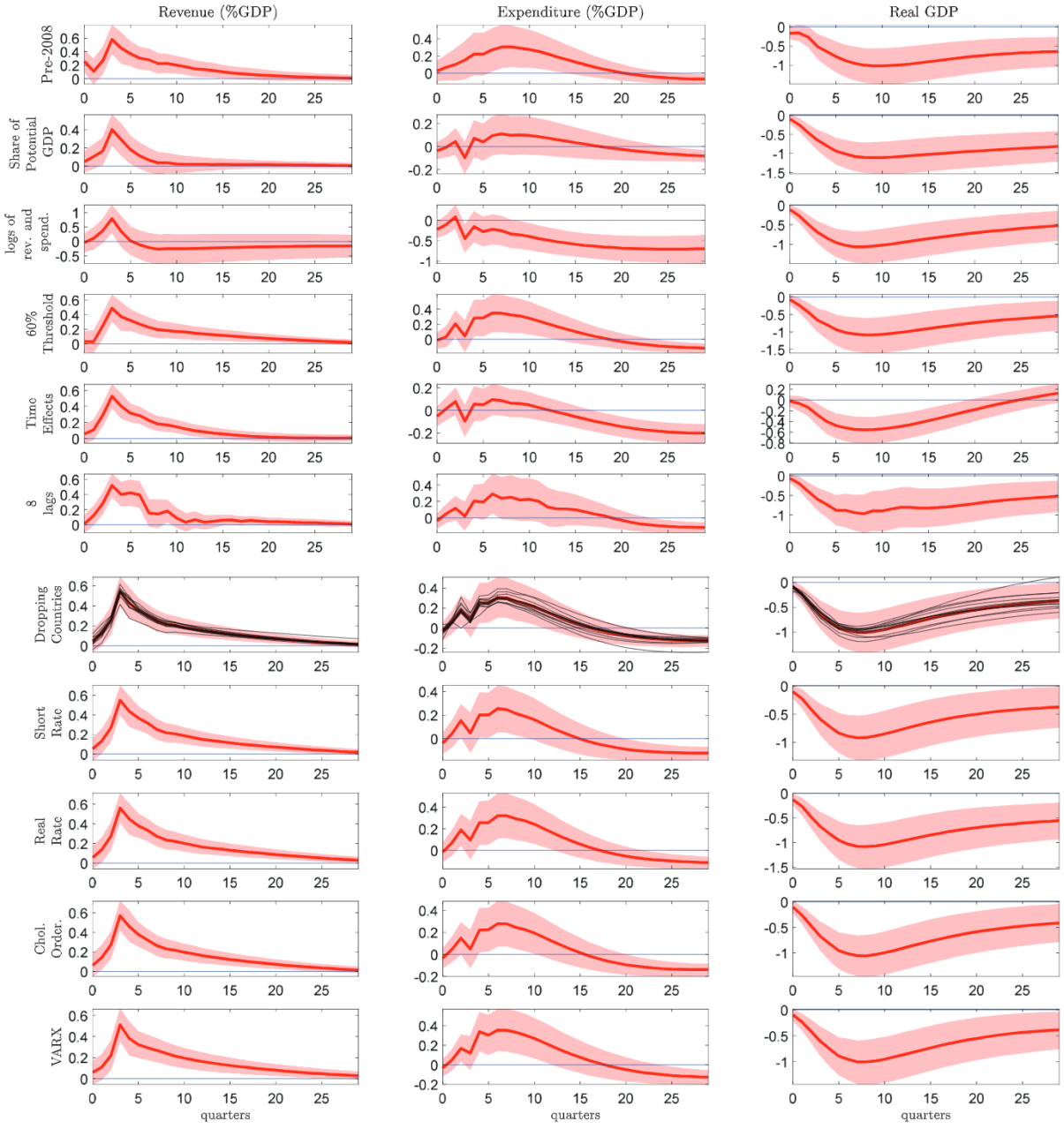

Fig. 3. (Akerlof and Shiller, 2009; Alesina et al., 2015a,b; Alesina and Ardagna, 2010) Robustness analysis: differences revenue- and spending-based announcements. Notes: See *Notes* to Fig. 1 and description in the main text. The figure shows differences between revenue- and spending-based announcements for actual revenue, actual spending and GDP.

of economies to announcement shocks could differ from those in other periods. However, the differences in impulse responses when we drop the period 2008–2013 confirm the differences in the baseline responses for the two types of consolidation. This is also the case when the (relevant) nominal variables are expressed as shares of potential nominal GDP,[21] and when we replace the revenue and spending ratios of GDP by the logarithms of real revenues and real spending, although here the difference in revenue responses between the two plan types is a bit larger. Restricting ourselves to revenue plans that contain at least 60% revenues measures and spending plans that contain at least 60% spending measures yields again responses that are qualitatively and quantitatively very similar to those under the baseline. The same is the case if we include a time dummy for each quarter in the sample or allow for eight instead of four lags in the panel VAR. To check whether the baseline results are not driven by a specific

[21] Potential nominal GDP is constructed by applying to the logarithm of nominal GDP a Hodrick-Prescott filter and taking the exponential of the resulting trend estimate.

country in our sample, our next robustness check drops one country at a time. The impulse responses are in all instances rather compactly clustered around the original responses, and in any case contained within the baseline confidence intervals, thus suggesting that no individual country drives our baseline estimates.

Guajardo et al. (2014) suggest that the differences in impulse responses between revenue- and spending-based consolidations can be explained by monetary policy being more accommodative in the case of spending-based consolidations. However, over a substantial part of the estimation period a majority of the countries in our sample had either a common currency or a stable exchange rate against the German mark. It is unlikely that the observed differences in the responses to revenue- and spending-based consolidation announcements can be explained by differences in the monetary responses alone, because the ECB only responds to euro-area wide macroeconomic developments and not to those in individual countries. Likewise, in the period before EMU, the Bundesbank only responded to German developments and not to those in other countries pegging their exchange rate to the German mark.[22] Nevertheless, to control for monetary policy, we replace the long-term interest rate with the short-term interest rate, which is closer to the central bank's policy instrument. However, again the impulse response differences are qualitatively and quantitatively essentially unaffected.[23]

An alternative channel to that via the public debt investigated below, is that the long-term interest rate rises because of an increase in inflation expectations following a consolidation announcement. The fact that GDP falls following an announcement, especially a revenue-based announcement, suggests that this is not plausible. To confirm that the responses of the long-term interest rate are not driven by movements in inflation expectations, we redo the baseline regressions by replacing the long-run interest rate with its difference with respect to realized CPI inflation, i.e. the *ex-post* long-run real interest rate. Fig. 3 shows that our baseline results are unaffected.

