

# IMF Working Paper

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## Expansionary Austerity: New International Evidence

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**IMF Working Paper**

Research Department

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**Abstract**

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This paper investigates the short-term effects of fiscal consolidation on economic activity in OECD economies. We examine the historical record, including Budget Speeches and IMF documents, to identify changes in fiscal policy motivated by a desire to reduce the budget deficit and not by responding to prospective economic conditions. Using this new dataset, our estimates suggest fiscal consolidation has contractionary effects on private domestic demand and GDP. By contrast, estimates based on conventional measures of the fiscal policy stance used in the literature support the expansionary fiscal contractions hypothesis but appear to be biased toward overstating expansionary effects.

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## I. INTRODUCTION<sup>1</sup>

The literature remains divided regarding the short-term effects of budget deficit reduction. A standard implication of Keynesian models is that cutting government spending or raising taxes has contractionary effects on aggregate demand in the short term. On the other hand, this standard implication can theoretically be overturned, as Blanchard (1990) explains. For example, a small increase in taxes today may reduce the need for a larger, more disruptive, fiscal adjustment later. It may also signal that there will be substantial tax cuts in the future. By raising households' expected future disposable income and by increasing the confidence of investors, fiscal consolidation can thus stimulate private consumption and investment even in the short term, a phenomenon known as "expansionary fiscal contraction" or "expansionary austerity."

A large empirical literature provides evidence in favor of the expansionary fiscal contractions hypothesis. In seminal contributions, Giavazzi and Pagano (1990, 1996) show that fiscal consolidations are sometimes correlated with expansions in private consumption within one year. They present evidence based on case studies and regressions of private consumption on cyclically-adjusted government revenue and spending for a panel of OECD economies. Similarly, using case studies, Alesina and Perotti (1997) find that fiscal consolidations are sometimes correlated with rapid output growth, particularly if implemented by cutting government spending rather than by increasing taxes. These findings have been confirmed by subsequent research based on larger samples of countries and years, including the recent paper of Alesina and Ardagna (2010).

This paper suggests that the standard method used to identify fiscal consolidation in the literature may bias the analysis toward finding support for the expansionary austerity hypothesis. The conventional approach is to identify discretionary changes in fiscal policy using a statistical concept such as the change in the cyclically-adjusted primary balance (CAPB). As this paper explains, changes in cyclically-adjusted fiscal variables often include non-policy changes correlated with other developments affecting economic activity. For example, a boom in the stock market improves the CAPB by increasing capital gains and cyclically-adjusted tax revenues. It is also likely to reflect developments that will raise private consumption and investment. Such measurement error is thus likely to bias the analysis towards downplaying contractionary effects of deliberate fiscal consolidation. Moreover, a rise in the CAPB may reflect a government's decision to raise taxes or cut

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spending to restrain domestic demand and reduce the risk of overheating. In this case, using the rise in the CAPB to measure the effect of fiscal consolidation on economic activity would suffer from reverse causality and bias the analysis towards supporting the expansionary fiscal contractions hypothesis.

A related literature identifies discretionary changes in fiscal policy using a structural VAR approach. For example, the seminal research of Blanchard and Perotti (2002) uses this approach to assess the impact of changes in government purchases and revenues on output using quarterly U.S. data. To identify fiscal policy shocks, they use institutional information to distinguish automatic changes in fiscal variables in response to output from discretionary fiscal policy changes. However, as Romer and Romer (2010) point out, even this more refined approach still assumes that, after controlling for lags of output growth, changes in government revenue and spending are uncorrelated with other short-term developments affecting economic activity. It therefore ignores the issue of nonpolicy changes in cyclically-adjusted fiscal data discussed above, and of forward-looking policy responses to prospective conditions. These matters are likely to be particularly relevant at the annual frequency often used in multi-country studies on the effects of fiscal consolidation.

To address these possible shortcomings, we examine the behavior of economic activity following discretionary changes in fiscal policy that historical sources suggest are not correlated with the short-term domestic economic outlook. In particular, we consult a wide range of contemporaneous policy documents to identify cases of fiscal consolidation motivated not by a desire to restrain domestic demand in an overheated economy, but instead by a desire to reduce the budget deficit. As Romer and Romer (2010) explain, such fiscal actions represent a response to *past* decisions and economic conditions rather than to *prospective* conditions. As a result, they are unlikely to be systematically correlated with other developments affecting output in the short term, and are thus valid for estimating the short-term effects of fiscal consolidation on economic activity.

Section II provides further details on how we identify discretionary adjustments in fiscal policy based on contemporaneous policy documents. The historical sources we examine to determine the motivation and budgetary impact of fiscal consolidation measures include *Budget Speeches*, *Budgets*, central bank reports, *IMF Staff Reports*, *IMF Recent Economic Developments* reports, and *OECD Economic Surveys*. Our basic strategy is similar to that of Romer and Romer (2010), who examine the effects on U.S. output of changes in U.S. tax rates identified from the historical record. To our knowledge, no other *multi-country* dataset of tax *and spending* changes based on the Romer and Romer (2010) historical approach has been compiled.<sup>2</sup> In addition, while Romer and Romer (2010) identify 23 tax changes motivated by the desire to reduce the budget deficit, we identify 173 fiscal policy

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<sup>2</sup> Cloyne (2011) applies the Romer and Romer (2010) approach to identifying *tax* policy changes in the United Kingdom. Our approach is related to the narrative approach of Ramey and Shapiro (1998) and Ramey (2011) who focus on U.S. military buildups and identify the timing of the associated government spending based on *Business Week* and other newspaper sources. Hall (2009), Barro and Redlick (2011), and others also focus on U.S. military buildups based on the plausible assumption that such changes in government spending are not a direct response to U.S. business cycle fluctuations.

adjustments in our sample of countries, potentially allowing us to obtain more precise estimates. A comparison of our measure of fiscal consolidation with the change in the CAPB reveals large differences between the two series, and suggests that, in these cases, the CAPB-based approach tends to misidentify deficit-driven fiscal consolidations.

Based on our new dataset, Section III estimates the short-term effect of fiscal consolidation on economic activity. Our estimates imply that a 1 percent of GDP fiscal consolidation reduces real private consumption over the next two years by 0.75 percent, while real GDP declines by 0.62 percent. In contrast, repeating the analysis using the change in the CAPB to measure discretionary policy changes provides evidence consistent with the expansionary austerity hypothesis. On average, a rise in the CAPB-to-GDP ratio is associated with a mild expansion in private consumption and GDP. The large difference in these estimates also arises for a subset of *large* fiscal adjustments—those greater or equal to 1.5 percent of GDP. These results suggest that the biases associated with using cyclically-adjusted data may be substantial.

We also test the robustness of our estimates along numerous dimensions. The finding of a negative effect of fiscal consolidation on private domestic demand and GDP is robust to excluding outliers; including additional control variables; and using alternative estimation techniques. Also, interestingly, using our series of deficit-driven fiscal adjustments as an instrumental variable for the change in the CAPB yields a significantly negative estimated effect of an increase in the CAPB on economic activity.

In Section IV, we extend our findings in a number of directions. In particular, we consider how international trade, the form of the consolidation, and perceived sovereign default risk influence the estimated effect of fiscal consolidation. We find that an increase in net exports associated with a fall in the value of the currency partly offsets the contractionary effect on private domestic demand. This mitigating channel is less potent in countries with pegged exchange rates. We also find that fiscal consolidation implemented mainly through an increase in taxation rather than by cutting government spending induces a sharper contraction in private demand. This difference seems to be due to the fact that central banks cut policy interest rates more aggressively following spending-based fiscal adjustments. Finally, there is evidence that fiscal consolidation is less contractionary when occurring in an economy with a high perceived sovereign default risk. However, even in the high sovereign default risk economies, fiscal consolidation typically has contractionary effects on private domestic demand and GDP. Section V concludes.

## II. IDENTIFYING FISCAL CONSOLIDATION

This section provides an overview of the analytical framework we use to estimate the effect of fiscal consolidation on economic activity, and explains how the methodology for identifying changes in fiscal policy differs from the conventional approach.

### A. The Conventional Approach

A minimalist specification for testing how changes in the fiscal balance affect output growth is the following:

$$(1) \quad \Delta Y_t = \alpha + \beta \Delta F_t + \varepsilon_t$$

where  $Y_t$  is the logarithm of real GDP,  $\Delta F_t$  is the change in the fiscal balance in percent of GDP, and  $\varepsilon_t$  is a vector of other developments that affect output. For the moment, we abstract from the fact that changes in the fiscal balance may have lagged effects on output and ignore country-specific effects. We return to these issues in the next section.

The first challenge that the analysis faces is to measure changes in the fiscal balance that reflect deliberate policy decisions taken by the government and not simply the automatic effect of business cycle fluctuations. Such fluctuations include, for example, upswings in economic activity which improve the budget balance automatically, without any change in policy. In Equation (1), such developments affect both the regressor,  $\Delta F_t$ , and the error term,  $\varepsilon_t$ , in the same direction. Therefore, using the change in the overall fiscal balance to measure changes in fiscal policy would bias estimates toward finding expansionary effects of fiscal consolidation on economic activity.

The conventional approach to addressing this issue is to identify discretionary changes in fiscal policy using cyclically-adjusted fiscal data. In particular, a standard approach is to use the change in the CAPB to measure discretionary changes in fiscal policy. The CAPB is calculated by taking the actual primary balance—non-interest revenue minus non-interest spending—and subtracting the estimated effect of business cycle fluctuations on the fiscal accounts.<sup>3</sup> Cyclical adjustment offers an intuitive way of dealing with the fact that tax revenue and government spending move automatically with the business cycle. The assumption is that, once they are cyclically adjusted, changes in fiscal variables reflect policymakers' decisions to adjust taxes and government spending. An increase in the CAPB would therefore provide evidence of deliberate fiscal policy tightening.

However, the conventional approach of using cyclically-adjusted fiscal data is far from perfect and is likely to bias the analysis toward finding evidence in favor of the expansionary austerity hypothesis. Two main issues arise that complicate inference regarding the effect of fiscal policy on economic activity based on cyclically-adjusted data.

First, the change in the CAPB typically includes nonpolicy factors that may be correlated with other developments affecting economic activity. For example, a boom in the stock market improves the CAPB by increasing capital gains and cyclically-adjusted tax revenues. It is also likely to reflect developments that will raise private consumption and investment. As a result, the correlation between the change in the CAPB and the error term in the

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<sup>3</sup> For example, Alesina and Perotti (1995) and Alesina and Ardagna (2010) correct the primary balance for year-to-year changes in the unemployment rate based on a method proposed by Blanchard (1990).

regression is likely to be positive, leading to an upward-biased estimate of the effect of fiscal consolidation on economic activity.<sup>4</sup> The case of Ireland in 2009 illustrates the issue of nonpolicy factors influencing the cyclically-adjusted fiscal accounts. A collapse in stock and housing prices in the context of a deep recession induced a fall in the CAPB in 2009 despite the implementation, as reported in contemporary policy documents, of fiscal consolidation measures exceeding 4.7 percent of GDP.<sup>5</sup> The fall in the CAPB here obscured the budgetary impact of spending cuts and tax hikes introduced to reduce the budget deficit. The standard approach would thus not recognize this unfavorable episode as a case of fiscal consolidation.

Second, the change in the CAPB may reflect deliberate policy responses to other developments affecting the economic outlook. For example, governments may cut spending and raise tax rates when domestic demand is expected to grow rapidly and raise inflation. Such developments are included in the error term in the regression,  $\varepsilon_t$ . Also, discretionary policy responses to such developments would be reflected in the change in the CAPB, implying a positive correlation between the regressor,  $\Delta F_t$ , and the error term. The analysis would then be biased toward overstating the expansionary effect of fiscal consolidation on economic activity. In a companion paper (Devries et al., 2011), we provide a number of real-world counterparts to this hypothetical example. For example, in Finland in 2000, there was an asset price boom and rapid domestic demand growth, and the government decided to cut spending to reduce the risk of economic overheating (2001 *IMF Staff Report*, p. 8). In a March 2000 Press Release, the Finland Ministry of Finance cited the lack of an independent monetary policy (Finland adopted the euro in 1999) in explaining why fiscal policy needed to tighten to stabilize economic activity: “Signs of overheating are becoming alarmingly widespread in the Finnish economy... In these conditions, it has become justifiable to adopt a tough stance in fiscal policy to ensure that economic developments remain on a balanced course” (Finland Ministry of Finance Press Release, March 7, 2000). If a fiscal adjustment is motivated primarily by restraining domestic demand, it is not valid for estimating the short-term effects of fiscal policy on economic activity, even if, as in this case, it is associated with a rise in the CAPB.

By the same token, the CAPB-based measure of fiscal consolidation is likely to omit years during which tax hikes or spending cuts aimed at reducing the fiscal deficit were followed by

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<sup>4</sup> For a further discussion of how cyclically-adjusted fiscal data contain non-policy movements correlated with economic activity, see, for example, Romer and Romer (2010), Milesi-Ferretti (2009), Morris and Schuknecht (2007), and Wolswijk (2007). As Morris and Schuknecht (2007, p. 4) explain, “asset price movements are a major factor behind unexplained changes in the cyclically adjusted balance, which, if not accounted for, can lead to erroneous conclusions regarding underlying fiscal developments.” A similar problem occurs during sharp recessions. As Wolswijk (2007) explains, standard cyclical adjustment methods assume that the automatic response (elasticity) of fiscal variables to the business cycle is constant over time. However, there is evidence that sharp recessions have a stronger-than-average automatic effect on fiscal variables. Therefore, if a fiscal consolidation coincides with a sharp recession, it is less likely to be identified by the standard approach, which searches for an increase in the CAPB.

