

This chapter examines the effects of fiscal consolidation—tax hikes and government spending cuts—on economic activity. Based on a historical analysis of fiscal consolidation in advanced economies, and on simulations of the IMF’s Global Integrated Monetary and Fiscal Model (GIMF), it finds that fiscal consolidation typically reduces output and raises unemployment in the short term. At the same time, interest rate cuts, a fall in the value of the currency, and a rise in net exports usually soften the contractionary impact. Consolidation is more painful when it relies primarily on tax hikes; this occurs largely because central banks typically provide less monetary stimulus during such episodes, particularly when they involve indirect tax hikes that raise inflation. Also, fiscal consolidation is more costly when the perceived risk of sovereign default is low. These findings suggest that budget deficit cuts are likely to be more painful if they occur simultaneously across many countries, and if monetary policy is not in a position to offset them. Over the long term, reducing government debt is likely to raise output, as real interest rates decline and the lighter burden of interest payments permits cuts to distortionary taxes.

Budget deficits and government debt soared during the Great Recession. In 2009, the budget deficit averaged about 9 percent of GDP in advanced economies, up from only 1 percent of GDP in 2007.¹ By the end of 2010, government debt is expected to reach about 100 percent of GDP—its highest level in 50 years. Looking ahead, population aging could create even more serious problems for public finances.

In response to these worrisome developments, virtually all advanced economies will face the challenge of fiscal consolidation. Indeed, many governments are already undertaking or planning

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¹Advanced economies are defined as the 33 economies so designated based on the *World Economic Outlook* classification described in the Statistical Appendix.

large spending cuts and tax hikes. An important and timely question is, therefore, whether fiscal retrenchment will hurt economic performance.

Although there is widespread agreement that reducing debt has important long-term benefits, there is no consensus regarding the short-term effects of fiscal austerity. On the one hand, the conventional Keynesian view is that cutting spending or raising taxes reduces economic activity in the short term. On the other hand, a number of studies present evidence that cutting budget deficits can stimulate the economy even in the short term. The notion that fiscal retrenchment stimulates growth in the short term is often referred to as the “expansionary fiscal contractions” hypothesis. A key factor explaining such effects is an improvement in household and business confidence.² The truth could be a mixture. For example, it may be that the short-term effects are usually contractionary, but that expansionary effects can occur when government solvency is in question, or when the consolidation is structured in a way that increases confidence.

This chapter offers new evidence regarding these important issues by studying fiscal consolidation in advanced economies over the past 30 years. It examines budget policies to identify periods of fiscal consolidation, and then uses simple statistical techniques to investigate the short-term growth effects of consolidation and how those effects are influenced by such factors as monetary policy, international trade, the form of the consolidation, and perceived sovereign risk. To complement the historical analysis, the chapter employs simulations of the IMF’s GIMF to explore additional issues such as the long-term effects of debt reduction. In particular, the chapter attempts to answer the following questions:

²For a summary of how such expansionary effects can arise in the short term, see, for example, Alesina (2010). Under some strict assumptions, Ricardian equivalence can imply that fiscal consolidation has no impact on economic activity, as changes in private demand exactly offset changes in government demand.

- What are the short-term effects of fiscal retrenchment on economic activity? Does output typically contract or expand in response to tax hikes and spending cuts? What happens to unemployment?
- What factors dampen or exacerbate the short-term effects? In particular, what are the roles of monetary policy, the composition of the package (taxes versus spending), and the perceived risk of sovereign default in shaping the outcome? What are the consequences of many countries cutting deficits at the same time?
- Does fiscal consolidation have different effects when interest rates are near zero? Interest rates have rarely been near zero in the past—with the exception of Japan since the 1990s—but they are near zero in many advanced economies today. Would fiscal consolidation in this environment be more or less painful than in the past?
- What are the long-term effects on output of reducing government debt? Do the long-term effects depend on whether the savings from lower interest payments are used to provide tax cuts or to finance new spending?

Given the importance of these issues, this chapter is not the first to address them. In particular, previous work by Giavazzi and Pagano (1990, 1996), Alesina and Perotti (1995, 1997), and Alesina and Ardagna (1998, 2010) has been extremely influential in the debate regarding the consequences of fiscal adjustment.³ A key conclusion of these studies is that fiscal adjustments tend to be expansionary when they rely primarily on spending cuts.⁴ However, these studies often identify periods of fiscal consolidation using a statistical concept—the increase in the cyclically adjusted budget surplus—that, as this chapter shows, is a highly imperfect measure of actual policy actions. The chapter finds that this way of selecting cases of consolidation

³Note that the literature on fiscal consolidation is part of a broader empirical literature on the effects of fiscal policy, which includes, among others, the work of Blanchard and Perotti (2002), Barro and Redlick (2009), Hall (2009), Ramey and Shapiro (1998), Ramey (2009), and Romer and Romer (2010).

⁴Many studies have followed the Alesina and Perotti (1995) methodology, including Broadbent and Daly (2010), Tsibouris and others (2006), and Von Hagen and Strauch (2001).

biases the analysis toward downplaying contractionary effects and overstating expansionary ones.

To avoid the problems associated with these existing studies, we use an alternative method for identifying periods of fiscal consolidation. In particular, our approach focuses on policy actions intended to reduce the budget deficit. As we explain later, this approach helps us obtain more accurate estimates of the effects of tax hikes and spending cuts on economic activity. Methodologically, our approach is close to that of Romer and Romer (1989, 2010), who examine the effects on U.S. output of changes in monetary policy and tax rates in the United States.

The main findings of the chapter are as follows:

- Fiscal consolidation typically has a contractionary effect on output. A fiscal consolidation equal to 1 percent of GDP typically reduces GDP by about 0.5 percent within two years and raises the unemployment rate by about 0.3 percentage point. Domestic demand—consumption and investment—falls by about 1 percent.
- Reductions in interest rates usually support output during episodes of fiscal consolidation. Central banks offset some of the contractionary pressures by cutting policy interest rates, and longer-term rates also typically decline, cushioning the impact on consumption and investment. For each 1 percent of GDP of fiscal consolidation, interest rates usually fall by about 20 basis points after two years. The model simulations also imply that, if interest rates are near zero, the effects of fiscal consolidation are more costly in terms of lost output.⁵
- A decline in the real value of the domestic currency typically plays an important cushioning role by spurring net exports and is usually due to nominal depreciation or currency devaluation. For each 1 percent of GDP of fiscal consolidation, the value of the currency usually falls by about 1.1 percent, and the contribu-

⁵For simplicity, the model simulations ignore the possibility that the central bank responds to fiscal consolidation using unconventional monetary tools, such as quantitative and credit easing. To the extent that such tools would be used to support output, the simulations may overstate the impact of the zero interest rate floor.

tion of net exports to GDP rises by about 0.5 percentage point. Because not all countries can increase net exports at the same time, this finding implies that fiscal contraction is likely to be more painful when many countries adjust at the same time.

- Fiscal contraction that relies on spending cuts tends to have smaller contractionary effects than tax-based adjustments. This is partly because central banks usually provide substantially more stimulus following a spending-based contraction than following a tax-based contraction. Monetary stimulus is particularly weak following indirect tax hikes (such as the value-added tax, VAT) that raise prices.
- Fiscal retrenchment in countries that face a higher perceived sovereign default risk tends to be less contractionary. However, even among such high-risk countries, expansionary effects are unusual.
- Model simulations suggest that over the long term, reducing debt is likely to be beneficial. In particular, the GIMF simulations considered here suggest that lower government debt levels reduce real interest rates, which stimulates private investment. Also, the lower burden of interest payments creates fiscal room for cutting distortionary taxes. Both of these effects raise output in the long term. Overall, the simulations imply that for every 10 percentage point fall in the debt-to-GDP ratio, output rises by about 1.4 percent in the long term.

The remainder of the chapter is organized as follows. The first section provides an empirical assessment of the short-term impact of fiscal consolidation using a new database of historical episodes of fiscal consolidation during 1980–2009. The second section complements the historical analysis by conducting model simulations to address additional issues, such as the consequences of being near the zero bound on nominal interest rates, the impact of having many countries consolidating simultaneously, and the long-term consequences of reducing debt levels. The concluding section draws lessons from the analysis for countries considering fiscal consolidation in the current environment.

Looking at History: What Is the Short-Term Impact of Fiscal Consolidation?

In this section, we examine the history of fiscal retrenchment in advanced economies over the past 30 years and evaluate the short-term effects on economic activity. The section starts by explaining how we identify periods of fiscal consolidation, and contrasts our approach to the standard approach used in previous studies. It then reports the estimated effects of fiscal consolidation, and compares our results with those based on the standard approach.

Identifying Cases of Fiscal Consolidation

The usual approach to identifying historical cases of fiscal retrenchment is to focus on swings in the cyclically adjusted primary budget balance (CAPB). 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. For example, Alesina and Perotti (1995) and Alesina and Ardagna (2010) correct the primary surplus for year-to-year changes in the unemployment rate.⁶ Cyclical adjustment offers an intuitive way of dealing with the fact that tax revenue and government spending move automatically with the business cycle. The idea is that, once they are cyclically adjusted, changes in fiscal variables reflect policymakers' decisions to change tax rates and spending levels. A sharp increase in the CAPB would therefore provide evidence of deliberate deep deficit cuts.