Finally, in the penultimate robustness check we order spending announcements before revenue announcement shocks, and in the final robustness check we include the announcement shocks as exogenous variables in the panel VAR. The results are very similar to those under the baseline.

5.4. Extensions of and variations on the baseline

In this subsection we consider extensions of the baseline. In particular, we expand the latter with the stock price index, the house price index and the public debt. We also explore the role of adding real private investment without or with replacing consumer confidence by business confidence.

5.4.1. Adding the stock price and the house price index

Our first extension adds the stock price index as an additional variable to capture the confidence effects of a consolidation announcement. As a leading indicator, the stock price index would typically be a pre-cursor to changes in economic activity. Fig. F.1 in Appendix F shows the responses for the baseline expanded with the stock price indicator. The responses of the baseline variables are unaffected, while the stock price indicator drops significantly upon impact in the case of a revenue-based announcement, but it does not move after a spending-based announcement. The confidence band on the difference in the responses also lies below zero. In fact, the response pattern of the stock price is very similar to that of the consumer confidence indicator. We also estimate a variant in which, instead of the stock price index, we add the house price index. The responses are shown in Fig. F.2 in Appendix F. Again, the baseline responses are unaffected, while the house price index exhibits a pattern very similar to that of GDP: virtually no movement upon impact and a smooth fall until about three years after the announcement, after which the index starts a smooth ascend. The smoothness of the pattern may not be surprising, as house sellers are typically known to be reluctant to lower prices when demand falls.

5.4.2. Adding the public debt

This subsection adds the public debt ratio of GDP as an endogenous variable to the baseline, in order to shed light on the effectiveness of fiscal consolidation in terms of improving the health of the public finances. In this respect we build upon Favero and Giavazzi (2012) and Alesina et al. (2019b). Fig. 4 shows the impulse responses under the expanded model. Moreover, by including the public debt ratio as an endogenous variable, we also allow for a feedback of the ratio onto GDP. The potential relevance of such a feedback for high-debt countries was pointed out by Reinhart and Rogoff (2010). We observe that the responses of the baseline variables are unaffected. Remarkably, contrary to what we might a priori expect, for both types of consolidation announcements we observe that the debt ratio increases following the announcement, presumably, because GDP falls (a "denominator effect"). The rise in the debt ratio is larger for a revenue-based than for a spending-based announcement. Alesina et al. (2019b) estimate an increase in the debt ratio following a revenue-based contraction and a fall after a spending-based contraction. Thus, we confirm the "relative ordering", but our announcements are on average followed by more adverse debt ratio dynamics. The increase in the debt ratio we find likely explains the rise in the long-term interest rate following a consolidation

[22] The open-economy specification considered in Section 6 will explicitly show the results of a split of the sample in fixed and floating exchange rate regimes.

[23] It seems implausible that the rise in the short-term interest rate is driven by a monetary tightening, because, if anything, we would expect monetary policy to become looser to avert a slowdown of the economy induced by a revenue-based consolidation announcement. In any case, a counterfactual in which we force the short-term interest rate to stay constant does not affect the impulse responses (see Figure F.8 in Appendix F).

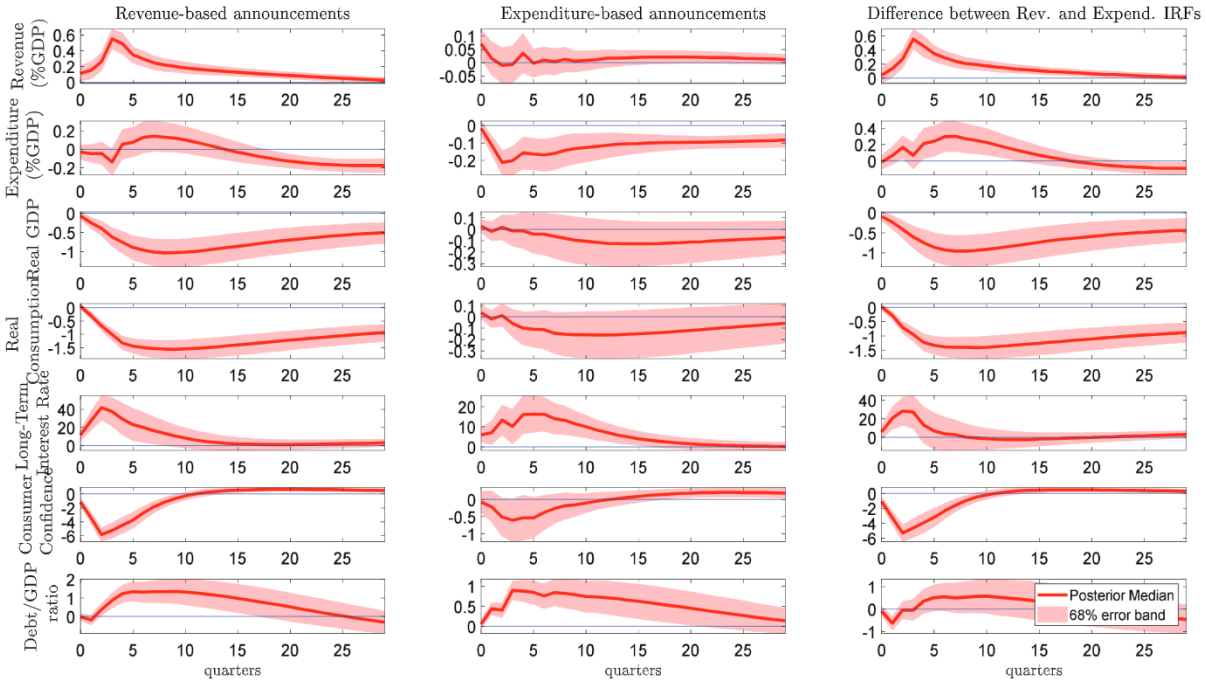

Fig. 4. Impulse responses baseline model extended with the debt-to-GDP ratio *Notes*: see Notes to Fig. 2.

announcement. This rise is likely the consequence of the pricing of the risks associated with a higher public debt ratio of GDP.[24] Moreover, the larger increase in the long-term interest rate under a revenue-based consolidation announcement is consistent with the ensuing larger debt-servicing costs and the larger increase in the debt ratio after this type of announcement.