<sup>5</sup> See 2008 *Budget*, 2009 *Supplementary Budget* of April 2009, *Budget Statement of the Minister for Finance* of April 2009, and the October 2008 and December 2009 *Ireland Stability Program* submitted by the authorities to the European Commission. Also see the appendix for a further discussion of Ireland in 2009.



an adverse shock and an offsetting discretionary fiscal stimulus. For example, imagine that two countries adopt identical deficit reduction measures, but then one is hit by an adverse shock and so adopts a discretionary spending increase, while the other is hit with a favorable shock. Here, the change in the CAPB would show a smaller increase for the first country than for the second country, despite the presence of identical deficit reduction measures. The standard approach would therefore tend to omit cases of consolidations followed by adverse shocks, because there may be little or no rise in the CAPB despite the implementation of consolidation measures. Again, this problem implies a positive correlation between the error term and the change in the CAPB in the regression equation, implying a positive bias for the estimated effect of fiscal consolidation on output. The case of Germany in 1982 provides a real-world counterpart to this hypothetical example. The authorities implemented spending cuts and tax hikes aimed at reducing the structural deficit, which had been passed by Parliament in December 1981 (1982 *IMF Recent Economic Developments*, p. 27). As the economy was weak in 1982, however, some expansionary countercyclical measures were introduced during the year, and their budgetary cost offset some of the savings associated with the deficit-reduction package.

Finally, the problems with the conventional approach are not just hypothetical or limited to a few specific cases. As we discuss below, the change in the CAPB-to-GDP ratio is an unreliable guide regarding the presence of fiscal consolidation. This approach often selects periods associated with favorable outcomes but during which no deficit-driven fiscal consolidation occurred. It also tends to omit cases of fiscal consolidation associated with unfavorable outcomes.<sup>6</sup>

## **B. The Historical Approach**

To address these problems with the conventional approach, we use an alternative methodology based on identifying changes in fiscal policy directly from historical documents. In particular, we examine contemporaneous policy documents to establish whether discretionary changes in tax rates and government spending were motivated by a response to the business cycle or not. Our approach is similar to that of Romer and Romer (2010), who estimate the macroeconomic effects of U.S. tax changes and achieve identification using the historical record in two ways. First, they verify that the policy documents do *not* discuss a desire to respond to current or prospective economic conditions and return growth to normal. Second, within the set of policy changes not motivated by the near-term economic outlook, they focus on tax changes motivated either by a desire to reduce the budget deficit or by raising long-run growth.

For the purposes of this paper, we focus on fiscal policy changes motivated by the desire to reduce the budget deficit. As Romer and Romer (2010) explain, the budget deficit reflects *past* economic conditions and budgetary decisions rather than current or prospective economic conditions. Therefore, “If policymakers raise taxes to reduce such a deficit, this is

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<sup>6</sup> See Jayadev, Arjun and Mike Konczal (2010), and Krugman (2010) for a further discussion of the pitfalls of using the CAPB to identify changes in fiscal policy.

not a change motivated by a desire to return growth to normal or to prevent abnormal growth. So it is exogenous” (Romer and Romer, 2010, p. 770). The U.S. Omnibus Budget Reconciliation Act of 1993 provides an example of such a policy change. The Act involved raising taxes and cutting spending not to reduce the risk of economic overheating, but because policymakers saw it as a prudent policy change with potential long-term benefits. Austria in 1996 provides another example. The authorities introduced austerity measures to conform to the budget deficit criteria for European Monetary Union (EMU) accession, agreed under the terms of the 1992 Maastricht Treaty, and not because there was a risk of economic overheating. Such changes in fiscal policy are thus valid for estimating the short-term effects of fiscal policy on economic activity and testing the expansionary austerity hypothesis.

While the historical approach addresses some of the problems associated with the conventional approach discussed above, it is subject to three additional criticisms that also apply to the conventional approach. First, if countries sometimes postpone fiscal consolidation until the economy recovers, then the consolidation exercise will be associated with good economic outcomes in both the standard approach based on the CAPB and our approach. Second, if a country is committed to a deficit-reduction path and the economy falls into a recession, it may implement additional fiscal consolidation measures, thus associating fiscal consolidation with unfavorable economic outcomes in both the standard CAPB-based approach and our approach. Thus, biases may remain even in our approach, although it is unclear in which direction they would go overall. Third, both the CAPB-based approach and our historical approach record changes in fiscal policy when they occur, which ignores the role of anticipation effects highlighted by Ramey (2011). Thus, while the changes in fiscal policy that we identify should be “exogenous” in the Romer and Romer (2010) sense—explicitly not a response to the business cycle—they are not necessarily unanticipated. However, as Beetsma, Giuliadori and Klaassen (2008) point out, at the annual frequency used here, the role of anticipation effects is likely to be smaller than at the quarterly frequency used by Ramey (2011) and Romer and Romer (2010).

To identify the policy changes, we examine a wide range of contemporaneous policy documents. The contemporaneous sources include *Budgets*, *Budget Speeches*, central bank reports, *Convergence* and *Stability Programs* submitted by the authorities to the European Commission, *IMF Recent Economic Developments* reports, *IMF Staff Reports*, and *OECD Economic Surveys*. In addition, we examine country-specific sources, such as the Congressional Budget Office (CBO) reports and the *Economic Report of the President* for the United States, the *Journal Officiel de la Republique Francaise* for France, Ministry of Finance press releases and publications, and, in one case, a transcript of a television interview. These documents provide evidence of what policymakers believed at the time that policy measures were taken, and provide estimates of the measures’ budgetary impacts. Our sample includes 17 OECD countries over the period 1978-2009. The countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, the United Kingdom and the United States. In a companion paper, Devries et al. (2011), we provided detailed citations for each data point to show how we determine the motivation and estimated budgetary effects from the historical

record. Following Romer and Romer (2010), we use the contemporaneous estimates contained in these sources since retrospective estimates are rarely available.

The dataset contains a total of 173 fiscal policy changes. The budgetary impact of these fiscal adjustments has a mean of 0.99 percent of GDP and a standard deviation of 0.94 percentage point. The range runs from  $-0.75$  percent of GDP to 4.74 percent of GDP. Note that negative values arise when temporary fiscal consolidation measures expire. For example, a one-year tax of \$1 has a budgetary impact of \$1 in the first year and  $-\$1$  in the next year, followed by no impact. These changes in fiscal policy are the key inputs into the empirical analysis outlined in Section III.

### C. Comparing the Two Approaches

In this subsection, we compare the size of fiscal consolidation identified using our action-based approach with the conventional CAPB-based definition of fiscal consolidation.<sup>7</sup> As reported in Figure 1, the two measures broadly agree regarding the size of fiscal adjustment in a number of cases. However, there are also numerous cases in which the standard approach and our approach come to different conclusions regarding the presence and size of fiscal consolidation. Cases for which there was no evidence of deficit-driven changes in fiscal policy in the historical record correspond to the observations along the zero line on the horizontal axis.

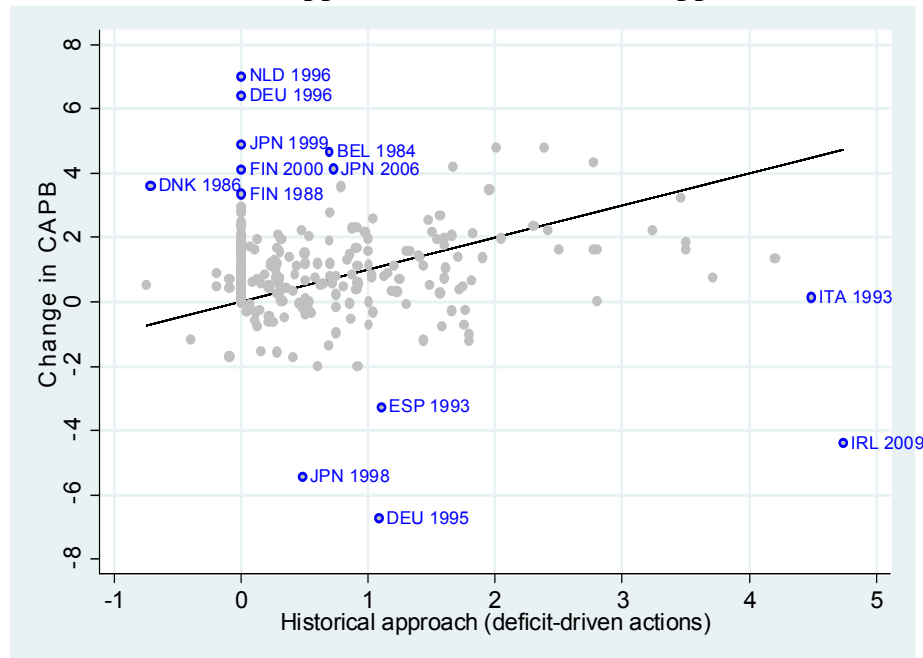
To investigate which approach typically provides a more accurate identification of fiscal consolidation, we focus on the largest discrepancies between the two approaches. In particular, we examine the 13 largest disagreements between the two approaches—cases for which the discrepancy between the two approaches exceeded 3 percent of GDP. Figure 1 highlights these large discrepancies, and the appendix describes each of the 13 cases in detail and explains how we assess the relative accuracy of the two approaches.

Our analysis of the 13 largest disagreements between the two approaches provides strong evidence that our action-based approach more accurately identifies the size of deficit-driven fiscal consolidation. We find 12 cases where we are able to identify specific economic or budgetary developments that cause the CAPB-based measure to inaccurately identify the size of the consolidation and that largely explain the gap between the two measures. In one case (Italy in 1993) there was a large economic contraction that, for the reasons explained above, could plausibly have caused the CAPB-based approach to be highly inaccurate. We find no cases where there is evidence that the measure based on the historical approach is less accurate.

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<sup>7</sup> The data on the CAPB come from Alesina and Ardagna (2010), who correct the primary balance for year-to-year changes in the unemployment rate based on the method proposed by Blanchard (1990). Numerous papers in the literature on expansionary fiscal contractions use this approach, including that of Alesina and Perotti (1995).

**Figure 1. Fiscal Consolidation in Percent of GDP:  
Historical Approach vs. CAPB-based Approach**



Note: Figure highlights cases for which the discrepancy between the action-based and CAPB-based approach exceeds 3 percent of GDP. Diagonal line indicates points along which the two approaches provide equal estimates. BEL=Belgium, DEU=Germany, DNK=Denmark, ESP=Spain, FIN=Finland, IRL=Ireland, ITA=Italy, JPN=Japan, NLD=Netherlands.

This analysis also reveals a further issue with the CAPB data used in the literature: they include the effects of large one-off accounting operations. For example, in Germany in 1996 (top left corner of Figure 1), the CAPB-to-GDP ratio increased by 6.4 percentage points, suggesting a large fiscal retrenchment. However, an examination of the policy record reveals that this increase reflected a one-time accounting operation in 1995 related to the transfer of Treuhand (Trust Agency) and East German housing debt to the general government account. Due to this one-time accounting operation, the general government deficit rose to 9.7 percent of GDP in 1995 and fell to 3.3 percent of GDP in 1996, implying a sharp rise in the CAPB-to-GDP ratio in 1996. The appendix documents other such examples of sharp CAPB increases that are unrelated to fiscal consolidation measures, such as Japan in 1999 and Netherlands in 1996. By introducing noise into the identification of episodes and their sizes, such accounting operations can further attenuate the estimated effect of fiscal consolidation on domestic demand.

### III. EFFECT OF FISCAL CONSOLIDATION ON ECONOMIC ACTIVITY

With periods of fiscal consolidation now identified, this section estimates the effect of the fiscal measures on economic activity. We focus on the effect of fiscal consolidation in the short term—the first three years.

### A. Baseline Specification

Our baseline regression specification takes the following form:

$$(2) \quad \Delta Y_{i,t} = \mu_i + \lambda_t + \sum_{j=1}^2 \beta_j \Delta Y_{i,t-j} + \sum_{s=0}^2 \gamma_s \Delta F_{i,t-s} + v_{i,t}$$

where subscript  $i$  indexes countries, subscript  $t$  indexes years, and  $Y$  is the logarithm of real economic activity. Our baseline results focus on real private consumption and real GDP, but we also consider the effects on private investment and the unemployment rate in the subsection on robustness analysis. The term  $\Delta F$  is our series of action-based fiscal consolidations in percent of GDP—the total budgetary impact of changes in taxes and spending in year  $t$  motivated by a desire to reduce the budget deficit. The term  $\mu_i$  denotes country-fixed effects,  $\lambda_t$  denotes year-fixed effects, and  $v_{i,t}$  is a mean-zero error term. The  $\beta$ s are the autoregressive coefficients capturing the normal dynamics of economic activity, while the  $\gamma$ s are the direct effects (contemporaneous and lagged) of fiscal consolidation. To see how the results compare with those obtained using the standard CAPB-based measure of fiscal consolidation, we re-estimate the regression equation with the change in the CAPB-to-GDP ratio replacing our action-based measure.