However, the conventional approach used to identify cases of fiscal consolidation is far from perfect and can bias the results toward finding

⁶In particular, these studies use a method proposed by Blanchard (1990) following which “the cyclically adjusted value of the change in a fiscal variable is the difference between a measure of the fiscal variable in period t computed as if the unemployment rate were equal to the one in $t - 1$ and the actual value of the fiscal variable in year $t - 1$ ” (Alesina and Ardagna, 2010, p. 7). Most studies also use a statistical threshold for identifying large increases in the CAPB. For example, Alesina and Ardagna (2010) identify a period of fiscal adjustment as a year in which the ratio of the CAPB to GDP improves by at least 1.5 percentage points.

expansionary effects.⁷ Two key problems relate to measurement errors and to policy motivation:

- The first problem is that cyclical adjustment methods suffer from measurement errors that are likely to be correlated with economic developments. For example, standard cyclical-adjustment methods fail to remove swings in government tax revenue associated with asset price or commodity price movements from the fiscal data, resulting in changes in the CAPB that are not necessarily linked to actual policy changes.⁸ Thus, including episodes associated with asset price booms—which tend to coincide with economic expansions—and excluding episodes associated with asset price busts from the sample introduces an expansionary bias.⁹ For example, in the case of Ireland in 2009, the collapse in stock and housing prices induced a sharp reduction in the CAPB despite the implementation of tax hikes and spending cuts totaling 4.5 percent of GDP.¹⁰
- The second problem with the standard approach is that it ignores the motivation behind fiscal actions. Thus, it omits years during which actions aimed at fiscal consolidation were followed by an adverse shock and an offsetting discretionary stimulus. For example, imagine that two countries adopt identical consolidation policies, but then one is hit by an adverse shock and so adopts discretionary stimulus, while the other is hit with a favorable shock. Here, the change in the CAPB would show a smaller increase for the

⁷Appendix 3.3 provides a number of specific examples that illustrate the problems associated with the conventional approach.

⁸As Morris and Schuknecht (2007) 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” (p. 4).

⁹A 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 picked up by the standard approach, which searches for an increase in the CAPB.

¹⁰See 2009 *OECD Economic Surveys: Ireland*; EC (2008); and 2009 IMF Staff Report for Ireland (Country Report No. 09/195).

first country than for the second country, despite the presence of identical consolidation measures. The standard approach would therefore tend to miss cases of consolidation followed by adverse shocks, because there may be little or no rise in the CAPB despite the consolidation measures. The case of Germany in 1982 provides a real-world counterpart to this hypothetical example: the CAPB-to-GDP ratio rose by only 0.4 percentage point, despite the fact that the authorities implemented fiscal austerity measures amounting to about 1.4 percent of GDP.¹¹ The impact of these measures on the CAPB was partly offset by countercyclical stimulus measures introduced in response to the recession that year.¹²

Moreover, the problems with the usual approach are not just hypothetical or limited to a few specific cases. As we show in Appendix 3.3, the change in the CAPB-to-GDP ratio is an unreliable guide regarding the presence of fiscal consolidation. The standard approach tends to select periods associated with favorable outcomes but during which no austerity measures were actually taken. It also tends to omit cases of fiscal austerity associated with unfavorable outcomes.

Therefore, rather than focusing on the CAPB, we look at policy actions. In particular, we identify cases in which the government implemented tax hikes or spending cuts (at the general government level) to reduce the budget deficit and put public finances on a more sustainable footing. Thus, whereas the usual strategy identifies periods of consolidation based on successful (cyclically adjusted) budget *outcomes*, our approach identifies episodes based on fiscal policy *actions* motivated by deficit reduction, irrespective of the outcomes.

¹¹The source of the data for the CAPB-to-GDP ratio is Alesina and Ardagna (2010). The concept of government used for the CAPB is that of the general government.

¹²For similar reasons, the standard approach is likely to identify cases of fiscal tightening that are unrelated to deficit-reduction concerns. For example, imagine that two countries adopt no consolidation measures, but then one is hit by a favorable shock and so adopts countercyclical tightening to cool the economy, while the other does nothing. Here, the change in the CAPB would show tightening for the first country, and no change for the second country, despite the lack of consolidation measures in both countries. The standard approach would therefore tend to include cases associated with economic booms despite the lack of measures aimed at fiscal consolidation.

Although our action-based approach addresses the problems associated with the conventional approach to identifying fiscal consolidation, both the standard approach and our approach *are* subject to two additional criticisms. 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 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 approach and our approach. Thus, biases may remain even in our approach, although it is unclear in which direction they would go overall.

In addition, in contrast to some previous studies, we do not focus on periods of “sustained” (multiyear) fiscal consolidation. A key problem with such an approach is that governments may choose to interrupt a program of fiscal austerity due to unfavorable output developments. For example, Japan’s six-year fiscal adjustment plan, initiated in 1997, was suspended in December 1998 following a sharp economic downturn. In contrast, favorable output developments are likely to help governments complete a sustained fiscal consolidation. Therefore, focusing on cases of sustained consolidation would bias toward finding expansionary effects.

In sum, not only does the standard approach sometimes select years that bear no relation to actual changes in fiscal policy, it also biases the results toward downplaying contractionary effects and overstating the expansionary effects of fiscal adjustment. In contrast, a key contribution of this chapter is to reduce these bias problems and therefore allow us to better estimate the causal impact on output of fiscal consolidation.

Implementing the Action-Based Approach

Our approach requires identifying policy actions motivated by deficit reduction. Therefore, we examine accounts and records of what countries actually did. In particular, we analyze *OECD Economic Surveys*, *IMF Staff Reports*, *IMF Recent Economic*

Developments reports, country budget documents, and additional country-specific sources.¹³ The estimated effect on the budget deficit is based on these sources. In this respect, our methodology is closely related to the “narrative approach” proposed by Romer and Romer (1989, 2004, 2010).¹⁴ The analysis also distinguishes between permanent and temporary measures. Temporary measures are recorded as generating positive savings when they are introduced and negative savings when they expire.

The sample includes the fiscal actions taken to reduce the deficit in 15 advanced economies during 1980–2009.¹⁵ The main reason the analysis focuses on advanced economies is that fiscal policy adjustment needs are particularly large, on average, for the group of advanced economies, as discussed in the IMF’s May 2010 *Fiscal Monitor* (IMF, 2010).

For the 15 countries covered—Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Portugal, Spain, Sweden, the United Kingdom, and the United States—we identified 173 years in which there were budgetary measures aimed at fiscal consolidation. Thus, on average across the sample countries, about 40 percent of years saw the introduction of budgetary measures aimed at reducing the deficit (Figure 3.1). The average size of fiscal consolidation was about 1 percent of GDP per year, but the range was wide (see Figure 3.1). Fiscal contractions of more

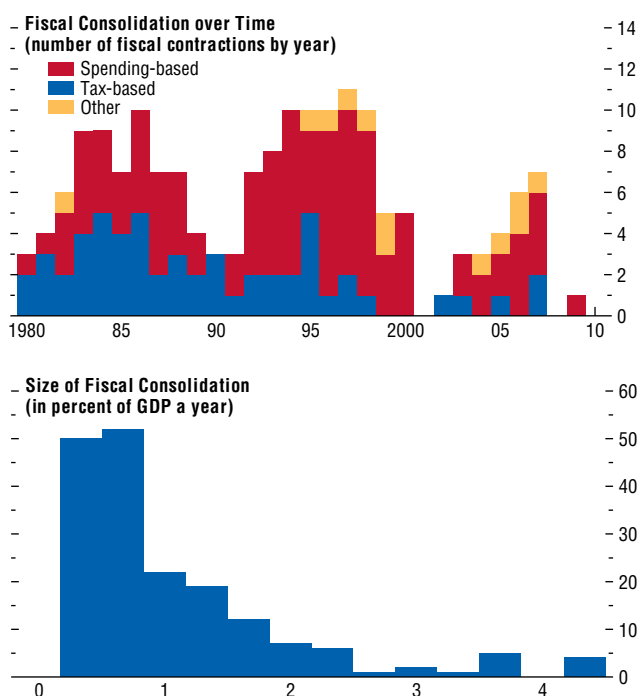
¹³ Additional country-specific sources used to clarify the motivation behind the fiscal consolidation measures include Kuttner and Posen (2002), Nakagawa (2009), and Takahashi and Tokuoaka (2010) for Japan; Lawson (1992) for the United Kingdom; and Romer and Romer (2009) and the sources cited therein, for the United States. We find that the estimates of the measures’ expected impact on the fiscal deficit at the time they were implemented are similar across the various sources.

¹⁴ Focusing on the United States, Romer and Romer (2010) use the narrative record, such as congressional reports, to identify the size and motivation for all post–World War II tax policy actions. They find that only a small share of observed changes in government revenue reflect actual changes in tax policy and use the changes in tax policy identified by means of their narrative approach to obtain estimates of the causal impact of tax changes on the economy.

¹⁵ The complete list of periods of fiscal adjustments is reported in Appendix 3.1. A companion paper, available on request, shows how we implement the approach. In particular, it provides quotations and citations for each case to show how we determined the presence of fiscal consolidation measures.

Figure 3.1. Action-Based Fiscal Consolidation

There were about 170 cases of action-based fiscal consolidation over the past 30 years in advanced economies. Consolidation has often relied primarily on spending cuts. On average, action-based fiscal consolidation amounted to 1 percent of GDP a year, but the range was wide.