5.4.3. Including real private investment

We now add real private investment to the baseline. Fig. F.3 in Appendix F depicts the impulse responses. Again, the responses of the baseline variables are unchanged. The impulse response of private investment is very similar to that of private consumption.

An alternative to the current baseline would have been a specification with business confidence instead of consumer confidence. However, our sample period would become shorter for most countries in our sample and we would lose a number of consolidation periods. Moreover, the question arises which confidence indicator is more important. A priori, to the extent that confidence affects the real economy, we expect consumer confidence to primarily affect consumption and business confidence to primarily affect private investment. Because consumption is substantially larger as a share of GDP, consumer confidence seems to be the more relevant confidence indicator. Nevertheless, here we replace in the baseline the consumer confidence with the business confidence indicator and private consumption with private investment. Fig. F.4 in Appendix F depicts the responses. After a revenue-based consolidation announcement, GDP again exhibits a fall, though this fall is smaller than under the baseline and, hence, the difference in GDP responses between the two types of announcement types is also smaller. Private investment also exhibits a fall under a revenue-based consolidation announcement (consistent with Alesina et al., 2019b). Overall, the above baseline specification seems to be more appropriate than the alternative with private investment and business confidence.

5.5. Disentangling the sources of the differences in GDP responses

Exploiting our data on the announcements of consolidation plans, this subsection aims at disentangling the sources of the differences in the GDP responses to the two types of announcements, focusing in particular on differences in multipliers and differences in follow-up.

The roles of differences in multipliers and differences in follow-up.

Define the cumulative multiplier of revenues and spending associated with a one-percent of GDP revenue-based, respectively spending-based consolidation announcement by:

[24] Another complementary explanation is that an additional demand for funding by the government at given available supply of savings drives up the interest rate. This effect seems less relevant in view of the large international capital market in which governments sell their debt. Since it is not the focus of this paper, we will not investigate further the relative importance of the sources of the rise in the long-term interest rate.

$$m_{r,h} \equiv \sum_{j=1}^{h} \hat{y}_{r,j} / \sum_{j=1}^{h} \tau_{r,j} \quad m_{g,h} \equiv \sum_{j=1}^{h} \hat{y}_{s,j} / (-\sum_{j=1}^{h} g_{s,j}),$$

where h is the horizon (in quarters), $\hat{y}_{r,j}$ is the percent deviation of real output from its original value in the case of a revenue-based announcement and $\hat{y}_{s,j}$ similarly in the case of a spending-based announcement, $\sum_{j=1}^{h} \tau_{r,j}$ is the cumulative change in revenues over GDP for a revenues-based announcement, and $-\sum_{j=1}^{h} g_{s,j}$ is the negative of the cumulative change in spending over GDP for a spending-based announcement. In the case of the latter we take the negative in order to facilitate a direct comparison between the two cumulative multipliers. The cumulative revenues multiplier $m_{r,h}$ is the cumulative percent change of output, divided by the cumulative increase in revenues in percent of GDP over a horizon of h periods. The interpretation of $m_{g,h}$ is analogous.

To explore the relative roles of differences in multipliers and differences in follow-up for the output dynamics, we can rewrite the above expressions as:

$$\sum_{j=1}^{h} \hat{y}_{r,j} = m_{r,h} (\sum_{j=1}^{h} \tau_{r,j}) \sum_{j=1}^{h} \hat{y}_{s,j} = m_{g,h} (-\sum_{j=1}^{h} g_{s,j}).$$

Hence, the cumulative change in output following an announcement shock, i.e. the left-hand side of each expression, is the product of the cumulative multiplier, given by the first factor on the right-hand side, and degree of follow-up to the announcement, i.e. the second factor on the right-hand side. Throughout we will assume that the multiplier per unit of change of the policy instrument is independent of the size of the change. Moreover, our model is estimated using non-cyclically adjusted values for our budgetary variables. Because our sample covers all business cycle situations, we effectively calculate the average cumulative multipliers over the business cycle.

Rows 1 and 2 of Table 5 report the figures for the cumulative multipliers $m_{r,h}$ and $m_{s,h}$. As variables are forced to return to their baseline, we limit ourselves to a maximum horizon of 20 quarters. The cumulative revenue multiplier under revenue-based announcements is negative at all horizons and becoming more negative with the horizon. The effect on output per percentage-point of GDP increase in revenues is substantial and reaches minus 3.5% after 5 years. The cumulative spending multiplier under spending-based announcements is always close to zero. Row 3 of Table 5 reports the difference in the two cumulative multipliers, calculated as $\sum_{j=1}^{h} \hat{y}_{r,j} / \sum_{j=1}^{h} \tau_{r,j} - \sum_{j=1}^{h} \hat{y}_{s,j} / (-\sum_{j=1}^{h} g_{s,j})$. Note that, because they normalize the cumulative output change in the instruments' use, the multipliers can be directly compared. We observe that the confidence interval on the difference lies below zero at any horizon.

Rows 1 and 2 of Table 5 also report the follow-up in terms of the "own" instrument, i.e. $\sum_{j=1}^{h} \tau_{r,j}$ for revenue-based and $-\sum_{j=1}^{h} g_{s,j}$ for spending-based announcements, while row 3 reports the difference in follow-up. We observe that, in addition to the cumulative multiplier being larger for revenue-based than for spending-based announcements, also the degree of follow-up in the respective instruments is larger under the former. Over the first two years the confidence band is entirely above zero, suggesting that the differences in the responses of output following the two types of consolidation announcements are driven by both differences in multipliers and differences in follow-up working into the same direction.

While the literature has mostly looked at the output multipliers in response to either revenues or spending, consolidation packages generally deploy increases in both revenues and spending.[25] Hence, to further improve the comparison of the multipliers, we define the cumulative primary-balance multiplier of output following a one-percent of GDP announcement shock F as:

$$m_{pb,F,h} \equiv \sum_{j=1}^{h} \hat{y}_{F,j} / \sum_{j=1}^{h} pb_{F,j},$$

where, for announcement type F, $\hat{y}_{F,j}$ is the percent deviation of real output from its original value and $pb_{F,j}$ the impulse response of the primary balance in percentage points of GDP. Here, $F = r$ in the case of a revenue-based announcement and $F = s$ in the case of a spending-based announcement. The cumulative primary-balance multiplier $m_{pb,Fh}$ of output for announcement type F is the cumulative percent change of output, divided by the cumulative improvement in the primary balance in percent of GDP over a horizon of h periods.