We cumulate the estimated responses to recover the response of the level of the logarithm of real private consumption and real GDP (in logs) to a permanent 1 percent of GDP fiscal consolidation. Estimation is by ordinary least squares and the standard errors of the impulse responses are calculated via the delta method. The baseline regression's lag order of 2 is selected based on a review of the information criteria and serial correlation properties associated with various lag lengths. As reported in the next section, the results are similar for alternative specifications and estimation approaches.

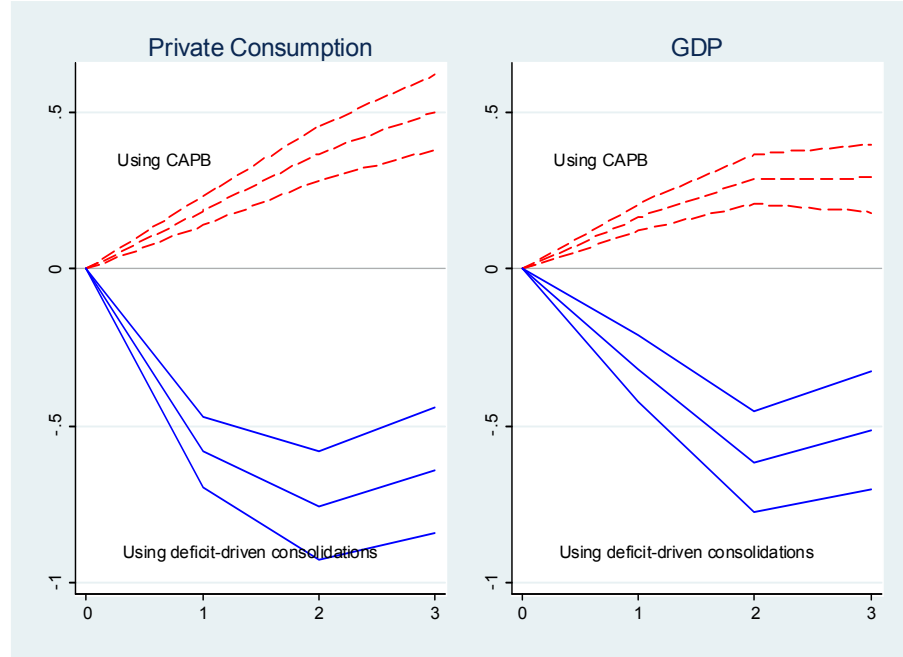
### B. Estimation Results

Figure 2 summarizes the estimated effect of a 1 percent of GDP fiscal consolidation on real private consumption and real GDP relative to normal (in logs), together with one standard-error bands.<sup>8</sup> The figure also compares the results obtained using our new series with those obtained using the standard approach, with the  $\Delta F$  terms measured by the change in the CAPB-to-GDP ratio. For both sets of results, the sample of countries and years is the same, as is the econometric specification. The estimates based on our new series suggest that fiscal consolidation has contractionary effects on private consumption, with a peak effect of  $-0.75$  percent within two years ( $t$ -statistic =  $-4.36$ ). The estimated effect on GDP is  $-0.62$  percent within two years ( $t$ -statistic =  $-3.82$ ). In stark contrast, estimates based on the CAPB suggest that fiscal consolidation has an *expansionary* effect on private consumption, with an estimate of  $0.37$  within two years ( $t$ -statistic =  $4.30$ ). The estimated impact on GDP is  $0.29$  percent within two years ( $t$ -statistic =  $3.69$ ). These CAPB-based estimates are broadly consistent with

<sup>8</sup> The data on real private consumption and real GDP come from the OECD Economic Outlook Database No. 88, codes CPV and GDPV, respectively. For Germany prior to 1992, the data are back-spliced using growth rates of data for the former Federal Republic of Germany.

the regression results obtained in the literature.<sup>9</sup> Thus, while our new series provides little evidence of expansionary austerity, using the conventional cyclically-adjusted approach produces results more consistent with the hypothesis.

**Figure 2. Estimated Effect of a 1 Percent of GDP Fiscal Consolidation**



Note: Figure reports point estimates and one standard error bands in percent.  $t=1$  denotes the year of fiscal consolidation.

A similar striking contrast between the two sets of results emerges when the analysis focuses on a subset of *large* fiscal adjustments. A number of studies focus on the effects of large fiscal consolidations, and find that such severe or “decisive” adjustments can be expansionary (Giavazzi and Pagano, 1990). Following the literature, we define fiscal consolidations greater than 1.5 percent of GDP as large. The estimated equation is now

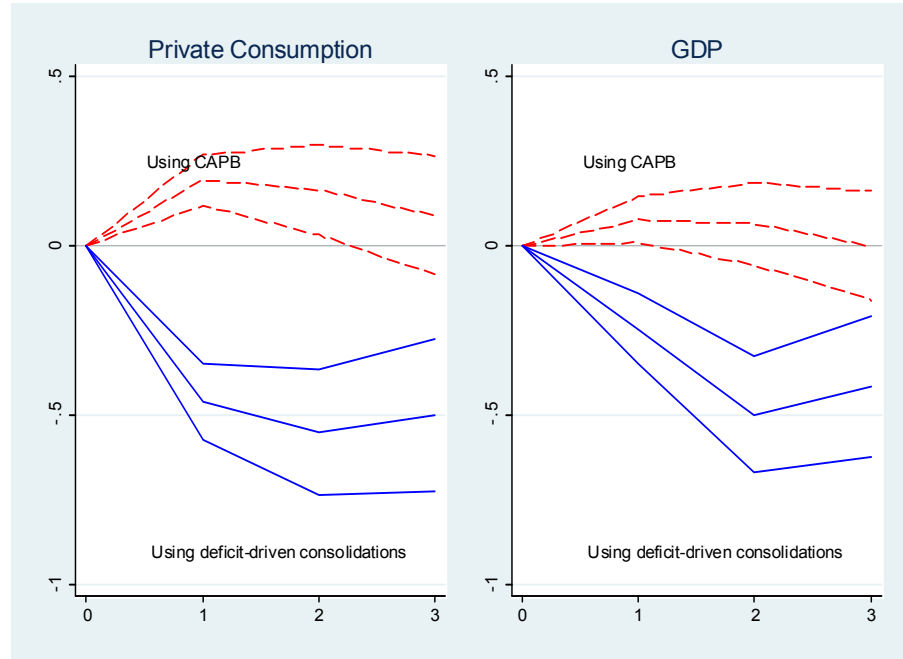
$$(3) \quad \Delta Y_{i,t} = \mu_i + \lambda_t + \sum_{j=1}^2 \beta_j \Delta Y_{i,t-j} + \sum_{s=0}^2 \gamma_s Large_{i,t-s} + \sum_{s=0}^2 \beta_s \Delta F_{i,t-s} + v_{i,t}$$

where *Large* equals fiscal consolidation ( $\Delta F$ ) when it exceeds 1.5 percent of GDP. The sum of the responses to *Large* and  $\Delta F$  show the effects of large consolidation. As Figure 3 reports, based on our series, the estimated effect on private consumption and real GDP is again significantly contractionary. The effect on private consumption is  $-0.55$  percent within two years ( $t$ -statistic =  $-2.97$ ), while the effect on GDP is  $-0.50$  percent ( $t$ -statistic =  $-2.88$ ).

<sup>9</sup> For example, in panel regressions for an OECD sample with more countries and years than in our dataset, after controlling for country- and time-fixed effects and the initial government debt-to-GDP ratio, Alesina and Ardagna (2010) report (Table 11 “GDP Growth and Fiscal Policy”) that a 1 percentage point increase in the CAPB-to-GDP ratio is associated with a rise in GDP of 0.15 percent ( $t$ -statistic = 3.98) within *one* year. This is close to the CAPB-based estimate for our sample of 0.16 percent ( $t$ -statistic = 3.87) within one year, as shown in Figure 2 (right panel).

Using the change in the CAPB produces mildly expansionary estimates, although, for real GDP, these are no longer statistically significant.

**Figure 3. Estimated Effect of *Large* Fiscal Consolidation  
(marginal effect per additional 1 percent of GDP)**

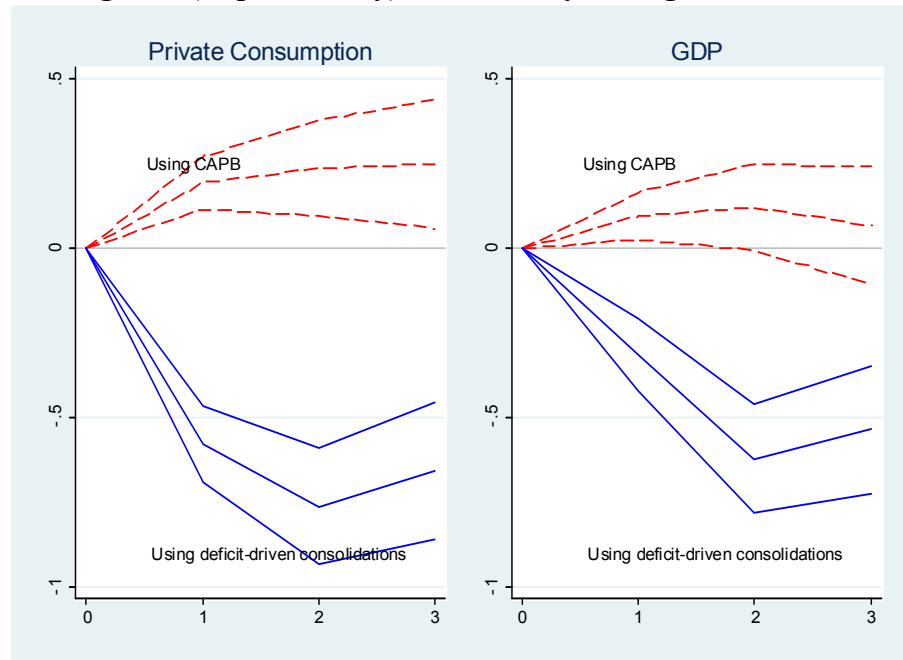


Note: Figure reports point estimates and one standard error bands in percent.  $t=1$  denotes the year of fiscal consolidation.

Finally, the striking difference in results also occurs when the variables measuring changes in the fiscal balance are censored to include only positive values. While our series of fiscal policy changes does include some with a negative budgetary impact—the end of temporary deficit-reduction measures, as discussed above—the overwhelming majority of our fiscal policy changes have a positive budgetary impact. In contrast, the distribution of changes in the CAPB is more symmetric across positive and negative values. Is the difference in estimation results obtained using the two variables driven by this difference in distributions? To explore this possibility, we re-estimate our baseline Equation (2) while setting all the negative changes in our series and in the CAPB-to-GDP to zero.<sup>10</sup> Figure 4 reports the results, and suggests that the main findings hold up to this change. In particular, the difference between the results obtained using our action-based and the CAPB-based fiscal variables remains large even when both are censored at zero.

<sup>10</sup> As Kilian and Vigfusson (2009) explain in the context of estimating the effects of energy price increases, setting one side of the distribution of the independent variable to zero can lead to estimates that are greater in absolute value than the true effects.

**Figure 4. Estimated Effect of a 1 Percent of GDP Fiscal Consolidation  
Negative (Expansionary) Fiscal Policy Changes Set to Zero**



Note: Figure reports point estimates and one standard error bands in percent.  $t=1$  denotes the year of fiscal consolidation.

Overall, the estimation results suggest that the biases associated with using cyclically-adjusted data discussed above may be substantial. On average, a rise in the CAPB is associated with a mild expansion in private consumption and real GDP in the short term. However, using our series of deficit-driven fiscal adjustments, which attempts to address the issues associated with the CAPB-based approach discussed above, suggests that fiscal consolidations have a significant contractionary effect in the short term.

### C. Robustness

The above results suggest that fiscal consolidation, when estimated using fiscal actions motivated by deficit reduction, has contractionary effects on economic activity. In this subsection, we perform a number of tests to assess the robustness of this result. We also broaden the analysis to examine the effect of fiscal consolidation on two other indicators of economic activity: real private investment (in logs) and the unemployment rate.<sup>11</sup>

First, we consider the robustness of the results to estimating a static model, excluding lags of the dependent variable, as well as a model with a longer lag structure. If consolidation is

<sup>11</sup> The data on the real private investment and the unemployment rate come from the OECD Economic Outlook Database No. 88, codes IPV and UNR, respectively. The effect of the fiscal consolidation on real private investment (in logs) and on the unemployment rate (in percentage points) is obtained by re-estimating Equation (2) while replacing the  $\Delta Y$  terms with the change in the variable of interest, and again cumulating the responses to obtain the impact on the level.



more likely to be implemented in a strong economy, one would expect to see a correlation between lagged growth and fiscal consolidation, and controlling for lagged growth would have an appreciable impact on the estimates. We thus try excluding the terms  $\sum_{j=1}^2 \beta_j \Delta Y_{i,t-j}$  from the estimated equation. As Table 1 reports, estimating this static model had only a small effect on the results, which is reassuring as it suggests that this source of bias is small in our sample. The effect on private consumption changes from the baseline estimate of  $-0.75$  ( $t$ -statistic =  $-4.36$ ) to  $-0.83$  ( $t$ -statistic =  $-5.44$ ), while the estimated effect on real GDP changes from  $-0.62$  ( $t$ -statistic =  $3.82$ ) in the baseline specification to  $-0.65$  ( $t$ -statistic =  $-4.58$ ) for the static model. For private investment, the estimated effect is  $-1.48$  percent ( $t$ -statistic =  $-2.02$ ) in the baseline specification, and  $-1.40$  percent ( $t$ -statistic =  $-2.17$ ) for the static model. The decline in private investment is consistent with the notion that investment is influenced by the overall level of domestic demand. However, the effect on private investment is less precisely estimated, which is not surprising given the volatility of this component of GDP. The estimated effect on the unemployment rate is a rise of  $0.32$  percentage point ( $t$ -statistic =  $3.44$ ) for the baseline model and  $0.33$  percentage point ( $t$ -statistic =  $4.16$ ) for the static model. Also, as the next row in Table 1 reports, the results hold up to using a longer lag structure—four years of lags compared with two years of lags in the baseline specification.