Source: IMF staff calculations.

Note: The 15 advanced economies in the sample are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Portugal, Spain, Sweden, United Kingdom, and United States. “Spending-based” consolidation relied primarily on spending cuts. “Tax-based” consolidation relied primarily on tax hikes. The “other” category denotes contractions for which composition details were either not available or for which no category accounted for the majority of the adjustment.

than 1.5 percent of GDP per year represent about one-fifth of all cases of consolidation. Therefore, on average, countries implemented such large fiscal adjustments once every 14 years. As we show later on, the estimated effects of these large adjustments on output are similar to the effects of smaller adjustments.

Estimated Effects of Fiscal Consolidation

With periods of fiscal consolidation now identified, this section employs statistical techniques to assess the impact of the fiscal measures on economic activity. The statistical methodology is standard and follows that of Cerra and Saxena (2008), Romer and Romer (2010), and others. In particular, we estimate the average impulse response of output to action-based fiscal consolidation using panel data analysis. The estimated equation makes use of an autoregressive model in growth rates estimated on annual data for 1980–2009 for the 15 countries in our sample. The growth rates are then cumulated to obtain the estimated impact of fiscal consolidation on the level of output.¹⁶

A key result is that fiscal consolidation is typically contractionary. A fiscal consolidation equal to 1 percent of GDP typically reduces real GDP by about 0.5 percent after two years (Figure 3.2). The effect on the unemployment rate is an increase of

¹⁶In particular, the estimated equation has the growth rate of real GDP as the dependent variable on the left-hand side. On the right-hand side, the explanatory variables are the current and lagged values of the fiscal consolidation measures identified as discussed above. Including lags allows for a delayed impact of fiscal consolidation on growth. In addition, the approach controls for lags of real GDP growth, to distinguish the effect of fiscal consolidation from that of normal output dynamics. Thus, the equation estimated is

$$g_{it} = \alpha + \sum_{j=1}^2 \beta_j g_{i,t-j} + \sum_{s=0}^2 \beta_s ABFC_{i,t-s} + \mu_i + \lambda_t + v_{it}$$

where the subscript i denotes the i th country, and the subscript t denotes the t th year; g is the percent change in real GDP; and $ABFC$ is the estimated size of the action-based fiscal consolidation measures as a percent of GDP. The approach includes a full set of country dummies (μ_i) to take account of differences among countries’ normal growth rates. The estimated equation also includes a full set of time dummies (λ_t) to take account of global shocks such as shifts in oil prices or the global business cycle.

about 0.3 percentage point after two years.¹⁷ The results are statistically significant at conventional levels. Overall, the idea that fiscal austerity stimulates economic activity in the short term finds little support in the data.¹⁸

However, the average effect of fiscal consolidation shown in Figure 3.2 hides a range of experiences related to a number of factors. In particular, we now turn to three key factors that shape the outcomes: the role of interest rates and exchange rates, the composition of the fiscal package, and the role of perceived sovereign risk of the country undertaking the consolidation.

The Mitigating Role of Interest Rates and Exchange Rates

This section looks at the role of interest rate cuts and declines in the value of the currency in mitigating the impact of fiscal consolidation. In addition, to clarify how interest rates and exchange rates shape the outcome, we examine the behavior of the components of GDP, including exports and imports. To explore these channels, we use the same statistical approach as described above, but apply it to studying the impact of fiscal consolidation on exchange rates and interest rates instead of on output.¹⁹

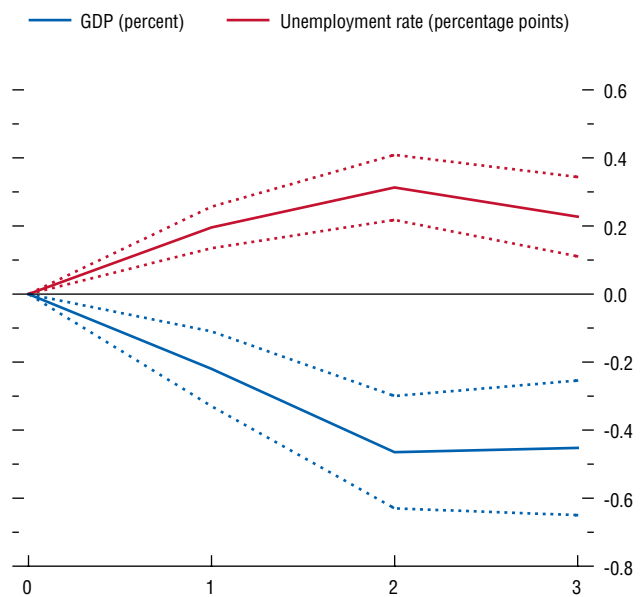
¹⁷To explore the impact on the unemployment rate, we replace all the GDP growth terms in the estimated equation with the change in the unemployment rate. We then cumulate the impulse responses to obtain the impact of fiscal consolidation on the level of the unemployment rate.

¹⁸Several robustness checks were performed, as reported in Appendix 3.2. In particular, excluding lags of growth had little effect on the results; using different lag lengths (up to four) yielded similar results. Although the country dummies are correlated with the lagged dependent variables in the estimated equation, the bias is small here given the large number of observations per country relative to the number of countries (30 years for each of our 15 countries). When the estimation is conducted using the Arellano-Bond estimator, which corrects for this possible bias, the results are very similar.

¹⁹For example, to examine the response of the real exchange rate to fiscal consolidation, we repeat the estimation of the equation described above, while replacing all the GDP growth terms with the change in the log of the real exchange rate. We then cumulated the impulse responses to obtain the impact of fiscal consolidation on the (log) level of the real exchange rate.

Figure 3.2. Impact of a 1 Percent of GDP Fiscal Consolidation on GDP and Unemployment

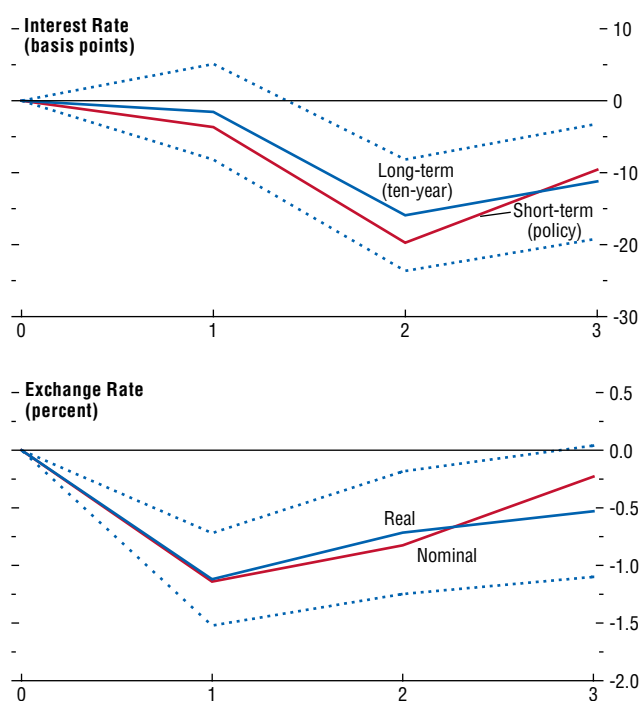
Fiscal consolidation is normally contractionary. A fiscal consolidation equal to 1 percent of GDP typically reduces real GDP by about 0.5 percent and raises the unemployment rate by about 0.3 percentage point.



Source: IMF staff calculations.
 Note: $t = 1$ denotes the year of consolidation. Dotted lines equal one standard error bands.

Figure 3.3. Response of Monetary Conditions to a 1 Percent of GDP Fiscal Consolidation

Interest rate cuts and a decline in the value of the domestic currency usually play a key supportive role during episodes of fiscal consolidation.



Source: IMF staff calculations.

Note: $t = 1$ denotes the year of consolidation. Dotted lines equal one standard error bands.

Interest rates

The short-term policy interest rate typically falls by about 20 basis points in response to a fiscal consolidation of 1 percent of GDP (Figure 3.3). Since the rate of inflation usually does not change much following fiscal consolidation, the fall in real interest rates is similar. At the same time, the long-term nominal interest rate on government bonds falls broadly in line with short-term rates. In particular, the yield on government bonds with a maturity of 10 years declines by about 15 basis points after two years in response to a fiscal consolidation equal to 1 percent of GDP. The response of long-term rates suggests that fiscal consolidation may reduce risk premiums.²⁰

Exchange rates

In response to a fiscal consolidation of 1 percent of GDP, the exchange rate depreciates by about 1.1 percent in real terms (see Figure 3.3). Interestingly, this real depreciation is almost fully explained by nominal exchange rate depreciation or currency devaluation. Examples of large devaluations during fiscal consolidation include, among others, Finland (1992), Ireland (1987), and Italy (1992).

Transmission channel: the role of net exports

How do these changes in interest rates and exchange rates affect the economy? The fall in interest rates is likely to support consumption and investment. And the real depreciation should support economic activity by boosting net exports.