Rows 4 and 5 of Table 5 show that the cumulative multipliers $m_{pb,r,h}$ and $m_{pb,g,h}$ are similar to $m_{r,h}$ and $m_{g,h}$, respectively, which reflects the dominance of revenue measures in revenue-based plans and spending measures in spending-based plans. This is also the case for the difference $m_{pb,r,h} - m_{pb,s,h}$, reported in row 6, of which the confidence band uniformly lies below zero at any reported horizon. Rows 4–6 report the degree of follow-up of the primary balance to the announcement types, as well as the difference in follow-up. Again, follow-up is larger for revenue-based announcements. However, the confidence band is only fully above zero after one year.

Overall, the results reported in Table 5 suggest that the differences in the responses of output following the two types of consolidation announcements are driven by both differences in multipliers and differences in follow-up working into the same direction.

[25] Figure F.9 in Appendix F reports the results of an experiment in which we calculate cumulative primary-balance multipliers of output for revenue-based (spending-based) announcements, while holding the actual spending (revenues) response fixed at zero for the first K = 8 quarters. This is achieved, as in Mountford and Uhlig (2009), by feeding the system with additional shocks, calculated via a non-linear equation solver, to ensure that the response of the relevant variable, actual spending in the case of a revenue-based announcement, to the consolidation announcement is zero. This experiment should not be subject to the "Lucas critique", because the VAR parameters are not modified. The idea of the experiment is to show the "pure" cumulative multipliers by purging the response of spending (revenues) under the revenue-based (spending-based) plan announcements. The resulting multipliers are very similar to those reported in Table 5.

Table 5
Cumulative fiscal consolidation multipliers at various horizons.

Row	Plan type	Description	Expression	$h = 4$	$h = 8$	$h = 12$	$h = 20$
1	Revenue-based	Cumulative multiplier revenues	$m_{r,h}$	−1.24 (−2.06,−0.65)	−1.90 (−2.94,−1.13)	−2.58 (−4.11,−1.54)	−3.49 (−5.88,−1.93)
		Cumulative response revenues	$\sum_{j=1}^{h}\tau_{r,j}$	1.11 (0.75,1.48)	2.63 (1.91,3.37)	3.50 (2.48,4.53)	4.42 (3.02,5.89)
2	Spending-based	Cumulative multiplier spending	$m_{s,h}$	0.14 (−0.63,0.63)	0.11 (−0.80,0.66)	0.02 (−1.22,0.68)	−0.22 (−2.16,0.75)
		Cumulative response spending	$-\sum_{j=1}^{h}g_{s,j}$	0.57 (0.35,0.80)	1.48 (0.89,2.06)	2.14 (1.21,3.07)	2.87 (1.52,4.25)
3		Difference cumulative multipliers	$m_{r,h} - m_{s,h}$	−1.35 (−2.34,−0.39)	−1.96 (−3.15,−0.76)	−2.49 (−4.19,−0.91)	−3.09 (−5.75,−0.70)
		Difference cum. Responses revenues minus spending	$\sum_{j=1}^{h}\tau_{r,j} - (-\sum_{j=1}^{h}g_{s,j})$	0.54 (0.12,0.97)	1.16 (0.23,2.10)	1.35 (−0.03,2.76)	1.58 (−0.44,3.57)
4	Revenue-based	Cumulative multiplier primary budget balance	$m_{pb,r,h}$	−0.98 (−1.97,−0.45)	−1.83 (−4.01,−0.85)	−2.54 (−6.49,−1.05)	−2.98 (−7.92,−1.11)
		Cumulative response primary budget balance	$\sum_{j=1}^{h}pb_{r,j}$	1.38 (0.91,1.87)	2.67 (1.49,3.87)	3.27 (1.45,5.12)	4.71 (2.02,7.49)
5	Spending-based	Cumulative multiplier primary budget balance	$m_{pb,s,h}$	0.12 (−0.48,0.56)	0.09 (−0.63,0.57)	0.01 (−0.99,0.60)	−0.20 (−1.86,0.67)
		Cumulative response primary budget balance	$\sum_{j=1}^{h}pb_{s,j}$	0.70 (0.43,0.98)	1.78 (1.11,2.44)	2.51 (1.47,3.55)	3.28 (1.76,4.79)
6		Difference cumulative multipliers	$m_{pb,r,h} - m_{pb,s,h}$	−1.11 (−2.18,−0.29)	−1.91 (−4.10,−0.67)	−2.49 (−6.42,−0.61)	−2.67 (−7.69,−0.12)
		Difference cum. Primary balance responses	$\sum_{j=1}^{h}pb_{r,j} - \sum_{j=1}^{h}pb_{s,j}$	0.68 (0.13,1.23)	0.88 (−0.43,2.22)	0.75 (−1.25,2.81)	1.46 (−1.49,4.45)

Notes: (i) The announcement shock always has a magnitude of 1% of GDP. (ii) Horizon h is expressed in quarters. (iii) The figure reported in the first line of the cell is the median of the draws from the posterior distribution, while the interval in parentheses in the second line is the 68% error band around the median. (iv) Note that the median of the difference in cumulative multipliers is generally not equal to the difference in the medians of the multipliers; similarly for the other quantities. (v) The multipliers are defined as $m_{r,h} = \sum_{j=1}^{h}\hat{y}_{r,j}/\sum_{j=1}^{h}\tau_{r,j}$, $m_{s,h} = \sum_{j=1}^{h}\hat{y}_{s,j}/(-\sum_{j=1}^{h}g_{s,j})$, $m_{pb,r,h} = \sum_{j=1}^{h}\hat{y}_{r,j}/\sum_{j=1}^{h}pb_{r,j}$ and $m_{pb,s,h} = \sum_{j=1}^{h}\hat{y}_{s,j}/\sum_{j=1}^{h}pb_{s,j}$.

5.5.1. Further exploration of multipliers and follow-up: counterfactual

To further explore the roles of differences in multipliers and differences in follow-up for the GDP responses under the two type of announcements, we turn to a counterfactual experiment. The idea behind the counterfactual is that we impose the same follow-up under the two types of announcements, so that the difference in output effects can be attributed to differences in fiscal multipliers only. Specifically, in the experiment we lift the degree of follow-up under a spending-based announcement to the actual follow-up under a revenues-based announcement, and vice versa.