Second, we investigate the sensitivity of the results to outliers. While very large or very small fiscal consolidations are worth considering, it is natural to ask how important they are for the results. We therefore re-estimate the baseline equation after dropping 10 percent of the fiscal policy changes from the dataset, comprising the largest 5 percent and the smallest 5 percent of the sample. We also investigate the role of outliers using Cook's distance method, by discarding observations with Cook's distance greater than  $4/N$ , where  $N$  is the sample size. As Table 1 shows, in both cases, the results are similar after the removal of outliers. For private investment, the point estimate still indicates a decline, but the result is no longer statistically significant when discarding extreme values. In addition, to assess how important any individual country is for the results, we re-estimate the baseline equation while dropping one country at a time from the sample. As Table 2 reports, in each case, the estimation results for the peak effect (year  $t=2$ ) continue to indicate a significant contraction in private consumption and GDP, and all of the estimates are within one standard error of the baseline.

**Table 1. Robustness: Estimated Effect of a 1 Percent of GDP Fiscal Consolidation**  
(Effect in year  $t=2$ )

Estimation approach	Private Consumption	Private Investment	GDP	Unemployment Rate
Baseline	-0.75*** (0.17)	-1.48** (0.73)	-0.62*** (0.16)	0.32*** (0.09)
Static model	-0.83*** (0.15)	-1.40** (0.65)	-0.65*** (0.14)	0.33*** (0.08)
Longer lag structure	-0.81*** (0.17)	-2.22*** (0.74)	-0.64*** (0.17)	0.43*** (0.09)
Dropping outliers (extreme values)	-0.72*** (0.22)	-0.93 (0.89)	-0.81*** (0.20)	0.25** (0.12)
Dropping outliers (Cook's distance)	-0.73*** (0.15)	-1.70*** (0.61)	-0.57*** (0.13)	0.25*** (0.07)
Two-stage least squares	-0.98** (0.39)	-0.87 (1.47)	-0.80** (0.31)	0.38** (0.17)
Two-variable VAR	-0.96*** (0.20)	-2.12** (0.86)	-0.73*** (0.19)	0.37*** (0.11)
Arellano-Bond	-0.70*** (0.18)	-1.35* (0.76)	-0.62*** (0.17)	0.32*** (0.10)
Additional control variables				
Government debt-to-gdp ratio	-0.60*** (0.22)	-2.63** (1.05)	-0.58** (0.23)	0.53*** (0.13)
Future sovereign default risk	-0.60*** (0.18)	-1.36* (0.74)	-0.50*** (0.17)	0.26*** (0.09)
Sovereign bond yield	-0.70*** (0.17)	-1.21 (0.76)	-0.58*** (0.16)	0.30*** (0.09)
Increase in old-age ratio	-0.74*** (0.17)	-1.70** (0.71)	-0.61*** (0.16)	0.35*** (0.09)

Note: Table reports point estimate and delta method standard error for level of variable in year  $t = 2$ . \*, \*\*, and \*\*\* denote statistical significance at the 10, 5, and 1 percent level, respectively. All specifications contain full set of country and time fixed effects. See text for the description and data sources for the various variables.

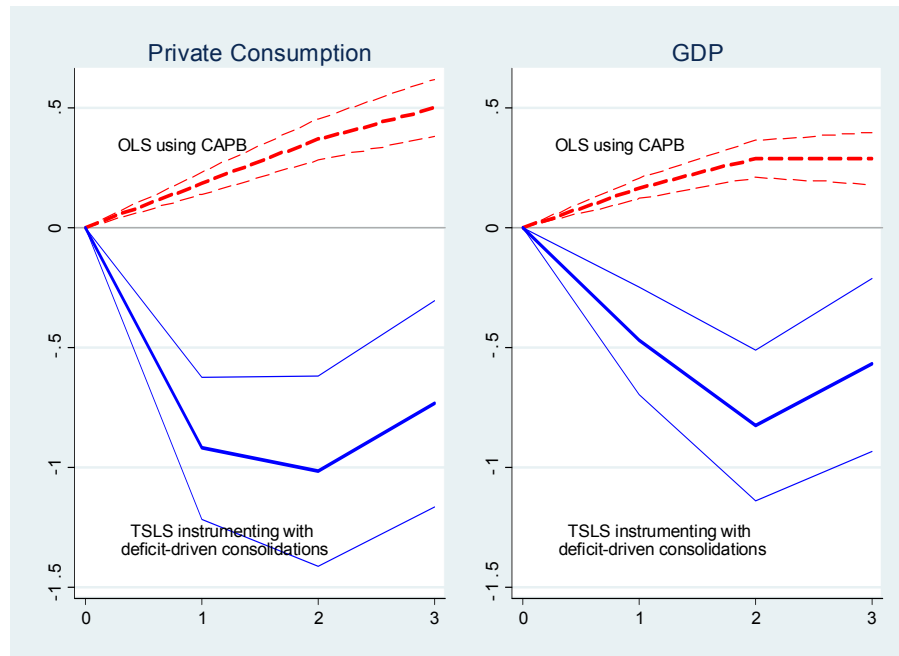
**Table 2. Exclusion of One Country at a Time:  
Estimated Effect of a 1 Percent of GDP Fiscal Consolidation  
(Effect in year  $t=2$ )**

Country Dropped	Private Consumption	GDP	Country Dropped	Private Consumption	GDP
Baseline	-0.75*** (0.17)	-0.62*** (0.16)	FRA	-0.76*** (0.18)	-0.63*** (0.17)
AUS	-0.75*** (0.18)	-0.59*** (0.16)	GBR	-0.73*** (0.18)	-0.61*** (0.16)
AUT	-0.73*** (0.18)	-0.61*** (0.17)	IRL	-0.60*** (0.18)	-0.46*** (0.17)
BEL	-0.76*** (0.18)	-0.65*** (0.17)	ITA	-0.78*** (0.19)	-0.71*** (0.18)
CAN	-0.73*** (0.18)	-0.56*** (0.16)	JPN	-0.74*** (0.18)	-0.61*** (0.16)
DEU	-0.78*** (0.18)	-0.66*** (0.16)	NLD	-0.76*** (0.18)	-0.62*** (0.17)
DNK	-0.88*** (0.17)	-0.68*** (0.17)	PRT	-0.71*** (0.18)	-0.54*** (0.16)
ESP	-0.75*** (0.18)	-0.60*** (0.17)	SWE	-0.80*** (0.18)	-0.65*** (0.17)
FIN	-0.83*** (0.18)	-0.71*** (0.16)	USA	-0.72*** (0.18)	-0.58*** (0.16)

Note: Table reports point estimate and delta method standard error for level of variable in year  $t = 2$ . \*, \*\*, and \*\*\* denote statistical significance at the 10, 5, and 1 percent level, respectively. All specifications contain full set of country and time fixed effects. See text for the description and data sources for the various variables. AUS=Australia, AUT=Austria, BEL=Belgium, CAN=Canada, DEU=Germany, DNK=Denmark, ESP=Spain, FIN=Finland, FRA=France, GBR=United Kingdom, IRL=Ireland, ITA=Italy, JPN=Japan, NLD=Netherlands, PRT=Portugal, SWE=Sweden, USA=United States.

Third, we consider how the results change when our action-based series of fiscal adjustments is used as an instrumental variable for the change in the CAPB. In particular, we estimate the effect of fiscal consolidation based on the CAPB via two-stage least squares. The results reported in Table 1 and Figure 5 imply that the rise in the CAPB, when instrumented using our variable, has a large and negative effect on economic activity. The first stages are strong. Each equation has an  $F$ -statistic on the excluded instruments with a  $p$ -value well below 1 percent, indicating that our series of deficit-driven fiscal consolidations have explanatory power for the CAPB. The Anderson canonical correlations and Cragg-Donald Wald tests also have  $p$ -values well below 1 percent, rejecting the null that the system is unidentified. The second stage indicates that a rise in the CAPB-to-GDP ratio of 1 percentage point reduces private consumption by 0.98 percent ( $t$ -statistic =  $-2.49$ ) within two years, while the effect on real GDP is  $-0.80$  percent ( $t$ -statistic =  $-2.57$ ).

**Figure 5. TSLS Estimates: Effect of a 1 Percent of GDP CAPB-based Fiscal Consolidation**



Note: Figure reports ordinary least squares (OLS) and two-stage least squares (TSLS) point estimates and one standard error bands.  $t=1$  denotes the year of fiscal consolidation.

We also consider two additional estimation approaches: a two-variable VAR and the Arellano-Bond (1991) estimator. We run the two-variable VAR on the growth rate of economic activity ( $\Delta Y$ ) and our fiscal consolidation variable ( $\Delta F$ ) to allow for effects of lagged economic activity and past fiscal consolidation on fiscal consolidation. To allow fiscal consolidation to influence economic activity within one year, we order our fiscal consolidation variable first in the VAR. The VAR-based estimates again suggest that fiscal consolidation has contractionary effects, with the estimated effects on private consumption and GDP estimated at  $-0.96$  percent ( $t$ -statistic =  $-4.72$ ) and  $-0.73$  percent ( $t$ -statistic =  $-3.92$ ), respectively. Also, re-estimating the model using the Arellano-Bond (1991) estimator produces results similar to the baseline. This procedure addresses the possibility of bias due to the fact that country fixed effects are correlated with the lagged dependent variables in the autoregressive equation. The finding that the results are similar is not surprising since the bias is likely to be small with a large number of observations per country relative to the number of countries (30 years for each of the 17 countries).

Finally, we address the possibility that the baseline estimated equation omits variables that affect economic activity and may be correlated with fiscal consolidation. Not controlling for such factors could influence the estimated effect of consolidation. It is worth noting that such omitted variable bias would affect both the CAPB-based results and the estimates based on our deficit-driven fiscal consolidations. Thus, these robustness tests do not address the *difference* between the two sets of results; they focus on the accuracy of the estimates based on our series of deficit-driven fiscal consolidations. In addition, the omission of some variables could lead our baseline specification to *under-estimate* the contractionary effect of

fiscal consolidation. For example, governments may be more likely to consolidate when other factors are not acting to reduce output. Overall, it is not clear from the outset which way the omission of additional controls would influence the results.

Here, we consider the most obvious omitted variables that could plausibly bias the analysis towards *overstating* the negative effects of fiscal consolidation on economic activity. First, we consider the initial government debt-to-GDP ratio. A large stock of government debt could raise borrowing costs and crowd out growth, and also prompt governments to undertake fiscal consolidation. We therefore include three lags of the government debt-to-GDP ratio in our baseline specification. As Table 1 reports, the results are similar to the baseline. However, it is possible that the recent debt-to-GDP ratio is less relevant for borrowing costs and growth than the outlook for *future* government debt dynamics. In particular, governments may be more likely to undertake a fiscal consolidation in response to the deficit if they are concerned about the long-term debt outlook, even if the current government debt-to-GDP ratio is low. And the same factors that lead to an unsustainable outlook for government debt may lead to slower economic growth. To address this possibility, we use two forward-looking indicators: the perceived risk of future sovereign default, and the long-term (10-year) government bond yield. We measure the perceived risk of future sovereign default using the Institutional Investor Ratings index (IIR), following Reinhart, Rogoff, and Savastano (2003) and Eichengreen and Mody (2004).<sup>12</sup> In each case, we include three lags of the additional variable in the estimated equation. As Table 1 reports, we find that the results are similar after the inclusion of these forward-looking variables. Finally, we consider the role of demographics. In particular, it is plausible that an increase in the fraction of the population that is older might decrease labor supply growth and hence output growth, but also increase transfer payments and decrease tax revenues, and prompt the government to introduce fiscal consolidation measures such as a reform of pension entitlements. To address this possibility, we include three lags of the increase in the old-age dependency ratio in the estimated equation.<sup>13</sup> As Table 1 reports, the results are again similar to the baseline.

#### IV. EXTENSIONS

This section addresses three factors that could influence the effect of fiscal consolidation on economic activity: the role of international trade; the composition of the deficit-reduction package; and the role of perceived sovereign default risk of the country undertaking fiscal consolidation.