Decomposing the response of GDP into its demand components confirms that net exports expand in response to fiscal consolidation, providing a key cushioning role. In particular, the contribution of net exports to GDP increases by about 0.5 percentage point (Figure 3.4). The increase in net exports reflects both an increase in real exports in response to the real exchange rate depreciation

²⁰ The effect of fiscal consolidation on longer-term interest rates may be influenced by two factors: the decline in the current and future short-term interest rate and a reduction in the risk premium related to the perceived improvement in the fiscal outlook.

and a decline in real imports, which also reflects the fall in income (see Figure 3.4).²¹

Meanwhile, domestic demand (consumption and investment) declines substantially in response to fiscal retrenchment. In particular, a consolidation of 1 percent of GDP reduces the contribution of domestic demand to GDP by about 1 percentage point after two years. This result is broadly consistent with textbook (Keynesian) effects on demand of spending cuts and tax hikes.

Overall, this section confirms that a fall in the value of the currency plays a key role in softening the impact of fiscal consolidation on output through the impact on net exports. Without this increase in net exports, the output cost of fiscal consolidation would be roughly twice as large, with output falling by 1 percent instead of 0.5 percent. Cuts in interest rates also help cushion the impact on consumption and investment.

Taxes versus Spending: Does Composition Matter?

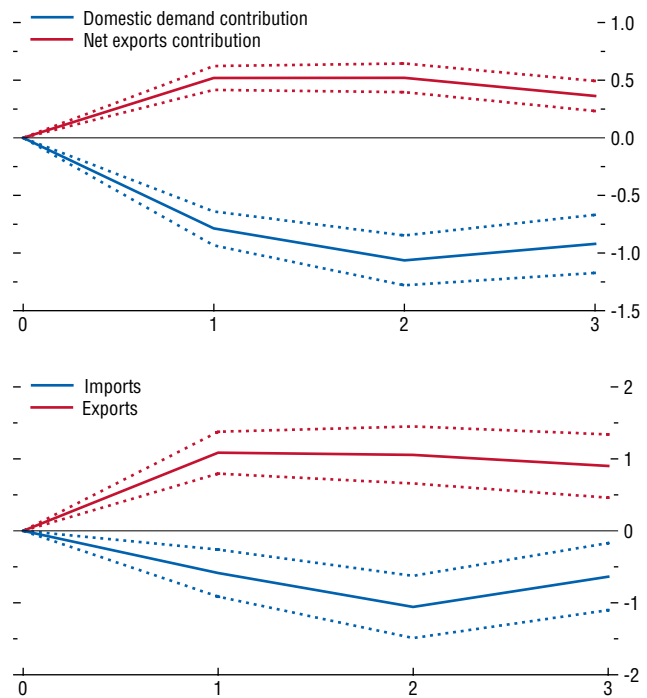
Does the composition of fiscal consolidation across taxes and spending matter? A number of studies suggest that fiscal contraction associated primarily with declines in spending is accompanied by an expansion of the economy in the short term, whereas adjustments based primarily on revenue increases feature output contractions.²² In this section, using our data set of periods of action-based fiscal consolidation, we revisit these stylized facts to test whether the composition of consolidation measures makes a difference in terms of their impact on growth. We also investigate the role of interest rates and exchange rates in explaining the effects of different types of fiscal consolidation measures.

Basic results

To address the issue, we repeat the estimation approach used above for two types of fiscal con-

Figure 3.4. Impact of a 1 Percent of GDP Fiscal Consolidation on GDP Components (Percent)

Net exports typically expand in response to fiscal consolidation, providing a key cushion for GDP. In contrast, domestic demand contracts. The boom in net exports reflects both an increase in exports in response to the real exchange rate depreciation and a decline in imports reflecting the fall in income.



Source: IMF staff calculations.
 Note: *t* = 1 denotes the year of consolidation. Dotted lines equal one standard error bands.

²¹ Since the analysis controls for shifts in global demand (time dummies), the estimated increase in exports does not reflect an upswing in external demand. Also, the estimated response of exports and imports is consistent with that implied by standard elasticities with respect to the real exchange rate, as reported, for example, in Bayoumi and Faruqee (1998).

²² See, for example, Alesina and Perotti (1995, 1997), Alesina and Ardagna (2010), Broadbent and Daly (2010), and others.

solidation. The first type, denoted “tax-based,” corresponds to years in which the contribution of tax hikes to fiscal consolidation is greater than the contribution of spending cuts. The second type, denoted “spending-based,” corresponds to years in which the contribution of spending cuts to fiscal consolidation is greater than that of tax hikes.²³

The following main results emerge from the analysis:

- Spending-based adjustments are less contractionary than tax-based adjustments. In the case of tax-based programs, the effect of a fiscal consolidation of 1 percent of GDP on GDP is -1.3 percent after two years (Figure 3.5). In the case of spending-based programs, the effect is -0.3 percent after two years, and is not statistically significant.²⁴ Similarly, while deficit cuts that rely on tax hikes raise the unemployment rate by about 0.6 percentage point, spending-based deficit cuts raise the unemployment rate only by about 0.2 percentage point (see Figure 3.5). However, as will be shown below, a key reason the costs of spending-based deficit cuts are relatively small is that they typically benefit from a large dose of monetary stimulus, as well as an expansion in exports.
- Domestic demand contracts for both types of fiscal consolidation, but by more in the case of tax-based packages. In particular, in the case of spending-based measures, domestic demand falls by about 0.9 percent after two years, whereas the decline exceeds 1.8 percent in the case of tax-based packages (see Figure 3.5).
- A rise in net exports mitigates the impact of the consolidation on GDP in both cases. However, there is a considerably larger improvement in exports associated with spending-based measures than with tax-based measures, whereas imports fall more for tax-based adjustments (see Figure 3.5).

²³ 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; the same holds true for the spending-based type.

²⁴ The difference between the tax-based and spending-based responses is strongly statistically significant.

Why are spending-based adjustments less contractionary?

Much of the difference is due to the response of monetary conditions to fiscal consolidation: interest rates and the value of the currency tend to fall more following spending-based consolidation (Figure 3.6). Existing estimates in the literature can provide a rough sense of how much of the difference in output performance stems from the difference in monetary conditions. The difference in interest rate responses between tax-based and spending-based fiscal consolidation is about 50 basis points in the first year (see Figure 3.6).²⁵ Meanwhile, the output cost for tax-based consolidation exceeds that for spending-based consolidation by about 0.3 percentage point in the first year and by about 1 percentage point in the second year (see Figure 3.5). 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 about 0.6 percent in the first year and 2 percent in the second. Such impacts are within the range of estimates found in the empirical literature, though toward the high end.²⁶ Thus, it appears that the difference in monetary policy responses accounts for much, though probably not all, of the difference in output performance.

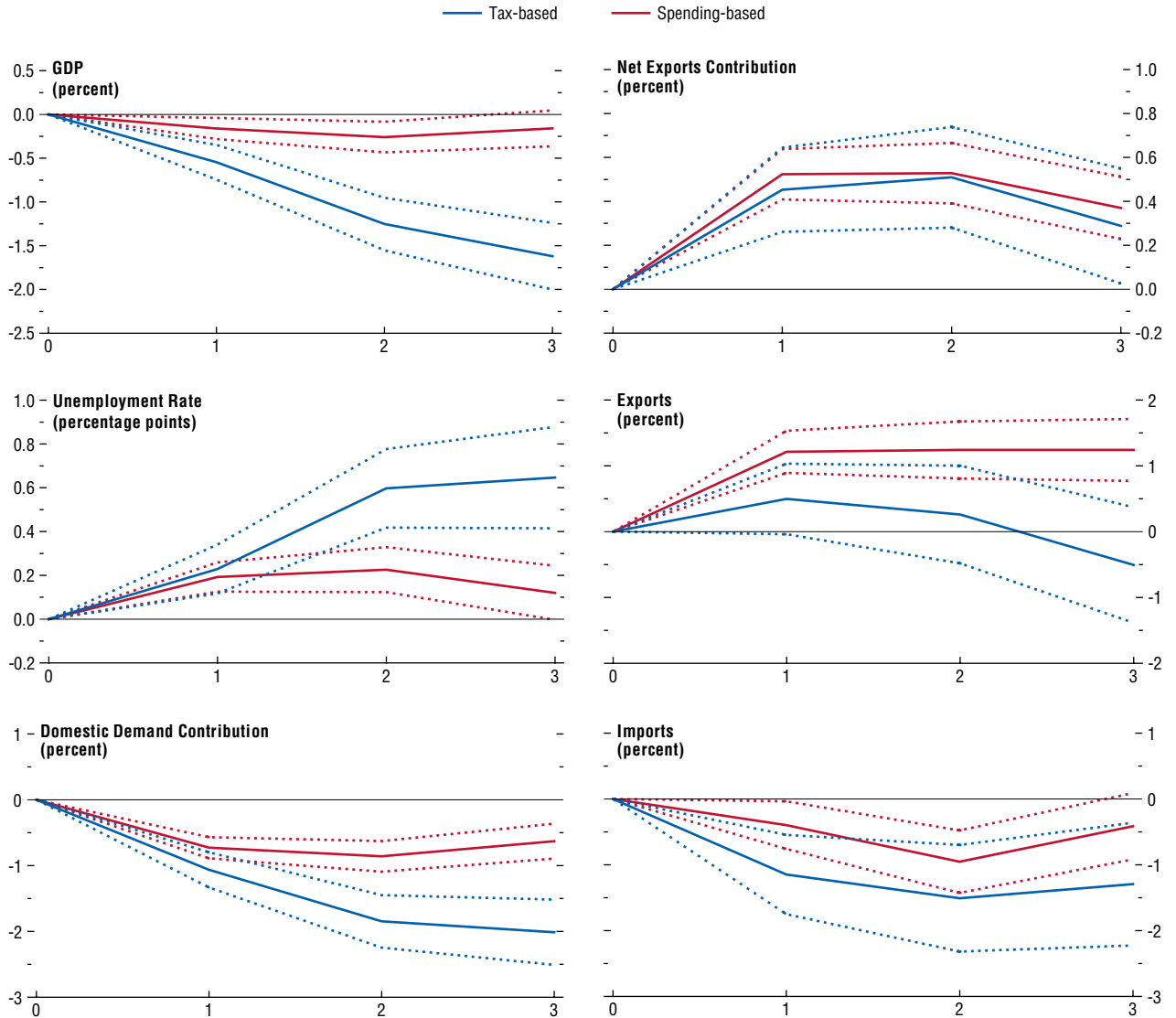
These findings are in line with the notion that central banks view spending-based deficit cuts more favorably, possibly because they interpret them as a signal of a stronger commitment to fiscal discipline, and are therefore more willing to provide monetary stimulus following spending-based adjustments. It is also plausible that an increase in taxes, if it involves indirect tax hikes (sales and excise taxes, VAT), raises inflation on impact, making interest rate cuts