We proceed as follows. We can calculate the cumulative output effect in percent (indicated by a tilde) under announcement $F(=r,s)$ for some common counterfactual primary-balance path (indicated by subscript c) as:

$$\sum_{j=1}^{h}\widetilde{y_{F,j}} = m_{pb,F,h}\sum_{j=1}^{h}pb_{c,j}$$

where $m_{pb,F,h}$ is the multiplier calculated above. Lagging this expression by one period, subtracting it from the original one, and rewriting, yields the counterfactual value of output growth after h quarters:

$$\widetilde{y_{F,h}} = m_{pb,F,h}\sum_{j=1}^{h}pb_{c,j} - m_{pb,F,h-1}\sum_{j=1}^{h-1}pb_{c,j}$$

Hence, $\widetilde{y_{r,h}}$ and $\widetilde{y_{s,h}}$ represent the responses of output to revenue- and spending-based consolidation announcements imposing a *common* counterfactual follow-up trajectory for the primary balance.

We can now construct $(\hat{y}_{r,h} - \hat{y}_{s,h}) - (\widetilde{y_{r,h}} - \widetilde{y_{s,h}})$, i.e. the difference in GDP responses under revenue- and spending-based announcements based on the *estimated actual* follow-up in both cases, *minus* the difference in GDP responses under some *common counterfactual* follow-up scenario.

We consider two specific common counterfactual scenarios: in the first, we impose that the counterfactual primary balance follow-up is identical to the actual follow-up under the revenue-based announcement. Hence, $\widetilde{y_{r,h}} = \hat{y}_{r,h}$, so $(\hat{y}_{r,h} - \hat{y}_{s,h}) - (\widetilde{y_{r,h}} - \widetilde{y_{s,h}})$ reduces to $-(\hat{y}_{s,h} - \widetilde{y_{s,h}})$. This quantity captures for spending-based announcements the difference in output responses resulting from different follow-ups. As shown in the top panel of Fig. 5, the confidence band around this difference always contains zero except in the first quarter after the announcement. The size of the difference is always less than 0.1% of original GDP. By contrast, if we impose that the counterfactual primary balance follow-up is identical to the actual follow-up after the spending-based announcement, the aforementioned difference reduces to $\hat{y}_{r,h} - \widetilde{y_{r,h}}$, which is the difference in output responses from different follow-up under revenue-based announcements. This difference is negative, as expected, because the counterfactual follow-up is smaller than the actual follow-up. As of almost four years after the announcement the confidence band falls entirely below zero (see bottom panel in Fig. 5) and, in terms of magnitude, the difference is larger than that depicted in the top panel, reaching a maximum of approximately 0.5% of original GDP. Hence, if the follow-up under revenue-based announcements were to drop to

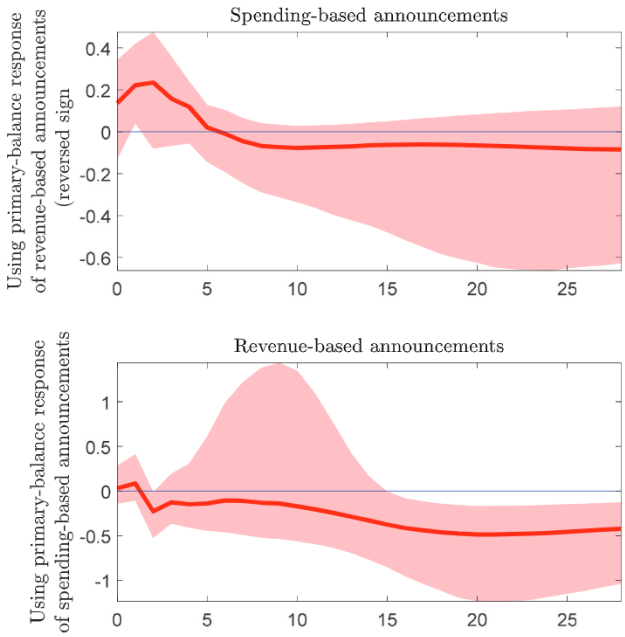

Fig. 5. Differences in responses between actual and counterfactual. Notes: See Notes to Fig. 1 and description in the main text. The vertical axis refers to percent deviations from original GDP. The top panel depicts the GDP response to a *spending-based announcement* based on the *actual* primary-balance response minus the GDP response based on a *counterfactual* primary-balance response equal to the actual primary-balance response for a revenue-based announcement. The bottom panel depicts the GDP response to a *revenue-based announcement* based the *actual* primary balance response minus the GDP response to a *counterfactual* primary-balance response equal to the actual primary balance response for a spending-based announcement.

the actual level under spending-based announcements, then the drop in GDP would be substantially smaller than that under the actual follow-up under revenue-based announcements.

Fig. 5 provides further support for the hypothesis that the differences in the GDP responses following the two announcement types are the result of a combination of a larger multiplier following a revenue-based announcement and larger follow-up after such a type of announcement: an increase in the latter from the actual level after a spending-based announcement to that after a revenue-based announcement produces an additional contraction in output that becomes significantly different from zero after some time. The cumulative multiplier of the revenue-based consolidation is increasing with the horizon (in absolute size). This explains why the drop below zero of the confidence band in the second panel of Fig. 5 lags the negative peak in the GDP difference in Fig. 2, which is the result of both a difference in cumulative multipliers and an earlier peaking difference in follow-up.

6. Extension to the open economy

Because the EU economies in our sample are open, an important question is whether this openness matters for the (different) effects of (different) consolidation announcements. To investigate this, we expand the baseline model with both quantity and price variables relating to the open economy. In particular, we add to the baseline exports, imports and the real effective exchange rate. The response of the latter to fiscal shocks has puzzled the literature, with different contributions finding different responses following a fiscal expansion. Given the nature of our dataset, our analysis is particularly well-suited to account for the role of the real effective exchange rate following fiscal consolidation news, on which there exists little empirical evidence in the literature. The reason is that our model allows the nominal effective exchange rate, the main driver of the real effective exchange rate in the presence of price stickiness, to jump upon fiscal consolidation news. Our Bayesian estimation approach is, moreover, well-suited to handle the resulting, larger panel VAR.

The extended model features the following vector of endogenous variables:

$$Z_{i,t} = \left[F_{i,t}, \tau_{i,t}, g_{i,t}, y_{i,t}, c_{i,t}, LTI_{i,t}, CCONF_{i,t},\ exp_{i,t}, imp_{i,t}, reer_{i,t}\right]', \tag{5}$$

where $exp_{i,t}$ and $imp_{i,t}$ are nominal exports and imports, respectively, in percent of nominal GDP and $reer_{i,t}$ is the logarithm (times 100) of the real effective exchange rate. An increase (decrease) in the latter means an appreciation (depreciation).