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<sup>12</sup> The ratings are based on assessments of sovereign risk by private sector analysts. Each country is rated on a scale of zero to 100, with a rating of 100 assigned to the lowest perceived sovereign default probability. The Institutional Investor Rating comes from *Institutional Investor*. The general government debt-to-GDP ratio comes from the IMF's World Economic Outlook Database, series GGD in percent of series NGDP. The 10-year government bond yield data come from Datastream.

<sup>13</sup> The old-age dependency ratio comes from the World Bank's World Development Indicators.

### A. The Role of International Trade

In estimating the effect of fiscal consolidation on economic activity, we found that real GDP falls by less than 1 percent following a 1 percent of GDP fiscal consolidation, implying a multiplier of less than one. As this section reports, this result reflects an expansion in net exports associated with a fall in the value of the domestic currency, which partly offsets the decline in domestic demand.

Figure 6 summarizes the results of re-estimating our baseline specification for the contributions to real GDP of total domestic demand and net exports, respectively. The contribution of net exports to GDP is defined as  $\frac{X_{t-1}}{Y_{t-1}}g_{X,t} - \frac{M_{t-1}}{Y_{t-1}}g_{M,t}$ , where  $X$  and  $M$  denote real exports and imports, respectively,  $Y$  denotes real GDP, and  $g_X$  and  $g_M$  denote the growth rates of real exports and imports, respectively.<sup>14</sup> The contribution of domestic demand to GDP is defined as  $\frac{C_{t-1}}{Y_{t-1}}g_{C,t} + \frac{I_{t-1}}{Y_{t-1}}g_{I,t}$ , where  $C$  and  $I$  denote total (public and private) real consumption and investment, respectively. The results suggest that a 1 percent of GDP fiscal consolidation raises the contribution of net exports to GDP by 0.47 percentage points of GDP ( $t$ -statistic = 4.46). As Figure 6 also reports (right-hand panel), this increase in net exports reflects both a rise in real exports and a decline in real imports. Real exports rise by 0.91 percent ( $t$ -statistic = 2.44), and real imports fall 1.18 percent ( $t$ -statistic = -2.92). Meanwhile, the contribution of domestic demand—consumption and investment—to GDP declines by 1.05 percent of GDP ( $t$ -statistic = -5.42) within two years. Thus, the effect on total GDP reported above combines a contraction in domestic demand with a partially offsetting rise in net exports.

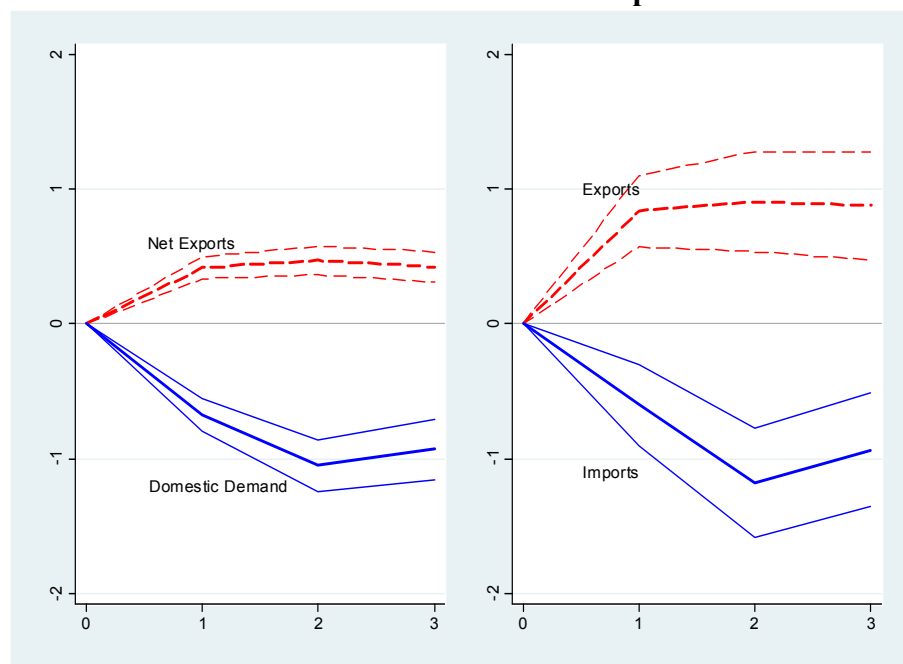
As Figure 7 reports, the adjustment mechanism underlying the rise in net exports is a shift in the real exchange rate. In particular, the real effective (trade-weighted) exchange rate depreciates by 1.57 percent ( $t = -4.13$ ) within one year following a 1 percent of GDP fiscal consolidation. Over the short-term horizon examined here, the real exchange rate adjustment occurs primarily through a fall in the nominal value of the currency (Figure 7, panel 2), and not through an adjustment in domestic prices relative to trading partners (Figure 7, panel 3).<sup>15</sup> The fall in the value of the currency is associated with an easing in domestic monetary policy, with the nominal policy rate falling by 19 basis points ( $t$ -statistic = 1.35) (Figure 7, panel 4). Interestingly, the estimated responses of real exports and imports are broadly consistent with those implied by conventional estimates of elasticities with respect to the real

<sup>14</sup> To explore these channels, we use the baseline specification in Equation (2) with the change in the variable of interest replacing the  $\Delta Y$  terms. As before, we then cumulate the estimates to recover the impact on the level of the variable of interest. Data for real exports and real imports come from the OECD Economic Outlook Database No. 88, codes XGSV and MGSV.

<sup>15</sup> The nominal and real (CPI-based) effective exchange rate data come from the IMF's International Financial Statistics (IFS) database, codes REER and NEER, respectively. The domestic price differential relative to trading partners is defined as the ratio of the real effective exchange rate to the nominal effective exchange rate. The monetary policy (short-term) interest rate data come from Datastream.

exchange rate.<sup>16</sup> Also, since the analysis controls for shifts in global demand (time fixed effects), the estimated increase in exports reported above is unlikely to reflect an upswing in global demand.

**Figure 6. Estimated Effect of a 1 Percent of GDP Fiscal Consolidation: Domestic Demand and Net Exports**



Note: Figure reports point estimates and one standard error bands for contribution to GDP of net exports and domestic demand in percentage points; and for real exports and real imports in percent.  $t=1$  denotes the year of fiscal consolidation.

To further investigate the role of the exchange rate, we split the sample according to the flexibility of the exchange rate regime. In particular, we repeat the estimation approach used above for two sub-samples: fiscal consolidations occurring in pegged exchange rate regimes, and those occurring in floating regimes. The source of the exchange rate regime classification is the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*.<sup>17</sup> In particular for the pegged regimes, we estimate the following equation:

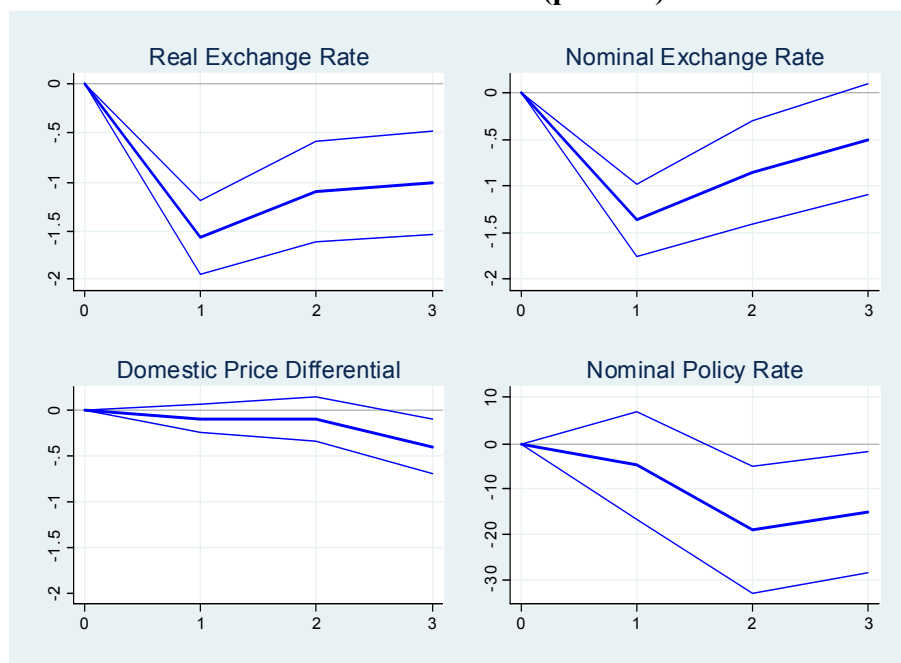
<sup>16</sup> For example Bayoumi and Faruqee (1998, p. 32) report that, within two years, a 1 percent real depreciation should raise exports by 0.60 percent and reduce imports by 0.78 percent, other things equal. In our sample, the estimated impact of fiscal consolidation is a real depreciation of 1.57 percent. The conventional elasticities would thus imply an impact on exports and imports of 0.94 percent ( $1.57 \times 0.60$ ) and 1.22 percent ( $1.57 \times 0.78$ ), respectively, close to our estimated effect of 0.91 percent and 1.18 percent, respectively.

<sup>17</sup> Following Bubula and Otker-Robe (2002), pegged regimes include both hard pegs (currency unions and currency boards) and soft pegs (pegs vis-à-vis a single currency or a basket, horizontal bands, and crawling pegs and bands). Floating regimes include both independently floating regimes and managed floating regimes with no predetermined path for the exchange rate.

$$(3) \quad \Delta Y_{it} = \mu_i + \lambda_t + \sum_{j=1}^2 \beta_j \Delta Y_{i,t-j} + \sum_{s=0}^2 \gamma_s Peg_{i,t-s} + \sum_{s=0}^2 \beta_s \Delta F_{i,t-s} + v_{i,t}$$

where  $Peg$  equals fiscal consolidation ( $\Delta F$ ) when the exchange rate regime is pegged. The sum of the responses to  $Peg$  and  $\Delta F$  show the effects of a consolidation occurring in a pegged exchange rate regime. The response to  $\Delta F$  shows the effect of a consolidation occurring in a floating regime.

**Figure 7. Estimated Response of Relative Prices to a 1 Percent of GDP Fiscal Consolidation (percent)**

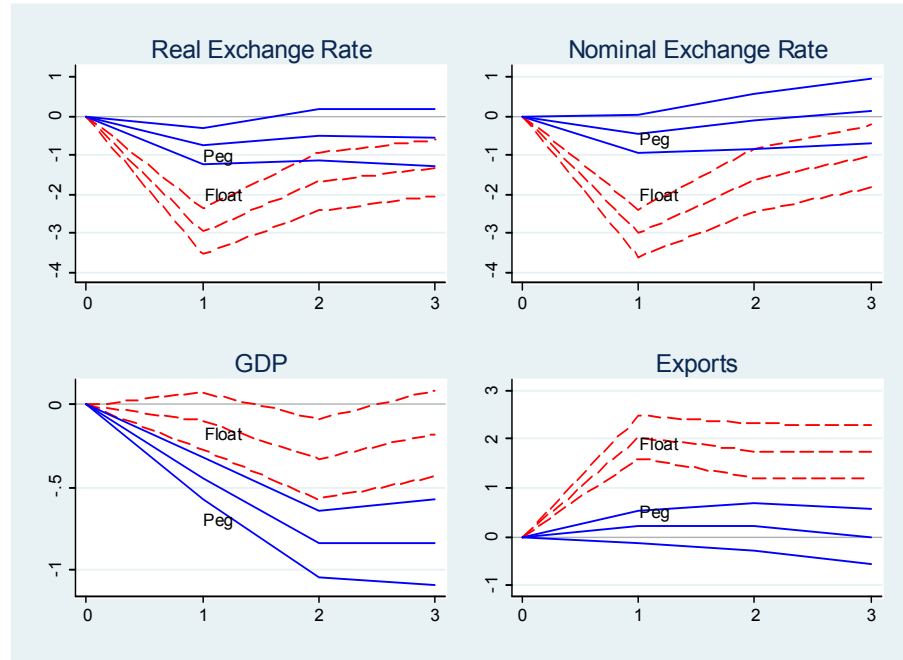


Note: Figure reports point estimates and one standard error bands.  $t=1$  denotes the year of fiscal consolidation. Estimates for real and nominal effective exchange rates and for domestic price differential are in percent. Estimates for nominal policy interest rate are in basis points.

The results suggest that the effect of fiscal consolidation on economic activity is more contractionary in pegged exchange rate regimes. A 1 percent of GDP fiscal consolidation reduces real GDP by 0.84 percent ( $t$ -statistic =  $-4.15$ ) within two years when the exchange rate is pegged, but by only 0.33 percent ( $t$ -statistic =  $-1.35$ ) in floating regimes (see Figure 8). Moreover, the real effective exchange rate depreciates more in the short term and real exports expand more in floating regimes than in pegged regimes. These findings are consistent with research, such as that of Ilzetzki, Mendoza, and Vegh (2010), that finds larger fiscal multipliers in economies operating fixed exchange rate regimes.



**Figure 8. Estimated Effect of a 1 Percent of GDP Fiscal Consolidation: Pegged vs Floating Exchange Rate Regime (percent)**



Note: Figure reports point estimates and one standard error bands.  $t=1$  denotes the year of fiscal consolidation.

Overall, this section suggests that a fall in the value of the currency and a rise in net exports mitigate the negative effect of fiscal consolidation on output. Excluding the rise in net exports, the contraction in domestic output is substantially greater than in the baseline.