²⁵ Note that part of the effect of interest rates on output works through the exchange rate. Therefore, to avoid double counting, the difference in output costs due to the difference in exchange rate behavior is not considered separately here.

²⁶ 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. 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.

Figure 3.5. Impact of a 1 Percent of GDP Fiscal Consolidation: Taxes versus Spending

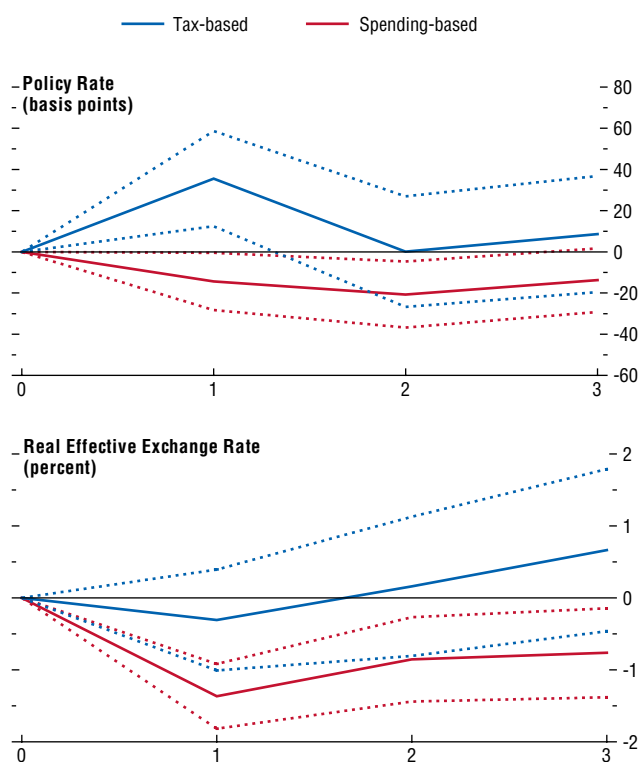
Spending-based consolidation is less contractionary than tax-based consolidation. GDP falls by less and unemployment increases less. Domestic demand contracts significantly as a result of both spending-based and tax-based consolidation, but the contraction is sharper after tax-based adjustments. A boom in net exports mitigates the contraction in both cases. A surge in exports drives the net export boom associated with spending-based consolidation. After tax-based consolidation, net exports rise mainly because imports fall.



Source: IMF staff calculations.
 Note: $t = 1$ denotes the year of consolidation. Dotted lines equal one standard error bands.

Figure 3.6. Composition and Monetary Conditions: Impact of a 1 Percent of GDP Fiscal Consolidation

Why are spending-based consolidations less contractionary? Partly because they benefit from monetary stimulus, whereas tax-based adjustments feature monetary tightening.



Source: IMF staff calculations.
 Note: $t = 1$ denotes the year of consolidation. Dotted lines equal one standard error bands.

by an inflation-averse central bank less likely. In line with this notion, Figure 3.7 provides evidence that the policy rate rises on impact for tax-based adjustments, and even more so when they include some indirect tax hikes. In the case of tax-based packages that include indirect tax hikes, the output costs are particularly large.²⁷

The results reported above suggest that spending-based measures are less contractionary than tax-based measures, but do the effects differ across different types of spending cuts? In particular, a number of studies, such as Alesina and Perotti (1995), predict that spending-based adjustments have relatively benign effects if they involve cuts to politically sensitive items, such as transfer programs, or government consumption, such as the public sector wage bill. The key idea is that cutting politically sensitive items may signal a credible commitment to long-term deficit reduction and that, in these cases, positive “non-Keynesian” confidence effects offset the negative “Keynesian” impact on aggregate demand. On the other hand, cuts to less politically sensitive items, such as government investment, might have weaker confidence effects. To investigate this possibility, we divide the spending-based adjustments into three groups: those that rely mainly on cuts to government transfers (31 percent of all spending-based packages), those that rely mainly on cuts to government consumption (46 percent), and those that rely mainly on cuts to public investment (9 percent).²⁸

The estimated impact on output of these three types of deficit cuts provides some evidence suggesting that spending cuts based on cuts to govern-

²⁷ Similarly, long-term interest rates tend to rise following tax-based adjustments that include indirect tax hikes, but tend to fall for those based on direct tax hikes or spending cuts. These results suggest that markets may perceive governments that make spending cuts or direct tax hikes as more serious about carrying out fiscal consolidation over time. This perception might be based on the notion that it is more difficult politically in most jurisdictions to cut spending or to raise direct taxes than to raise indirect taxes and that governments willing to invest political capital in the former measures are more likely to persist in their endeavor to reduce government debt.

²⁸ The remainder (14 percent of cases) features spending-based adjustments without sufficient documentation regarding the types of spending cuts or where no category accounted for the majority of the adjustment.

ment transfers are relatively benign (Figure 3.8). In particular, the point estimates indicate a modest expansion. For adjustments based mainly on cuts to government consumption or investment, the output costs are larger. However, the estimates reported in Figure 3.8 are based on a small sample of observations for which we have details regarding the types of spending cuts implemented. Hence, these results should be interpreted with caution. In particular, even for the cases of consolidation based on transfer cuts, there is no strong evidence of expansionary effects, as the results are statistically indistinguishable from zero.

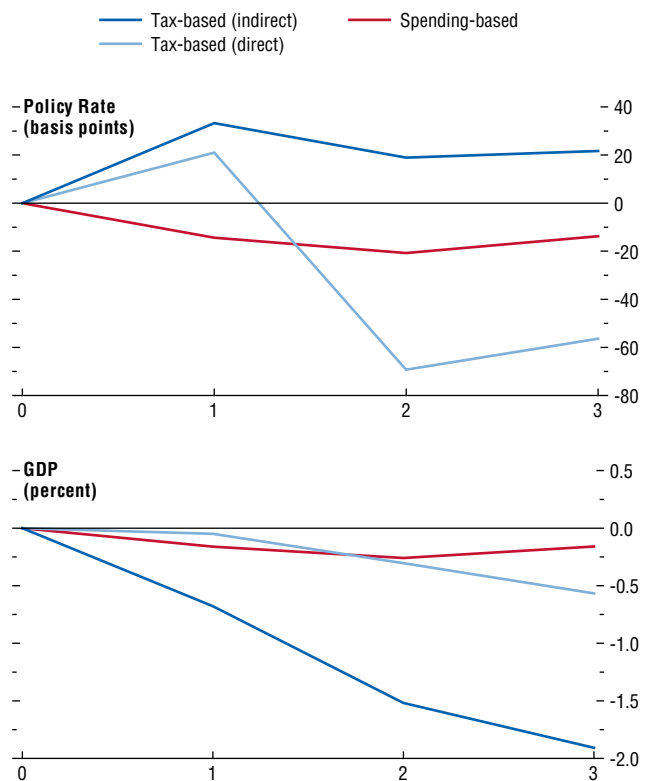
The Role of Perceived Sovereign Risk

One would expect expansionary fiscal contraction to be more likely in situations where doubts about solvency raise borrowing costs and where the consolidation could reduce those costs sharply. In line with this notion, Giavazzi and Pagano (1990) found evidence of “expansionary fiscal contractions” in Denmark in 1983 and Ireland in 1987—two countries that had experienced a rapid deterioration in their sovereign debt rating.²⁹ In this subsection, we examine the role of sovereign risk perception.

To explore this issue, we split the sample into two groups. The first group includes fiscal adjustment preceded by high (above-median) levels of perceived sovereign credit risk in the three years before fiscal consolidation. The second group includes adjustment preceded by low (below-median) perceived sovereign credit risk. Our measure of perceived solvency risk is the Institutional Investor Ratings (IIR) index.³⁰ These 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

Figure 3.7. Composition and Monetary Conditions: Impact of a 1 Percent of GDP Fiscal Consolidation

The policy rate usually rises on impact for episodes of tax-based consolidation, particularly when they include some indirect tax hikes. In the case of indirect tax hikes, the output costs are particularly high.



Source: IMF staff calculations.
Note: $t = 1$ denotes the year of consolidation.