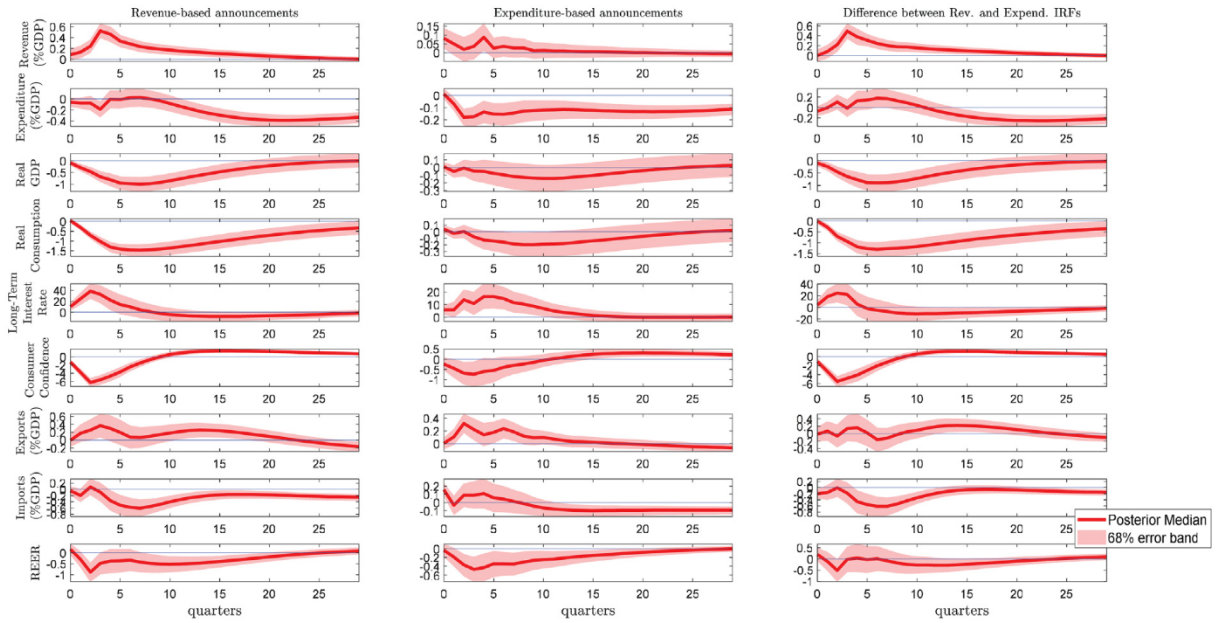

Fig. 6. Impulse responses open-economy specification. Notes: see Notes to Fig. 2.

6.1. Results for the baseline extended to the open economy

Fig. 6 depicts the impulse responses for the above baseline model extended with open-economy variables. The responses of the baseline variables are very similar to those depicted in Fig. 2. For both types of announcement exports rise (by roughly the same amount). Imports exhibit a substantial fall under a revenue-based announcement, while they are essentially unchanged following a spending-based announcement, a combination of patterns consistent (in a basic textbook setting) with the finding that a revenue-based announcement leads to a stronger negative GDP effect. In both cases, the real effective exchange rate depreciates. The peak depreciation is roughly twice as large for the spending-based announcement.

The response patterns of the open-economy variables are consistent with standard mechanisms. A reduction in government spending, typically concentrated on domestic products, reduces the demand for domestic non-tradables and tradables. Relative to (imperfectly substitutable) competing products, we expect the price of tradables to fall, both because of a direct reduction in the demand from the government and because the reduced demand for non-tradables, typically services with substantial labor input, will contain economy-wide labor costs. Since prices are sticky, short-run adjustment takes place through a depreciation of the real effective exchange rate, as predicted, for example, by the New-Keynesian open-economy model of Corsetti et al. (2011) and in line with Bénétrix and Lane's (2013) estimates for eurozone countries. The fall in the real effective exchange rate is driven by a fall in the nominal effective exchange rate, as shown by Figs. F.5 and F.6 in Appendix F, which replace the real effective exchange rate with the nominal effective exchange rate, respectively the nominal exchange rate of the local currency against the U.S. dollar (and which exhibit responses for the other variables very similar to those in Fig. 6). The response patterns in Fig. 6 are also consistent with standard settings in which the fall in (disposable) income caused by higher taxes lowers the demand for imports. Short-run adjustment is again achieved by a depreciation of the real effective exchange rate driven by a fall in nominal exchange rates.

6.2. Fixed versus floating exchange rate regimes

As discussed in Section 2, part of the literature offers rather sharply differing predictions on the effects of fiscal expansions (or contractions) under floating versus fixed exchange rate regimes. None or virtually none of the regimes in our sample can be characterized as perfect floats or pegs. For example, since 1999 most of the countries in our sample are part of the eurozone, which implies a common currency among its members, while the exchange rate against most of the rest of the world remains flexible. The same applies to the countries that were member of the European Monetary System before 1999. They tried to peg against the German mark, although many of them had to occasionally devaluate their currency.

Nevertheless, in this subsection we try to separate observations based on the exchange rate regime. Using the classification in Reinhart and Rogoff (2002) as well as internet sources, we classify pegs, currency unions and exchange rate bands as "fixed" and the remaining regimes as "floats". Hence, floats also include crawling pegs, crawling bands, moving bands, etcetera. The division in fixed and floating regimes is reported in Appendix E. The fixed sample contains 985 observations, while the floating sample features 607 observations.