## B. The Role of Composition

The literature suggests that evidence of expansionary effects is strongest for fiscal adjustments implemented mainly by cutting government spending rather than by increasing taxes. In this section, we therefore investigate how the response of economic activity depends on the composition of fiscal consolidation in terms of taxes and government spending. In particular, we re-estimate our baseline specification for two types of fiscal adjustments. The first type, denoted as “tax-based,” corresponds to fiscal consolidations in which the contribution of tax hikes to the adjustment is greater than that of spending cuts. The second type, denoted as “spending-based,” corresponds to years in which the contribution of spending cuts is greater than that of tax hikes.<sup>18</sup> To study this issue we estimate the following equation:

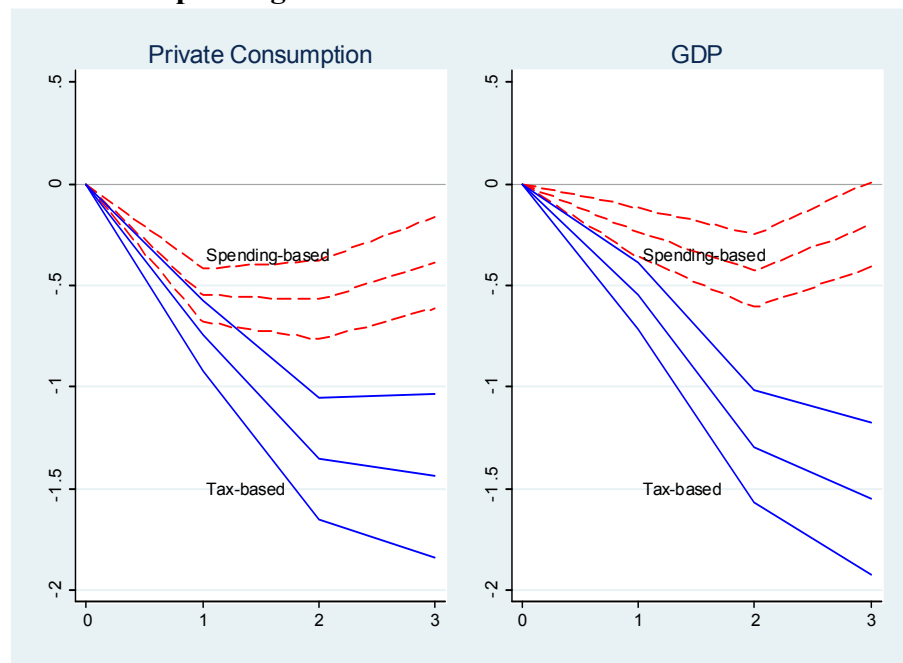
$$(4) \quad \Delta Y_{it} = \mu_i + \lambda_t + \sum_{j=1}^2 \beta_j \Delta Y_{i,t-j} + \sum_{s=0}^2 \gamma_s SB_{i,t-s} + \sum_{s=0}^2 \beta_s \Delta F_{i,t-s} + v_{i,t}$$

<sup>18</sup>Similar results are obtained if the tax-based type corresponds to years in which the contribution of tax hikes to fiscal consolidation was more than 60 percent of the total and the same holds for the spending-based type.

where  $SB$  equals fiscal consolidation ( $\Delta F$ ) when the consolidation is spending-based, and  $Y$  is the variable of interest. The sum of the responses to  $SB$  and  $\Delta F$  show the effects of a spending-based consolidation. The response to  $\Delta F$  shows the effect of a tax-based consolidation, and the response to  $SB$  shows the *difference* in the effects of a tax-based and a spending-based consolidation, which we also discuss below.

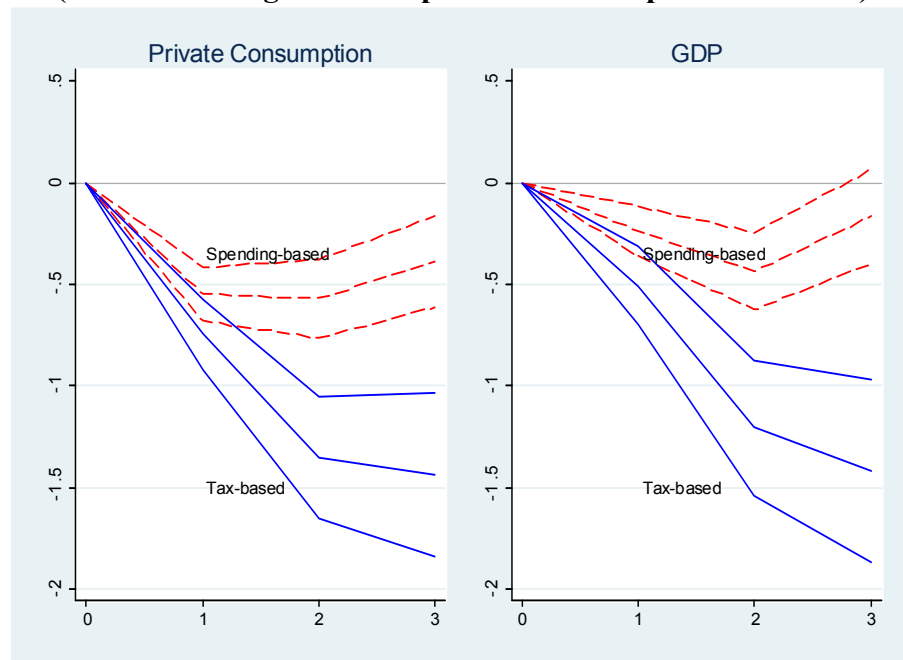
Figure 9 summarizes the estimated effects of the two types of fiscal consolidations. The results suggest that the effect of fiscal consolidation on private consumption and real GDP is negative even when the adjustment is based on spending cuts. For spending-based fiscal consolidations, the estimated effect on private consumption is  $-0.57$  ( $t$ -statistic = 2.95), while the estimated effect on real GDP is  $-0.43$  ( $t$ -statistic =  $-2.38$ ). The results are virtually identical for a subset of *large* spending-based fiscal consolidations (those greater than 1.5 percent of GDP) as Figure 10 reports. Thus, even in the case of large spending-based consolidations, there is little evidence of expansionary effects. However, the results also suggest that spending-based adjustments are less contractionary than tax-based adjustments, particularly after the first year. For tax-based adjustments, the estimated effect on private consumption is  $-1.35$  ( $t$ -statistic =  $-4.52$ ) within two years, while the estimated effect on real GDP is  $-1.29$  ( $t$ -statistic =  $-4.67$ ).

**Figure 9. Effect of a 1 Percent of GDP Fiscal Consolidation:  
Spending-based vs. Tax-based Consolidation**



Note: Figure reports point estimates and one standard error bands.  $t=1$  denotes the year of fiscal consolidation.

**Figure 10. Large Spending-based vs. Tax-based Consolidation  
(estimated marginal effect per additional 1 percent of GDP)**



Note: Figure reports point estimates and one standard error bands.  $t=1$  denotes the year of fiscal consolidation.

A natural question is whether the difference between the two types of fiscal adjustments might be due to the conduct of monetary policy. In particular, it might be that central banks provide a greater degree of monetary stimulus following spending cuts than following tax cuts. To investigate this possibility, Figure 11 presents the responses of real GDP, policy interest rates and inflation for the two types of adjustment. The estimated *difference* between them—the response to *SB* in Equation (4)—appears in the second row of the figure. The results suggest that the conduct of monetary policy differs significantly between the two types of adjustment, with more monetary policy easing following spending-based adjustments.

Existing estimates in the literature can help to assess how much of the difference in economic performance stems from the difference in monetary conditions. As Figure 11 reports, the difference in interest-rate responses between spending-based and tax-based fiscal consolidation is 71 basis points in the first year ( $t$ -statistic = 3.38). Meanwhile, the fall in real GDP for tax-based consolidation exceeds that for spending-based consolidation by 0.33 percentage point ( $t$ -statistic = 1.82) in the first year and by 0.83 percentage point ( $t$ -statistic = 2.73) in the second year. Therefore, for the difference in output outcomes to be attributable entirely to the different monetary policy responses, a 100 basis point rise in interest rates would need to reduce output by 0.46 percent in the first year ( $0.33/0.71$ ) and by 1.17 percent in the second ( $0.83/0.71$ ). Such impacts are inside the range of estimates found in the

empirical literature.<sup>19</sup> Thus, it appears that the difference in monetary policy responses accounts for much of the difference in output performance. For this reason, the results on the difference between spending- and tax-based adjustments are *not* consistent with the notion that an equal reduction in spending and taxes would stimulate economic activity (a *reverse* “balanced-budget multiplier”).

**Figure 11. Difference Between Effects of Spending-based and Tax-based Consolidation of 1 Percent of GDP**



Note: Figure reports the estimated difference ( $\Delta$ ) between the impact of spending-based and tax-based fiscal consolidations, along with one standard error bands.  $t=1$  denotes the year of fiscal consolidation. The policy rate results are in basis points; the other results are in percent.

These results are consistent with the notion that central banks view spending-based deficit cuts more favorably, possibly because they interpret them as a signal of a stronger commitment to fiscal discipline, and are therefore more willing to provide monetary stimulus following spending-based adjustments. It is also plausible that an increase in taxes, which sometimes involves indirect tax increases (excise duties and VAT rates), raises inflation, making interest rate cuts by an inflation-averse central bank less likely. In line with this notion, Figure 11 suggests that the inflation rate rises for tax-based adjustments.<sup>20</sup>

<sup>19</sup> Romer and Romer (2004) find that an unexpected 100 basis point increase in interest rates reduces output (measured by industrial production) by 4.3 percent after two years. Coibion (2011) finds that a 100 basis point innovation to the policy rate lowers industrial production by 2-3 percent. Sims (1992) estimates the maximum impact on industrial production at about -1.5 percent, while Bernanke and Mihov (1998) and Christiano, Eichenbaum, and Evans (1996) find a maximum effect on real GDP close to -1 percent.

<sup>20</sup> The inflation rate is calculated as the change in the log of the price level, where the price level is measured using the GDP deflator from the OECD Economic Outlook Database No. 88, code PGDP.

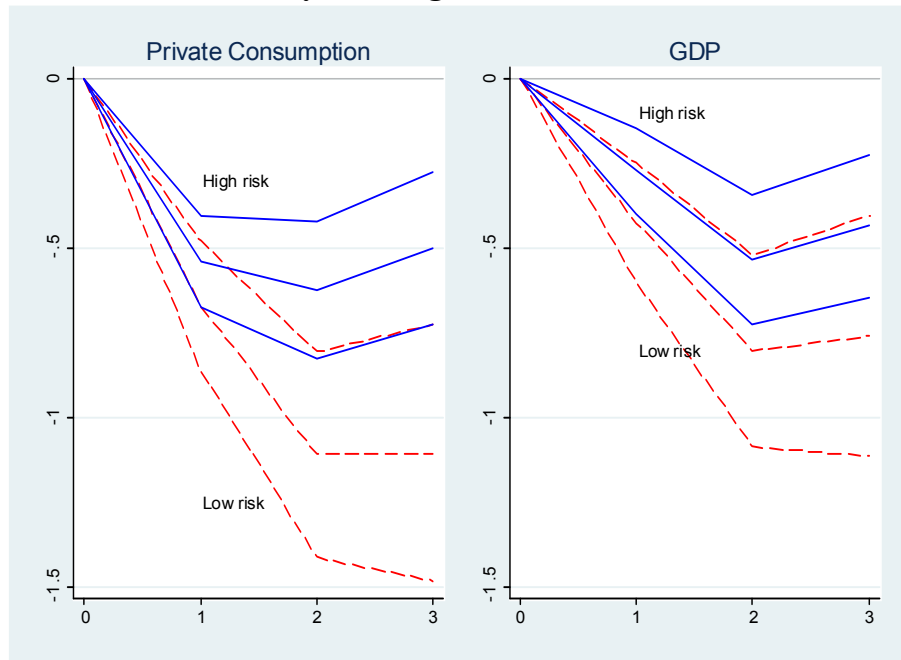
### C. The Role of Perceived Sovereign Risk

Expansionary fiscal consolidations may be more likely when doubts about government financial solvency raise borrowing costs, and where the consolidation could reduce those costs. To explore this issue in this section, we split the sample into two groups. The first group includes fiscal adjustments with high (above-median) perceived sovereign credit risk in the year before fiscal consolidation. The second group includes adjustments preceded by low (below-median) perceived sovereign credit risk. In particular, we estimate the following equation:

$$(5) \quad \Delta Y_{it} = \mu_i + \lambda_t + \sum_{j=1}^2 \beta_j \Delta Y_{i,t-j} + \sum_{s=0}^2 \gamma_s HiRisk_{i,t-s} + \sum_{s=0}^2 \beta_s \Delta F_{i,t-s} + v_{i,t}$$

where *HiRisk* equals fiscal consolidation ( $\Delta F$ ) when the perceived sovereign default risk is high in the year before the fiscal consolidation. The sum of the responses to *HiRisk* and  $\Delta F$  show the effects of consolidation in a high-risk economy, and the response to  $\Delta F$  shows the impact of consolidation in a low-risk economy. Our measure of perceived future sovereign default risk is, as above, the Institutional Investor Ratings index. Each country is rated on a scale of zero to 100, with a rating of 100 assigned to the lowest perceived sovereign default probability. The median level of this index for our 173 cases of deficit-driven changes in fiscal policy, 85, is close to that of Ireland and Portugal in 2009.