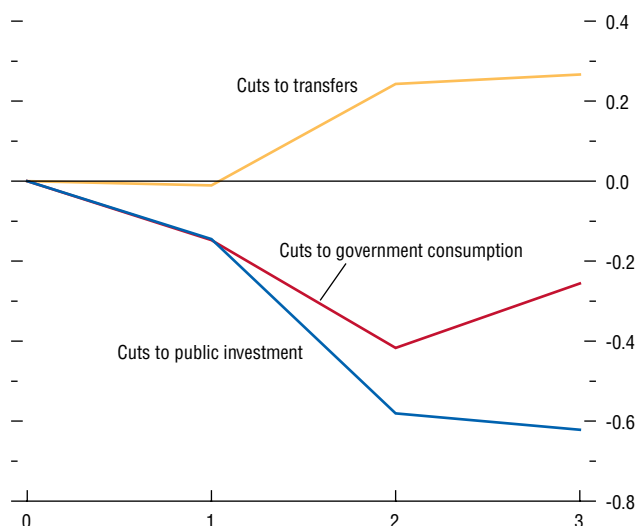
²⁹Based on our identification strategy, Denmark (1983) and Ireland (1987) undertook spending-based fiscal consolidation measures amounting to about 3 percent of GDP each.

³⁰Studies that use the IIR as a proxy for sovereign default risk include Reinhart, Rogoff, and Savastano (2003) and Eichengreen and Mody (2004). Similar results are obtained when the sample is split into three groups—high, medium, and low risk.

Figure 3.8. Impact on GDP of a 1 Percent of GDP Spending-Based Consolidation

(Percent)

Fiscal consolidation based on cuts to government transfers is less contractionary than that based on cuts to government consumption or government investment. But the differences between the three spending types are within the margin of error.



Source: IMF staff calculations.

Note: The three lines indicate consolidation in which most of the spending cuts fell on government transfers, government consumption, and public investment, respectively. $t = 1$ denotes the year of consolidation.

lowest perceived sovereign default probability.³¹ The median level of this index, 80, is close to that of Portugal in 2007.³²

The estimation results suggest that deficit cuts preceded by high perceived sovereign risk are indeed less contractionary than those preceded by low perceived sovereign default risk (Figure 3.9). This finding is consistent with the notion that confidence or credibility effects help mitigate the impact of fiscal consolidation on high-risk countries and that low perceived sovereign default risk is associated with a more typical contraction.

At the same time, however, even for the group of high-risk countries, the results are not usually expansionary. The point estimates imply that output on average still falls following fiscal consolidation in these countries by about 0.4 percent after two years. However, when the only two episodes of fiscal consolidation considered are those of Denmark (1983) and Ireland (1987), the estimated effect on output is indeed positive (although not statistically significant). These findings are consistent with the finding of Giavazzi and Pagano (1990) that Denmark and Ireland experienced “expansionary fiscal contractions.” However, the results also suggest that these two cases are not representative of the normal output response, even among countries with a relatively poor initial credit rating.

Comparison with Other Studies

How do our results compare with those obtained using the standard set of fiscal consolidation episodes? To answer this question, we consider the sample of large fiscal adjustments identified by Alesina and Ardagna (2010) for our same sample of 15 countries—years in which the CAPB-to-GDP ratio increases by at least 1.5 percentage points.³³ For this sample, the estimation results suggest that fiscal austerity usually stimulates GDP and

³¹Note that these ratings are strongly correlated with sovereign bond yields (although the latter reflect more than just default risk).

³²Note that Denmark (1983) and Ireland (1987)—the two cases studied by Giavazzi and Pagano (1990)—fall into this high-perceived-risk category.

³³The episodes identified by Alesina and Ardagna (2010) are listed in Table 3.5.

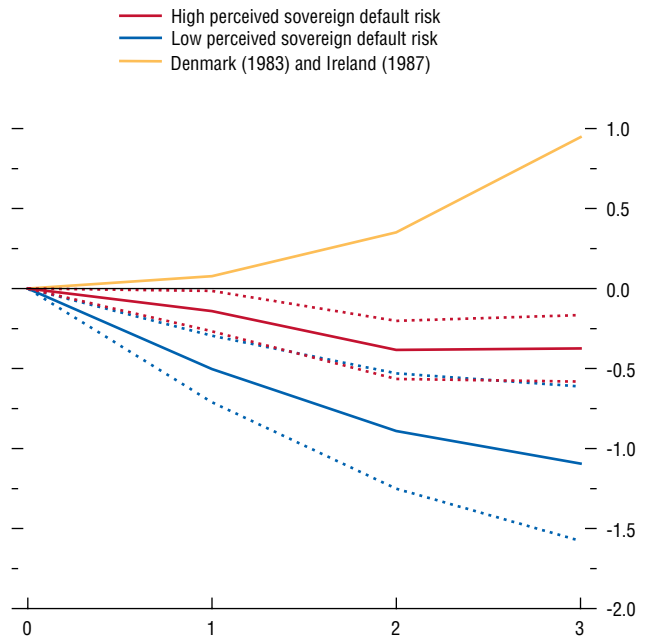
reduces the rate of unemployment in the short term (Figure 3.10). In contrast, for a comparable set of large consolidation episodes identified according to our action-based approach (those greater than 1.5 percent of GDP), the impact on GDP is negative and unemployment rises.

What explains this stark contrast? Why is fiscal contraction usually painless based on the standard set of episodes but contractionary based on our sample of action-based episodes? As described above, the standard approach to identification of consolidation based on the behavior of the CAPB may be imperfect and create bias in the estimated effects of consolidation. Appendix 3.3 demonstrates that these problems are substantial. It shows that there are large differences between the episodes identified by the two approaches. It then examines the 10 cases in which the difference between the size of the consolidation identified by the two approaches is largest and establishes two results. First, the action-based measure appears to be substantially more accurate. In the majority of the 10 episodes, there were specific economic or budgetary developments that cause the CAPB-based approach to inaccurately measure the size of the consolidation; in the remainder, there were economic developments that very likely had a large effect on the CAPB-based measure. Second, the errors are correlated with economic developments. Most notably, the CAPB-based approach often fails to identify consolidation when governments took substantial actions to reduce the deficit but the actions were associated with severe economic downturns. It is therefore not surprising that the estimates based on the CAPB-based measure do not find that consolidations are on average contractionary.

Finally, Figure 3.10 also illustrates another interesting finding: based on our set of fiscal adjustments, the incremental impact of fiscal consolidation on economic activity appears to be unrelated to the size of the package. In particular, the estimated responses of output and unemployment to these large deficit cuts (greater than 1.5 percent of GDP) are similar to those reported before for our full sample of fiscal consolidation. For each additional fiscal consolidation of 1 percent of GDP, the impact

Figure 3.9. Estimated Impact on GDP of a 1 Percent of GDP Fiscal Consolidation (Percent)

Fiscal consolidation preceded by high perceived sovereign risk is less contractionary than when preceded by low perceived default risk. But even for the group with high perceived risk, fiscal retrenchment rarely triggers faster growth. Exceptions include Denmark (1983) and Ireland (1987)—two cases of fiscal consolidation studied by Giavazzi and Pagano (1990)—which were expansionary.

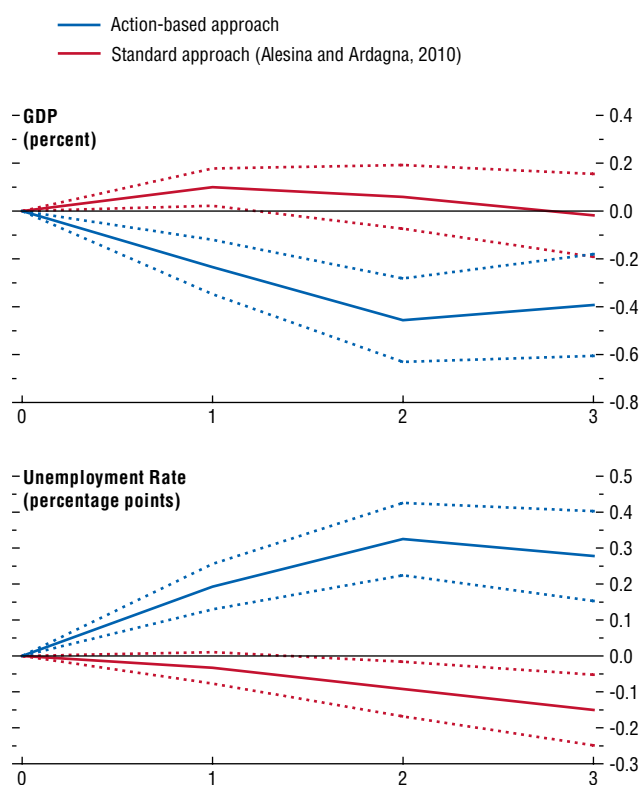


Source: IMF staff calculations.
 Note: $t = 1$ denotes the year of consolidation. Dotted lines equal one standard error bands.

Figure 3.10. Impact of Large Fiscal Consolidation on GDP and Unemployment: Action-Based Approach versus Standard Approach

(Impact of each additional 1 percent of GDP fiscal consolidation)

Fiscal retrenchment usually triggers faster growth and lower unemployment according to the standard approach, exemplified by Alesina and Ardagna (2010). But according to our action-based approach, the opposite is true.