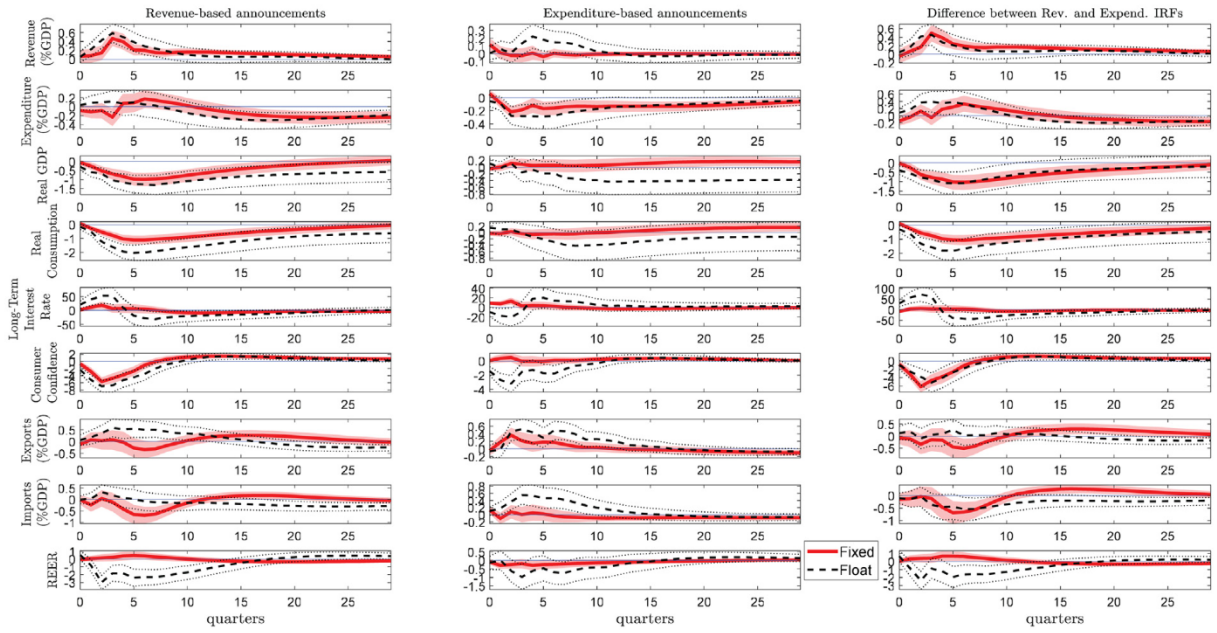

Fig. 7. Impulse responses open-economy specification: fixed versus floating. Notes: see Notes to Fig. 2.

Fig. 7 depicts the responses of the model based on (5). There are some differences for the two exchange rate regimes. First, consider revenue-based announcements. Follow-up in terms of revenues is quite similar for the two regimes. This is also the case for GDP. The fall in consumption is slightly larger under a float. However, the main differences are with respect to the long-term interest rate and the open-economy variables. The long-term interest rate only increases under a float. In line with the standard Mundell-Fleming model, this is also the case for exports, while imports fall under a fixed exchange rate. Contrary to this standard model, imports are unaffected under a float. The real effective exchange rate is unaffected under a fixed exchange rate, while it depreciates strongly under a float. Turning to expenditure-based announcements, the reduction in spending is overall slightly larger under a float than under a fixed exchange rate regime. Also, revenues increase under a float, but do not under a fixed regime. These differences may help to explain why we observe that GDP, consumption and consumer confidence are all flat under a fixed rate, but fall under a float. Somewhat surprisingly, and in contrast to the textbook prediction, imports rise under a float, even though GDP falls.

While the basic textbook and part of the more advanced literature predict that a fiscal contraction produces a drop in GDP under a fixed exchange rate and no GDP change under a float, the GDP responses in Fig. 7 deviate from this prediction. The most plausible explanation is that the textbook monetary accommodation under the fixed regime is essentially absent for our sample countries as they are part of a large fixed regime block, in which an individual country's fiscal actions elicit very little response by the central bank in control of monetary policy. An additional factor potentially contributing to the deviation from the textbook predictions is that the distinction between the exchange rate regimes is not as clear-cut in practice, because our sample countries also trade directly with countries outside the fixed regime block.

6.3. Multipliers and follow-up in the open economy

This subsection explores whether the extension of the baseline model with open-economy variables affects the multipliers we calculated earlier. For reasons of space and because the differences in GDP responses between revenue- and spending-based consolidation announcements for the two exchange rate regimes are rather similar (see Fig. 7), we do not consider these regimes separately. Table 6 is structured in a similar way as Table 5, and reports the cumulative multipliers following the announcements. The cumulative multipliers are close to those associated with the baseline specification. Only at long horizons, 5 years out, do cumulative multipliers start to diverge from their values for the closed-economy specification. However, confidence intervals so far out become so wide, that a comparison is no longer very meaningful. The confidence band on the difference between the cumulative multipliers for both announcement types remains firmly below zero at all horizons. The primary-balance multipliers are again larger in absolute value for revenue-based announcements and the confidence interval on the difference lies entirely below zero for a horizon up to three years. The cumulative primary balance following revenue-based announcements exceeds that after spending-based announcements, and the confidence band on the difference lies above zero over the first three years. Quantitatively, the responses are similar to those for the closed-economy specification; only at the 5-year horizon does the difference in primary-balance multiplier become quite a bit smaller than for the closed-economy specification.

Table 6
Cumulative fiscal consolidation and trade balance multipliers at various horizons.

Row	Plan type	Description	Expression	$h = 4$	$h = 8$	$h = 12$	$h = 20$
1	Revenue-based	Cumulative multiplier revenues	$m_{r,h}$	−1.54 (−2.61, −0.87)	−2.29 (−3.61, −1.45)	−2.93 (−4.75, −1.80)	−3.25 (−5.83, −1.75)
		Cumulative response revenues	$\sum_{j=1}^{h}\tau_{r,j}$	0.98 (0.63, 1.35)	2.30 (1.57, 3.03)	3.02 (1.99, 4.05)	3.81 (2.38, 5.26)
2	Spending-based	Cumulative multiplier spending	$m_{s,h}$	−0.17 (−1.50,0.51)	−0.35 (−2.02,0.45)	−0.55 (−2.59,0.39)	0.66 (−2.61,0.38)
		Cumulative response spending	$-\sum_{j=1}^{h}g_{s,j}$	0.41 (0.19, 0.62)	1.01 (0.47, 1.53)	1.50 (0.68, 2.32)	2.50 (1.30, 3.73)
3		Difference cumulative multipliers	$m_{r,h} - m_{s,h}$	−1.34 (−2.73, −0.16)	−1.90 (−3.58, −0.05)	−2.30 (−4.57, −0.05)	−2.49 (−5.41, −0.09)
		Difference cum. Responses revenues minus spending	$\sum_{j=1}^{h}\tau_{r,j} - (-\sum_{j=1}^{h}g_{s,j})$	0.57 (0.16, 0.99)	1.30 (0.38,2.21)	1.52 (0.18,2.86)	1.31 (−0.59,3.24)
4	Revenue-based	Cumulative multiplier primary budget balance	$m_{pb,r,h}$	−1.10 (−2.05, −0.55)	−1.94 (−3.92, −1.02)	−2.36 (−5.04, −1.19)	−1.82 (−3.62, −0.87)
		Cumulative response primary budget balance	$\sum_{j=1}^{h}pb_{r,j}$	1.39 (0.91, 1.87)	2.69 (1.58, 3.78)	3.65 (2.01, 5.31)	6.81 (4.42, 9.32)
5	Spending-based	Cumulative multiplier primary budget balance	$m_{pb,s,h}$	−0.14 (−0.93, 0.36)	−0.29 (−1.37, 0.33)	−0.48 (−1.93, 0.29)	−0.56 (−2.16,0.31)
		Cumulative response primary budget balance	$\sum_{j=1}^{h}pb_{s,j}$	0.60 (0.33,0.90)	1.37 (0.74,2.00)	1.92 (0.99,2.88)	2.97 (1.63, 4.34)
6		Difference cumulative multipliers	$m_{pb,r,h} - m_{pb,s,h}$	−0.95 (−2.10,0.01)	−1.62 (−3.74, −0.21)	−1.84 (−4.72, −0.00)	−1.24 (−3.20,0.52)
		Difference cum. Primary balance responses	$\sum_{j=1}^{h}pb_{r,j} - \sum_{j=1}^{h}pb_{s,j}$	0.79 (0.24,1.34)	1.32 (0.06,2.54)	1.73 (−0.11, 3.53)	3.85 (1.21,6.53)
7	Revenue-based	Cumulative TB multiplier revenues	$m_{TB,r,h}$	1.04 (0.52,1.93)	1.60 (1.05,2.54)	2.01 (1.34,3.23)	2.42 (1.59,4.03)
8	Spending-based	Cumulative TB multiplier spending	$m_{TB,s,h}$	0.81 (0.19,1.76)	0.82 (0.28,1.78)	0.91 (0.37,2.0)	0.92 (0.44,1.80)
9		Difference cumulative TB multipliers	$m_{TB,r,h} - m_{TB,s,h}$	0.24 (−0.89,1.46)	0.78 (−0.33,1.98)	1.08 (−0.14,2.56)	1.46 (0.26,3.26)