**Figure 12. Estimated Effect of a 1 Percent of GDP Fiscal Consolidation:  
By Sovereign Default Risk**



Note: Figure reports point estimates and one standard error bands.  $t=1$  denotes the year of fiscal consolidation.

The estimation results suggest that fiscal consolidation preceded by high perceived sovereign default risk is somewhat less contractionary (Figure 12). For the high-risk group (those with above median risk in the year preceding fiscal consolidation), the estimated effect of a 1 percent of GDP fiscal consolidation on private consumption is  $-0.62$  percent ( $t$ -statistic =  $-3.07$ ) within two years, whereas for the low-risk group, the estimated impact is  $-1.11$  percent ( $t$ -statistic =  $-3.65$ ). For real GDP, the estimation results for the high- and low-risk groups are  $-0.53$  ( $t$ -statistic =  $-2.81$ ) and  $-0.80$  ( $t$ -statistic =  $-2.83$ ), respectively. These findings are consistent with the notion that confidence or credibility effects help mitigate the negative impact of fiscal consolidation on economic activity in economies perceived as high risk and that low perceived sovereign default risk is associated with a sharper contraction. However, even for the high-risk group, the results tend to be contractionary and not statistically distinguishable from the low-risk group.

## V. CONCLUSION

This paper investigates the macroeconomic effects of fiscal consolidation in OECD economies, and assesses the evidence regarding the expansionary fiscal contractions hypothesis. Estimation results based on measuring discretionary changes in fiscal policy using cyclically-adjusted fiscal data—a practice often used in the literature—suggest that fiscal consolidation stimulates private domestic demand in the short term, providing support for the hypothesis. This result is consistent with a literature that finds that fiscal contractions can be expansionary. However, our analysis suggests that using cyclically-adjusted data to estimate the effects of fiscal consolidation biases the analysis toward overstating expansionary effects.

In contrast, estimation results based on fiscal actions identified directly from contemporaneous policy documents provide little support for the expansionary austerity hypothesis. In particular, we compile an international dataset of fiscal policy adjustments motivated by a desire to reduce the budget deficit and not in response to current and prospective economic conditions using the Romer and Romer (2010) historical approach. Based on the fiscal actions thus identified, our baseline specification implies that a 1 percent of GDP fiscal consolidation reduces real private consumption by 0.75 percent within two years, while real GDP declines by 0.62 percent. The baseline results survive a battery of robustness tests. Our main finding that fiscal consolidation is contractionary holds up in cases where one would most expect fiscal consolidation to raise private domestic demand. In particular, even large spending-based fiscal retrenchments are contractionary, as are fiscal consolidations occurring in economies with a high perceived sovereign default risk.

We also find that the decline in private consumption and private investment is mitigated by a rise in net exports associated with a fall in the value of the domestic currency. In line with the implications of standard models, this offsetting channel is less potent in economies with pegged exchange rates. The analysis can be extended, using this multi-country dataset, by exploring the effect of fiscal consolidation on the current account, thus contributing to the literature on the “twin deficits” hypothesis (see Bluedorn and Leigh (2011) for a start in this direction).

Our multi-country analysis could also be extended by collecting data on fiscal expansions such as tax reforms motivated by reducing marginal tax rates and encouraging long-run productivity growth. The only expansionary changes in fiscal policy currently included in our sample are those reflecting the end of temporary fiscal retrenchments. As Romer and Romer (2010) explain, policy changes based on long-run supply-side motivations can also be used to identify the impact of fiscal policy on economic activity. Including such additional fiscal policy actions in the sample would also raise the number of observed policy changes and potentially raise the precision of our estimates.

### **Appendix. Comparison of Fiscal Consolidation Series and Change in CAPB**

This appendix focuses on the largest discrepancies between the episodes identified by the historical and CAPB-based approaches. In particular, we examine the 13 cases for which the discrepancy between the two approaches exceeds 3 percent of GDP. These 13 cases are highlighted in Figure 1 above. We describe each of these 13 cases, and explain how we assess which provides a more accurate measure of deficit-driven fiscal consolidation.

#### ***Increase in CAPB larger than deficit-driven fiscal consolidation***

We start with the eight cases in the top-left corner of Figure 1, which contains periods identified as large fiscal consolidations based on the standard CAPB-based approach, but for which the policy record shows either only a small consolidation or no deficit-driven consolidation. We discuss the largest discrepancies first.

Netherlands (1996): The CAPB-to-GDP ratio increased by 7.0 percentage points, but the policy record indicates no fiscal consolidation measures motivated by deficit reduction. This discrepancy of 7.0 percent of GDP is mostly explained by the end of a large one-time capital transfer made in the previous year, 1995, which induced a negative change in the CAPB-to-GDP ratio in 1995 followed by an offsetting positive change in 1996. In particular, as reported in the 1995 *IMF Recent Economic Developments* report (p. 12): “In 1995, the approximate present value of all social housing subsidies from 1995 onward was to be paid in a one-time lump sum.” The *OECD Economic Surveys 1995/1996* (p. 29) estimates this lump-sum payment at 5.8 percent of GDP in 1995. So the end of this one-time transaction—which was unrelated to fiscal consolidation—explains the bulk (83 percent) of the discrepancy between our policy record and the CAPB-to-GDP ratio. Specific budgetary developments thus explain why the CAPB-based measure inaccurately identifies the size of the consolidation in 1996 and largely explain the gap between the two measures.

Germany (1996): The CAPB-to-GDP ratio increased by 6.4 percentage points, but the policy record indicates no fiscal consolidation measures motivated by deficit reduction, implying a discrepancy of 6.4 percent of GDP. The large increase in the CAPB-to-GDP ratio in 1996 reflected a large one-time capital transfer in 1995, which implied a *change* in the CAPB of 6.8 percentage points in 1995. As the 1996 *IMF Recent Economic Developments* reports (p. 18), a one-time transfer of Treuhand (Trust Agency) and East German housing debt to the general government amounting to 6.8 percent of GDP occurred in 1995. This one-time increase in capital transfers raised the general government deficit to 9.7 percent of GDP in

1995 (OECD Economic Outlook Database No. 88, code NLGQ). The next year, 1996, the one-time capital transfer ended and the government deficit fell to 3.3 percent of GDP, implying a change of 6.3 percentage points in 1996 (9.7–3.3). Therefore, the sharp increase in the CAPB in 1996 reflects the end of a one-time large accounting operation rather than deficit-driven fiscal consolidation. Specific budgetary developments thus explain why the CAPB-based measure inaccurately identifies the size of the fiscal consolidation and largely explain the gap between the two measures.

Japan (1999): The CAPB-to-GDP ratio rose by 4.9 percentage points, but the policy record shows no evidence of fiscal consolidation measures, implying a discrepancy of 4.9 percent of GDP. Indeed, Japan's fiscal consolidation program, initiated in 1997, was suspended at the end of 1998 following the onset of a severe recession, and there is no evidence of measures designed to cut the budget deficit until 2002, when the authorities announced a new multi-year program of fiscal consolidation (*OECD Economic Surveys* 2003, p. 15). Instead, as the *OECD Economic Surveys* 1998 reports (p. 84), the government made a one-time capital transfer in 1998 to the Japan National Railway, amounting to about ¥24.3 trillion (4.8 percent of GDP). The one-time nature of this capital transfer implied a change in the (general government) CAPB of about 4.8 percentage points of GDP in the *following* year, 1999. This increase is similar to the 4.9 percentage point change in the CAPB-to-GDP ratio computed by Alesina and Ardagna (2010). Specific budgetary developments thus explain why the CAPB-based measure inaccurately identifies the size of the consolidation and largely explain the gap between the two measures.

Finland (2000): The CAPB-to-GDP ratio increased by 4.1 percentage points, but this reflected an exceptional rise in revenue during an asset price boom and spending restraint motivated by reducing the risk of overheating. Therefore, despite the large increase in the CAPB-to-GDP ratio, we do not consider this as a fiscal consolidation motivated by a desire to reduce the budget deficit, and there is thus a discrepancy of 4.1 percent of GDP. Real stock prices rose by 70 percent in 1999 and by 86 percent in 2000 (Haver Analytics Database) and this led to an exceptional rise in cyclically-adjusted government revenue. The *OECD Economic Surveys* 2001-2002 explains (p. 37): “The 2000 budget outcome: a very high surplus was mainly due to one-off factors. In 2000, the rise in general government tax revenues on income and wealth was exceptionally strong (23 per cent) as substantial one-off revenues came on top of a sharp increase due to very rapid growth.” There was “a sharp and mostly temporary rise in property income of 1.1 per cent of GDP” (p. 37) in part reflecting an extraordinary dividend of the fully state-owned bank Leona. Also, taxes and proceeds from stock options and capital gains paid by households rose by about EUR 1.1 billion in 2000 (p. 120), or 0.83 percent of GDP. So extraordinary revenue gains unrelated to deliberate policy measures amounted to about 1.93 percent of GDP (1.1+0.83). On the other hand, a deliberate income tax *cut* motivated by supply-side considerations had a budgetary cost of about EUR 1 billion (p. 37), or 0.75 percent of GDP in 2000. On the spending side, cuts were put in place in response to rapid growth and the risk of overheating. In the Ministry of Finance press release of March 7 2000, the government expressed concern that the economy was overheating, recognized that monetary policy tightening was unlikely given Finland's



participation in EMU, and announced new expenditure restraint.<sup>21</sup> Spending cuts in 2000 amounted to about 2 percent of GDP and helped to restrain aggregate demand, as the 2001 *IMF Staff Report* (p. 8) reports: “staff estimates a fiscal withdrawal in 2000, brought about by a tightening of structural primary spending relative to GDP, of some 2 percentage points of GDP—strongly counteracting the monetary stimulus.” Finally, the overall soundness of the government finances at the time provides further evidence that the spending cuts were motivated primarily by preventing overheating rather than a desire to reduce the budget deficit (the budget was in surplus), as the *OECD Economic Surveys 1999-2000* explains (p. 11): “In this context, fiscal policy faces a dilemma as the cyclical situation would argue for an ever tighter fiscal stance, while the soundness of the fiscal position would normally provide considerable room for a much-needed reduction of the tax burden.” Overall, since much of the increase in the CAPB in 2000 was due to the rise in revenue due to the asset-price boom and to countercyclical spending restraint, we do not classify this as a case of fiscal consolidation motivated by deficit reduction. Specific economic and budgetary developments thus explain why the CAPB-based measure inaccurately identifies the size of the consolidation and largely explain the gap between the two measures.

Denmark (1986): The CAPB-to-GDP ratio increased by 3.6 percentage points, but this reflected fiscal tightening to restrain domestic demand and reduce overheating, as well as large capital gains. Deficit-reduction measures were implemented in the previous year, 1985, but part of these were of a one-time nature (bringing forward of payment by taxpayers by one year) and thus had a negative budgetary impact of DKr 5 billion (0.7 percent of GDP) the following year, as explained in the 1985 *IMF Recent Economic Developments* (p. 48). The discrepancy in this case is thus 4.3 percent of GDP (3.6+0.7). The 1987 *IMF Staff Report* explains that fiscal tightening in 1986 was motivated by restraining domestic demand to reduce overheating (p. 2): “In order to curb demand pressures and reduce overheating in certain sectors of industry, the Danish authorities introduced a package of fiscal measures in December 1985. This package included increased energy taxes and cutbacks in public works, as well as stepped up education and training to promote Labor market flexibility and reduce bottlenecks. Despite these measures, domestic demand continued to grow rapidly and pressures on the external accounts mounted. The authorities responded by introducing another package of fiscal measures in mid-March 1986, consisting mainly of increased, energy taxes. The two packages together were estimated to strengthen the budget by some 2½ percent of GDP, and to move the public sector into significant surplus. The authorities expected that these measures would hold the growth of domestic demand to less than 3 percent in 1986, and reduce the external current account deficit to about 2¾ percent of GDP...” In addition, “Concern over the strength of domestic demand and the widening external deficit led the authorities to introduce yet another fiscal package in October 1986, the third within a year. The main measure was a 20 percent tax on net interest payments on consumer credit, aimed at discouraging borrowing for private consumption” (p. 6). Finally,

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<sup>21</sup> Countercyclical spending restraint was also put in place in 1999 in response to rapid growth and the risk of overheating, as the *OECD Economic Survey 1998-1999* explains (p. 33): “The draft 1999 budget included FIM 4 billion (0.6 per cent of GDP) additional spending cuts compared to the preliminary expenditure guideline aimed at limiting the risk of overheating.”

cyclically-adjusted government revenue was boosted by a number of special factors related to the 1986 boom but not related to deliberate tax hikes, as the 1987 *IMF Staff Report* explains (p. 10): “Large capital gains in 1985 had resulted in higher corporate tax revenue from financial institutions in 1986.” Thus, much of the increase in the CAPB-to-GDP ratio in 1986 was the result of deliberate tightening to reduce overheating and exceptionally high revenues due to strong growth and capital gains. Therefore, we do not consider this as a fiscal consolidation motivated by a desire to reduce the budget deficit. Specific economic and budgetary developments largely explain the gap between the two measures.