Source: IMF staff calculations.

Note: $t = 1$ denotes the year of consolidation. Dotted lines equal one standard error bands.

on output is about -0.5 percent, and the impact on the unemployment rate is about 0.3 percentage point, which is similar to the baseline results for all adjustments, large and small, reported earlier.³⁴

Additional Insights from Model Simulations

The previous section looked at historical episodes of fiscal consolidation in advanced economies to assess the short-term effects. But historical analysis goes only so far. For example, the empirical framework used above is not well suited to providing estimates of the effects of fiscal consolidation over long periods such as 10 or 20 years. Moreover, historical analysis cannot fully address specific issues that are relevant for today but that rarely arose in the past, such as the zero floor on nominal interest rates. Therefore, to complement the empirical analysis, this section looks at fiscal consolidation in the controlled “laboratory” setting of the GIMF, a dynamic general equilibrium model designed to simulate the effects of fiscal and monetary policy measures.³⁵

In particular, we examine the following questions:

- How do the effects of fiscal consolidation change when nominal interest rates are near zero?
- How do the effects change when many countries conduct fiscal consolidation simultaneously?
- What are the long-term effects of reducing government debt from high levels?

³⁴ Additional analysis suggests that the proportional impact is also similar for *very* large deficit cuts (equal to more than 3 percent of GDP per year), although the estimation results are less precise for these cases due to the smaller number of observations.

³⁵ For presentations of the structure of the GIMF, see Kumhof and Laxton (2007); Kumhof, Muir, and Mursula (2010); Freedman and others (2009, forthcoming); and Clinton and others (2010). A companion paper, available on request, shows that the GIMF produces short-term expenditure and tax multipliers that are in line with those reported in the previous section of the chapter. In addition, it explains why fiscal multipliers associated with fiscal consolidation are likely to be smaller than those associated with fiscal stimulus, including the fact that monetary policy stimulus partly offsets the effect of fiscal consolidation but reinforces the effect of fiscal stimulus.

Fiscal Consolidation when Policy Rates Are Near the Zero Interest Rate Floor

Since the onset of the Great Recession, short-term interest rates in the largest advanced economies have been near the zero interest rate floor. Yet of the historical episodes considered above, only those of Japan since the 1990s occurred in an environment of near-zero interest rates. In the other episodes, interest rate cuts typically followed fiscal consolidation.

Therefore, to look at the effects of fiscal consolidation when interest rates are near zero, we use model simulations. In particular, we look at what happens when a small open economy, which we calibrate to fit the main features of Canada, implements fiscal consolidation with and without the zero interest rate floor. For simplicity, the analysis ignores the possibility of the central bank responding to the consolidation by using unconventional monetary tools, such as quantitative and credit easing. To the extent that such policies would be used to support output in response to the consolidation, the simulations reported here may overstate the impact of the zero interest rate floor.

The consolidation considered here is a reduction in the deficit equivalent to 1 percentage point of GDP, composed entirely of spending cuts. Three-quarters of the spending cuts fall on government transfers, with the rest falling on government consumption. All the simulations considered in this subsection assume that there are no cuts to productive public investment. If the spending cuts *do* include cuts to productive public investment, the long-term effects of fiscal consolidation can be negligible or even negative.

The results suggest the following:

- When the interest rate is well above zero and free to decline, the output cost is about 0.5 percent after two years (Figure 3.11). This output cost is broadly consistent with the estimated short-term effect reported in the previous section of this chapter. Two factors make the impact on GDP less than one-to-one for every 1 percent of GDP of fiscal consolidation. First, lower interest rates help offset the shock to domestic demand. Second, a significant depreciation in the exchange

rate, resulting from the persistence of the decline in the interest rate, boosts exports and raises the trade balance. Again, these simulation results are consistent with the empirical findings reported in the previous section.³⁶

- However, when interest rates are stuck at zero, the output cost of fiscal consolidation doubles to about 1 percent after two years (see Figure 3.11). Here, the simulation assumes that the zero lower bound holds for two years.³⁷ During this time, the central bank is powerless to offset the slump in aggregate demand and inflation induced by the cut in government spending. The resulting fall in inflation raises the real interest rate, which in turn exacerbates the decline in aggregate demand, amplifying the short-term contractionary effect of fiscal consolidation.

Fiscal Consolidation in Many Countries at the Same Time

How do the effects of fiscal consolidation change when many countries consolidate at the same time? This question is relevant today, as a number of advanced economies set fiscal consolidation in motion.

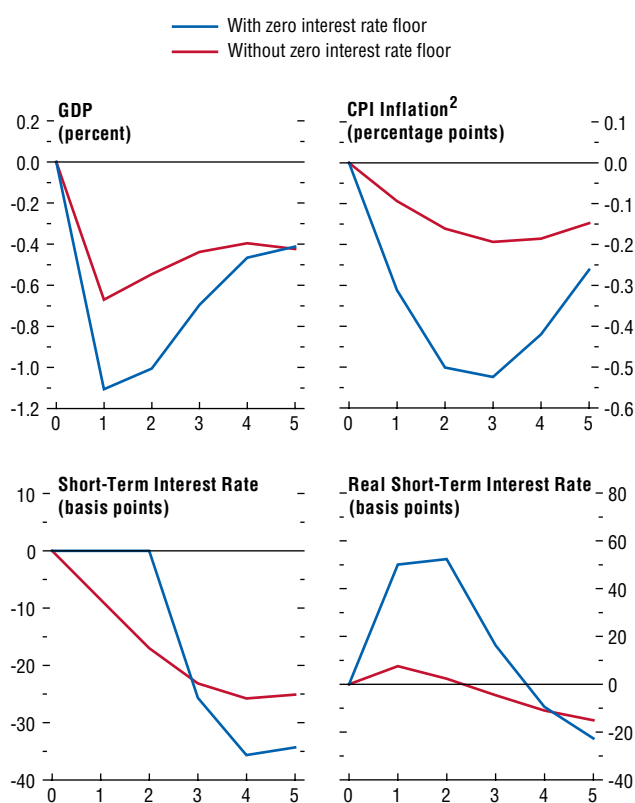
To address this issue, the simulations compare a situation in which only Canada cuts its fiscal deficit to one in which all countries do so simultaneously (global fiscal consolidation). We again use Canada here to illustrate the case of an economy small enough to have small spillover effects on the rest of the world and open enough that fiscal contraction in the rest of the world has significant effects on its GDP.³⁸

³⁶In an economy such as the United States, with less exposure to foreign trade, the domestic-demand channel would be more important. In this case, it would require a larger decline in the interest rate to offset the effects of the fiscal contraction on domestic demand.

³⁷Why do the simulations assume that the zero interest rate floor holds for two years? In the model, the only way the central bank can stabilize output and inflation is by cutting nominal interest rates. When the option of cutting interest rates is removed for a long time—here, three or more years—the model generates unstable macroeconomic dynamics, which complicates the computation of simulation results. In addition, for most countries, it is unlikely that interest rates will stay at zero for more than two years.

³⁸In 2009, Canada's GDP was 1.9 percent of global GDP on a purchasing-power-parity basis, and the sum of exports and imports represented 71 percent of GDP.

Figure 3.11. Impact of a 1 Percent of GDP Fiscal Consolidation: GIMF Simulations¹



Source: IMF staff calculations.

Note: $t = 1$ denotes the year of consolidation. Simulations are based on the GIMF calibrated for Canada and the rest of the world. The zero interest rate floor is assumed to hold for two years for reasons explained in the text.

¹ GIMF = Global Integrated Monetary and Fiscal Model.

² CPI = consumer price index.

As before, the adjustment involves reducing the deficit-to-GDP ratio by 1 percentage point, with the adjustment composed entirely of spending cuts. Three-quarters of the spending cuts fall on government transfers, with the rest falling on government consumption. Also, as before, the analysis considers two cases: the first assumes that the zero interest rate floor holds in all countries for two years, and the second assumes that the interest rate may change without constraint.

The following results emerge:

- In the simulations where the zero interest rate floor applies, the Canada-only consolidation implies an output loss of about 1 percent (Figure 3.12). But when the rest of the world conducts fiscal consolidation at the same time, the output cost to Canada more than doubles, to 2 percent. This simulation illustrates that, when interest rates are near zero, international spillovers are important.
- When central banks are able to cut interest rates, the difference between the Canada-only consolidation and the global consolidation is smaller. This reflects the interplay of two forces. On the one hand, the fiscal contraction in the rest of the world reduces demand for Canadian exports, and the exchange rate provides a smaller buffer—currencies cannot all depreciate at the same time. But on the other hand, the interest rate is now unconstrained by the zero bound, and the central bank can thus respond with more monetary stimulus. These larger interest rate cuts play a substantial cushioning role, and the additional output cost of global consolidation is therefore modest.

Overall, these results illustrate that changes in both the interest rate and the exchange rate are important to the adjustment process. When countries cannot rely on the exchange rate channel to stimulate net exports, as in the case of the global consolidation, and cannot ease monetary policy to stimulate domestic demand, due to the zero interest rate floor, the output costs of fiscal consolidation are much larger. Thus, in the presence of the zero interest rate floor, there could be large output costs associated with front-loaded fiscal retrenchment implemented across all the large economies at the same time.