Notes: (i) The announcement shock always has a magnitude of 1% of GDP. (ii) Horizon h is expressed in quarters. (iii) The figure reported in the first line of the cell is the median of the draws from the posterior distribution, while the interval in parentheses in the second line is the 68% error band around the median. (iv) Note that the median of the difference in cumulative multipliers is generally not equal to the difference in the medians of the multipliers; similarly for the other quantities. (v) "TB" is "trade balance". (vi) The multipliers are defined as: $m_{r,h} = \sum_{j=1}^{h}\hat{y}_{r,j}/\sum_{j=1}^{h}\tau_{r,j}$, $m_{s,h} = \sum_{j=1}^{h}\hat{y}_{s,j}/(-\sum_{j=1}^{h}g_{s,j})$, $m_{pb,r,h} = \sum_{j=1}^{h}\hat{y}_{r,j}/\sum_{j=1}^{h}pb_{r,j}$, $m_{pb,s,h} = \sum_{j=1}^{h}\hat{y}_{s,j}/\sum_{j=1}^{h}pb_{s,j}$ and $m_{TB,F,h} \equiv \sum_{j=1}^{h}\widehat{TB}_{F,j}/\sum_{j=1}^{h}pb_{F,j}$ for $F = r, s$.

Table 6 also reports the cumulative fiscal multipliers for the trade balance, defined as $m_{TB,F,h} \equiv \sum_{j=1}^{h}\widehat{TB}_{F,j}/\sum_{j=1}^{h}pb_{F,j}$ for $F = r, s$, where the changes in the trade balance $\widehat{TB}_{F,j}$ are calculated as the difference between the impulse responses of exports and imports, all in percentage points of GDP. We report the cumulative multipliers of this specific component of GDP to explore whether the difference in economic performance following a revenue- versus a spending-based announcement can be attributed to the open-economy character of countries in our sample. A revenue-based announcement is followed by a substantial positive effect on the cumulative trade balance multiplier, especially via a reduction in imports. The cumulative trade-balance multiplier following a spending-based announcement is also positive, though this is primarily driven by an improvement of exports. The confidence band on the difference in the cumulative multipliers $m_{TB,r,h} - m_{TB,s,h}$ contains zero except at a horizon of 5 years, suggesting that differences in trade balance responses are not responsible for the difference in responses following the two types of announcements, all the more so since the trade balance improves more following a revenue-based announcement.

Fig. F.7 in Appendix F shows the results of a counterfactual experiment for the extended model computed in exactly the same way as in Fig. 5. Raising follow-up after a spending-based announcement does have a negative effect on output. However, the confidence band around the depicted difference includes zero. The output effect of the same change in follow-up after a revenue-based announcement is up to around three times larger and the confidence band lies fully below zero for much of the horizon.

The results in this subsection indicate again that the difference in the GDP responses following the two announcement types is the result of a combination of a larger multiplier following revenue-based announcements and larger follow-up following this type of announcement.

7. Conclusions

Existing literature shows that narratively-identified spending-based consolidations have milder effects on the economy than revenue-based consolidations. In line with this, and using a quarterly narrative dataset on fiscal consolidation *announcements*, this paper finds that announcements of revenue-based plans have more adverse effects on economic activity than announcements of spending-based plans. We use a panel VAR analysis to show that the combination of larger revenue multipliers and, to a lesser extent, larger actual follow-up after a revenue-based announcement helps to explain these differences. The main results are the same for our closed-economy and open-economy specifications. The responses for the specific open-economy variables are in line with standard mechanisms. The unique nature of the dataset allows us to take proper account of fiscal anticipation effects

and to control for relevant asset prices and other variables that respond quickly to news, such as the interest rate, confidence indicators, stock prices and the exchange rate. It is important to notice, though, that the stronger negative output effect for a given follow-up of a revenue-based consolidation does not automatically imply that a spending-based consolidation is preferable; if the public budget is on an unsustainable path, announcing a revenue-based consolidation with a higher expected degree of implementation may be preferable.

Our analysis suggests a number of avenues for further research. First, it would be interesting to explore the extent to which the shortfalls from announcements of revenue- or spending-based consolidations originate from a lack of full implementation or errors in the projected impact on GDP. Second, it may be possible that the effects of consolidation announcements depend on the state of the economy or the public finances and, hence, it would be worthwhile to investigate their role. Finally, the composition of spending and revenues packages may matter. For example, the resistance to rolling back certain transfers may be larger than to increasing VAT, making announcements of the latter more credible than of the former. However, the latter two avenues for further research would require an expansion of the current dataset in order to draw reliable conclusions.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jinteco.2021.103455.

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