Belgium (1984): The CAPB-to-GDP ratio increased by 4.7 percentage points, but the policy record indicates fiscal consolidation measures amounting to 0.7 percent of GDP, implying a discrepancy of 4.0 percent of GDP. At the same time, the CAPB-to-GDP ratio reported in the OECD Economic Outlook Database No. 88 (code NLGXQA) rises by 4.1 percentage points in 1984. Thus, 0.6 percentage points of the discrepancy (4.7–4.1) is due to differences in the CAPB versions. Of the remaining 3.4 percentage point discrepancy (4.1–0.7), most is explained by the end of a one-time capital transfer made in 1983. In particular, the OECD Economic Outlook Database No. 88 indicates an increase in capital transfers (code TKPGQU) in 1983 that had an impact on the *change* in the CAPB-to-GDP ratio of –2.1 percentage points in 1983 and 2.1 percentage points in 1984 when it ended. The policy record suggests that this increase in capital transfers in 1983 reflected “direct aid to industry” (*OECD Economic Surveys* 1985/1986, pp. 25–26). Since the aid was motivated by supporting economic activity, we do not subtract its budgetary cost from our series of deficit-driven fiscal policy changes. The end of this spending in 1984 thus explains about two-thirds (2.1/3.4) of the remaining discrepancy between the CAPB-based approach and our action-based approach. Specific budgetary developments thus explain why the CAPB-based measure inaccurately identifies the size of deficit-driven fiscal consolidation and helps explain the gap between the two measures.

Japan (2006): The CAPB-to-GDP ratio increased by 4.1 percentage points, but the policy record indicates fiscal consolidation measures amounting to only 0.7 percent of GDP, implying a discrepancy of 3.4 percent of GDP. At the same time, the CAPB-to-GDP ratio reported in the *OECD Economic Surveys* 2008 rose by only 3.2 percentage points in 2006 (Table 3.1, p. 65, line 4). Thus, some (0.9 percentage point) of the discrepancy is due to differences in the CAPB versions. In addition, the *OECD Economic Surveys* 2008 indicates that a large part of the CAPB increase resulted from one-time asset operations that improved the fiscal balance in 2006 but were unrelated to tax hikes or spending cuts.<sup>22</sup> Without these one-time asset operations, the *OECD Economic Surveys* 2008 estimates that the CAPB-to-GDP ratio increased by only 0.4 percentage point in 2006 (*OECD Economic Surveys* 2008, Table 3.1, p. 65, line 8). Therefore, once the change in the CAPB-to-GDP ratio is adjusted to remove the influence of asset operations unrelated to tax hikes and spending cuts, the

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<sup>22</sup> The *OECD Economic Surveys* 2008 reports that the one-time factors include receipts of funds by the government from corporate pension funds, receipts associated with the privatization of highway corporations, and receipts from the “transfer of the reserve fund from the Fiscal Loan Fund Special Account to the central government” (p. 65).

increase in the CAPB-to-GDP ratio is close to our estimate of deficit-driven fiscal consolidation of 0.7 percent of GDP. Specific budgetary developments thus explain why the CAPB-based measure inaccurately identifies the size of deficit-driven fiscal consolidation and largely explain the gap between the two measures.

Finland (1988): The CAPB-to-GDP ratio increased by 3.4 percentage points, but this reflected a tightening in fiscal policy primarily motivated by restraining domestic demand in an overheated economy, as well as the end of one-time stimulus introduced in 1987. The 1988 *IMF Staff Report* explains (p. 6): “The authorities decided to tighten the policy stance in the 1988 fiscal budget to help restrain domestic demand and influence expectations ahead of the 1988 wage round. The principal measures were to limit the inflation adjustment of tax brackets to 2 percent and allow no inflation adjustment of tax allowances. In addition, fuel taxes were raised and indirect taxes on alcoholic beverages and tobacco were increased. In January 1988, indirect taxes were increased further. In early 1988, monetary policy was also tightened.” Similarly, the *OECD Economic Surveys 1987/1988* reports that “The 1988 budget foresees a tightening of the fiscal policy stance because of concerns about rapid private consumption growth and a deteriorating current account balance” (p. 15). The positive change in the CAPB also reflected end in 1988 of one-time fiscal stimulus measures implemented in 1987 of about 1 percent of GDP (1988 *IMF Staff Report*, p. 23). Overall, since the rise in the CAPB reflected the end of one-off measures in 1987 and a countercyclical fiscal tightening to restrain domestic demand in 1988, we do not classify this year as one of fiscal consolidation motivated by a desire to reduce the budget deficit. Specific economic and budgetary developments thus explain why the CAPB-based measure inaccurately identifies the size of the deficit-driven consolidation and largely explain the gap between the two measures.

### ***Deficit-driven fiscal consolidation larger than increase in CAPB***

Next, we turn to the five cases in the bottom-right corner of Figure 1—periods identified as large deficit-driven consolidations based on the historical approach, but that feature either a fall in the CAPB or a small increase. Again, we discuss the largest discrepancies first.

Ireland (2009): The CAPB-to-GDP ratio *fell* by 4.4 percentage points, but the historical record reports fiscal consolidation measures of 4.7 percent of GDP, implying a discrepancy of 9.1 percentage points. The fall in the CAPB reflects the impact of the sharp recession in 2009 during which real stock and house prices fell by 44 percent and 20 percent, respectively (Haver Analytics Database). For reasons discussed above, such sharp contractions tend to have a negative impact on the CAPB, causing the CAPB-based approach to inaccurately identify the size of consolidation measures. Indeed, while the CAPB-to-GDP ratio computed by Alesina and Ardagna (2010) falls by 4.4 percentage points, the CAPB-to-GDP ratio reported in the OECD Economic Outlook Database No. 88 (code NLGQA) falls by 2.7 percentage points, suggesting that 1.7 percentage points of the discrepancy (4.4–2.7) is due to the differences in the CAPB versions. Of the remaining 7.4 percent of GDP discrepancy, 1.2 percentage points is driven by a decline in cyclically-adjusted tax revenue directly related to asset prices, as the 2009 *Budget* explains (Macroeconomic and Fiscal Framework, 2009-2013, p. 9): “The decline in capital taxes (Capital Gains Tax, Capital

Acquisitions Tax and Stamp Duty) is of particular note. From the mid-part of this decade, revenue from these taxes increased significantly, driven by the strength of the construction sector and by increasing asset values.... From 2007 onwards, however, revenue from these tax heads has been adversely affected by negative developments in property and financial markets. At this stage, the overall yield from capital taxation is back at the levels last seen in the early part of this decade. This development presents a significant gap in Exchequer revenue which will not be replenished as the economic cycle improves over the coming years. As such this represents a significant structural gap in the revenue base.” In particular, these capital taxes fell by about 55 percent in 2009 to €1.5 billion (December 2009 *Ireland Stability Program*, Table 1b), representing a fall in cyclically-adjusted revenue of 1.2 percent of GDP. Also, with real private consumption contracting by 7.5 percent in 2009, the cyclically-adjusted indirect tax-to-GDP ratio fell by 1.1 percentage points (OECD Economic Outlook Database No. 88, code TINDA) despite a deliberate hike in the VAT rate and in excise duties (October 2008 *Ireland Stability Program*, p. D.16). Finally, discretionary spending on banking sector support had a budgetary impact of 2.5 percent of GDP in 2009. In particular, support provided by the government to Anglo Irish Bank in June 2009 amounted to €4 billion, or 2.5 percent of GDP (see Ireland Department of Finance *Information Note on Ireland’s Reported 2009 General Government Deficit* released on April 22, 2010). Since this spending was motivated by a response to economic developments, we do not subtract it from the budgetary impact of fiscal consolidation measures. Overall, excluding the cyclically-adjusted revenue decline and the banking support in response to economic developments, the CAPB-to-GDP ratio rises by 2.1 percentage points ( $-2.7+1.2+1.1+2.5$ ), which represents a large fiscal consolidation and is substantially closer to our estimated size of fiscal consolidation than the baseline change in the CAPB-to-GDP ratio is. Specific economic and budgetary developments thus explain why the CAPB-based measure inaccurately identifies the size of the consolidation and largely explain the gap between the two measures.

Germany (1995): The CAPB-to-GDP ratio *fell* by 6.7 percentage points, but the policy record indicates fiscal consolidation measures motivated by deficit reduction worth 1.1 percent of GDP, implying a discrepancy of 7.8 percent of GDP ( $6.7+1.1$ ). As discussed above, a large one-time capital transfer of Treuhand (Trust Agency) and East German housing debt to the general government account implied a *change* in the (general government) CAPB of  $-6.8$  percentage points in 1995 (1996 *IMF Recent Economic Developments*, p. 18). This one-time transfer explains the bulk of the discrepancy between the action-based and CAPB-based measure of fiscal consolidation. Specific budgetary developments thus explain why the CAPB-based measure inaccurately identifies the size of the consolidation and largely explain the gap between the two measures.

Japan (1998): The CAPB-to-GDP ratio *fell* by 5.4 percentage points, but the policy record indicates fiscal consolidation measures motivated by deficit reduction worth 0.5 percent of GDP, implying a discrepancy of 5.9 percent of GDP ( $5.4+0.5$ ). As the *OECD Economic Surveys* 1998 reports (p. 84), the financial debt of the Japan National Railway, amounting to about ¥24.3 trillion (4.8 percent of GDP), was assumed by the general government account in 1998 implying a change in the CAPB of  $-4.8$  percent of GDP. In addition, the April 1998 fiscal stimulus package introduced in response to the recession (1998 *IMF Staff Report*, p. 8)

implied an additional negative impact on the CAPB in 1998. Therefore, the change in the CAPB in 1998 was influenced by two developments unrelated to deficit reduction: a large accounting operation and a fiscal stimulus in response to the recession. These two factors also explain the bulk of the discrepancy between our action-based estimate of 0.5 percent of GDP and the change in the CAPB-to-GDP ratio of  $-5.4$  percentage points. Therefore, our action-based measure provides a more accurate estimate of deficit-driven fiscal consolidation.

Spain (1993): The CAPB-to-GDP ratio *fell* by 3.3 percentage points, but the policy record indicates fiscal consolidation measures totaling 1.1 percent of GDP, implying a discrepancy of 4.4 percent of GDP. The fall in the CAPB reflects the impact of the sharp recession associated with the European Exchange Rate Mechanism (ERM) crisis (GDP contracted by 1 percent while unemployment rose about 4 percentage points in 1993). As discussed above, such sharp contractions in economic activity can make the CAPB-based approach inaccurately identify the size of fiscal consolidation measures. Indeed, the CAPB-to-GDP ratio reported in the OECD Economic Outlook Database No. 88 (code NLGXQA) falls only by 0.6 percent of GDP in 1993, suggesting that the bulk of the discrepancy (2.7 percentage points) is due to the differences in the CAPB versions. Regarding the remaining 1.7 percentage point discrepancy (4.4–2.7), the 1994 *IMF Recent Economic Developments* (p. 11) reports a one-time financial transaction with a budgetary *cost* of Ptas 935 billion (1.5 percent of GDP) in 1993 to cover operations that took place prior to 1993. Thus, specific economic and budgetary developments explain why the CAPB-based measure inaccurately identifies the size of the consolidation and largely explain the gap between the two measures.

Italy (1993): The CAPB-to-GDP ratio increased by 0.2 percentage points in 1993, but the policy record reports a large consolidation of 4.5 percent of GDP, implying a discrepancy of 4.3 percent of GDP (4.5–0.2). A plausible reason for this discrepancy is that there was a sharp economic contraction in 1993 associated with the ERM crisis, which, for the reasons explained above, would cause the CAPB-based approach to be inaccurate. Indeed, the CAPB-to-GDP ratio from the OECD Economic Outlook Database No. 88 (code NLGXQA) increases by 1.8 percentage points, which is consistent with a large fiscal consolidation in 1993. However, even this larger estimate of fiscal consolidation is smaller than what is in the policy record. In particular, the *OECD Economic Surveys* 1994 (pp. 44-47), 1993 *IMF Recent Economic Developments* (pp. 7-8), and the 1993 *Banca d'Italia Annual Report* (p. 145) all report that fiscal consolidation measures in 1993 amounted to more than 4.0 percent of GDP. The source of the remaining discrepancy vis-à-vis the change in the CAPB-to-GDP ratio could plausibly reflect the fact that, during sharp recessions, cyclical adjustment techniques tend to allocate part of the fiscal worsening due to automatic stabilizers to a fall in the CAPB. This problem causes the increase in the CAPB to understate the size of fiscal consolidation measures. Overall, in this case, there was a crisis and a large economic contraction that could plausibly have caused the CAPB-based approach to be highly inaccurate.

This examination of the 13 largest disagreements between the two approaches suggests that our action-based approach more accurately identifies the size of deficit-driven fiscal consolidation. We find 12 cases where we are able to identify specific economic or budgetary

developments that cause the CAPB-based measure used in the literature to inaccurately identify the size of deficit-driven fiscal consolidation and that largely explain the gap between the two measures. In one case (Italy in 1993), there was a sharp economic contraction that could plausibly have caused the CAPB-based approach to be highly inaccurate. We find no cases where there is evidence that our action-based measure was less accurate.

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