Long-Term Effects of Reducing Government Debt

The discussion so far has focused on short-term effects. We now turn to the long term. Does fiscal consolidation generate long-term gains? And if so, how soon do the long-term gains arrive? This question is one that cannot be adequately addressed using the empirical framework used in the previous section, and so we again use model simulations.

To focus the discussion, we consider a fiscal consolidation that, over time, reduces the government-debt-to-GDP ratio by 10 percentage points in each of the G3 currency areas (euro area, Japan, United States). As in the simulations discussed above, the consolidation is based on permanent cuts to government consumption and transfers. As the debt-to-GDP ratio declines, the burden of interest payments falls, and the resulting savings may be used to finance either new tax cuts or spending increases. In the main simulation reported here, we assume that the savings are used to reduce labor income taxes. The tax cuts are designed to ensure that the debt-to-GDP ratio stabilizes at 10 percentage points below the initial level.

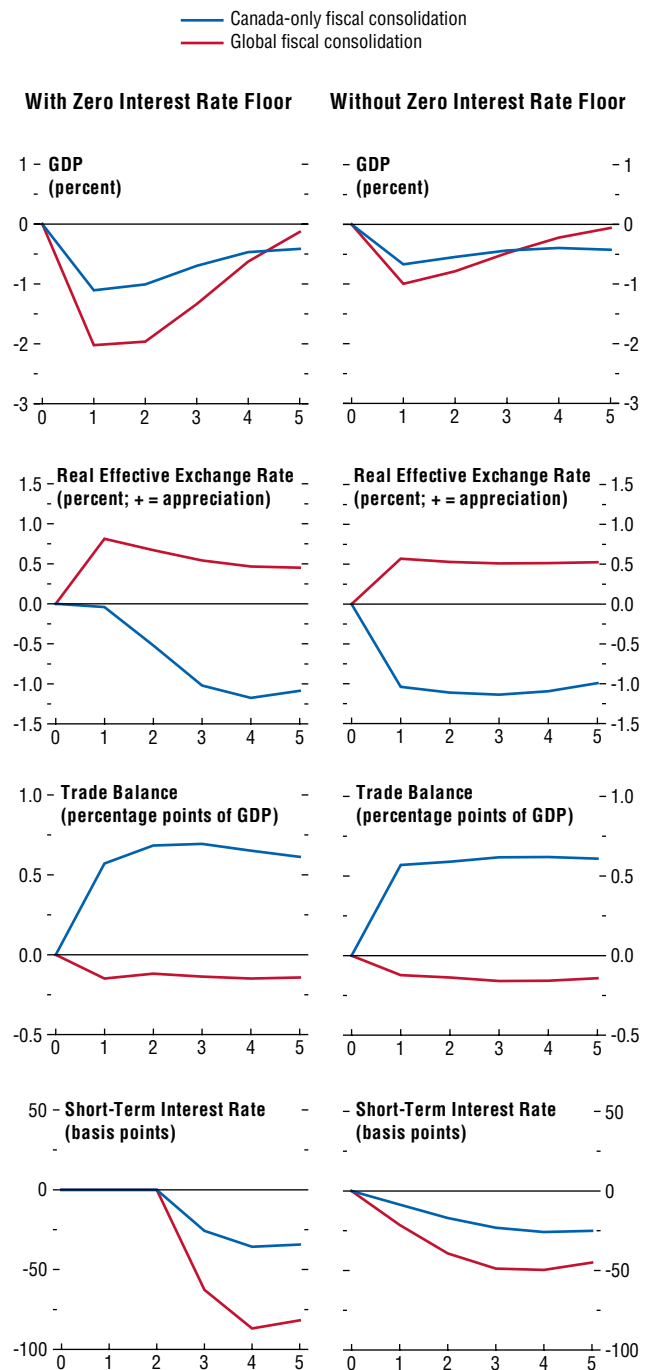
The simulations suggest that, over the long term, a reduction in the debt-to-GDP ratio is likely to raise output both in the G3 economies and in the rest of the world. Two main factors underlie this increase:

- *Lower real interest rates:* Reducing the fiscal deficit raises the overall G3 saving rate and improves the G3 current account balance.³⁹ Over time, the greater supply of savings lowers the real interest rate. In the simulation, the 10 percentage point fall in the debt-to-GDP ratio helps produce a fall in the G3 real interest rate of about 30 basis points (Table 3.1).⁴⁰ Since capital is assumed to be mobile across borders, the real interest rate falls by the same amount in the rest of the world. In turn, lower real interest rates “crowd in”

³⁹ The counterpart to this improvement in the G3 current account balance is a worsening in the current account balance of the rest of the world. The magnitude of this effect will depend on the degree to which government bonds are treated as net wealth and the sensitivity of aggregate consumption to changes in real interest rates.

⁴⁰ The magnitude of this interest rate–debt link is in line with empirical estimates in the literature, such as Engen and Hubbard (2004), Laubach (2009), and Baldacci and Kumar (2010).

Figure 3.12. Impact of a 1 Percent of GDP Fiscal Consolidation: GIMF Simulations¹



Source: IMF staff calculations.
 Note: $t = 1$ denotes the year of consolidation. Simulations are based on the GIMF calibrated for Canada and the rest of the world. The zero interest rate floor is assumed to hold for two years for reasons explained in the text.
¹GIMF = Global Integrated Monetary and Fiscal Model.

Table 3.1. Long-Term Effects of a Permanent 10 Percentage Point Decrease in the G3 Government-Debt-to-GDP Ratio: Global Integrated Monetary and Fiscal Model Simulations¹

	G3	Rest of the World	Global
Lower Interest Burden Used to Reduce Labor Income Taxes			
Real GDP (percent)	1.36	0.78	1.02
Real Interest Rate (percentage points)	-0.34	-0.34	-0.34
Capital Stock (percent)	2.14	1.58	1.82
Current-Account-to-GDP Ratio (percentage points)	0.44	-0.28	...
Effects on GDP under Different Assumptions (percent)			
Lower Interest Burden Used to			
Reduce Labor Income Tax	1.36	0.78	1.02
Raise General Transfers	0.54	0.40	0.46
Reduce Capital Income Tax	1.50	0.82	1.10
Reduce Consumption Tax	0.70	0.46	0.56

Source: IMF staff calculations.

Note: This table reports long-term effects on the level of GDP, interest rate, capital stock, and current-account-to-GDP ratio.

¹G3 = euro area, Japan, United States.

private investment, thereby raising the stock of physical capital and GDP over the long term.⁴¹ In the baseline simulation, the stock of physical capital rises by 2.1 percent in the G3 and by 1.6 in the rest of the world. Meanwhile, the level of GDP rises by 1.4 percent in the G3 and by 0.8 percent in the rest of the world.

- *Lower income taxes:* The lower interest rates and lower stock of government debt generate savings in terms of lower interest payments that can be used to finance tax cuts. In the baseline simulation, we assume that the savings are used to lower taxes on labor income. Since labor income taxes discourage workers from supplying labor, reducing them raises labor supply and output. As the lower panel of Table 3.1 reports, using the savings to cut capital income taxes instead has an even more beneficial impact on GDP in the long term. This is a reflection of capital income taxes' strong negative effect on private sector investment. On the other hand, if the savings are used to finance

⁴¹ This subsection has not taken into account the likelihood that reduced government debt would reduce risk premiums in market interest rates. A lower expected level of debt would alleviate concerns that the fiscal outcome might become unsustainable. That is, it would reduce the perceived risks of default and inflation. Reduced risk premiums in government and private sector borrowing rates would enhance and accelerate long-term positive effects on output.

cuts to consumption taxes, or to finance higher spending on government transfer programs, the long-term output gains are smaller.⁴² Finally, there are positive spillover effects from the G3 to the rest of the world arising through trade linkages. The more G3 incomes rise over the long term, the more goods the G3 economies import and the more income this generates for the rest of the world.⁴³

How long does it take for the positive output effects to outweigh the negative short-term effects? GIMF simulations suggest that for a consolidation based on cuts to government consumption and transfers, GDP is lower than baseline for three years before rising above the baseline forever. The break-even point, at which the sum of the annual GDP losses in the early years is just offset by the sum of the gains later on, occurs five years from the start date.

⁴² This ranking is consistent with the standard view of the relative distortionary supply-side aspects of the various fiscal instruments.

⁴³ Fiscal consolidation in the G3 generates a permanent improvement in the G3 current account balance, which implies a declining path for the G3 ratio of net foreign liabilities (NFL) to GDP. Over the long term, in the GIMF, an increase in imports relative to exports ensures that the NFL-to-GDP ratio stabilizes at a lower level instead of perpetually falling.

Lessons for Countries Considering Fiscal Consolidation

This section summarizes the principal findings of the chapter and outlines key lessons for countries considering fiscal consolidation in today's environment. Virtually all advanced economies are likely to conduct fiscal consolidation at some point in the future to put their fiscal positions back on a sustainable footing. The evidence based on historical analysis for advanced economies and model simulations in this chapter provides several lessons.

The idea that fiscal austerity triggers faster growth in the short term finds little support in the data. Fiscal retrenchment typically has contractionary short-term effects on economic activity, with lower output and higher unemployment. A budget cut equal to 1 percent of GDP typically reduces domestic demand by about 1 percent and raises the unemployment rate by 0.3 percentage point. At the same time, an expansion in net exports usually occurs, and this limits the impact on GDP to a decline of 0.5 percent.

Central banks usually offset some of the contractionary pressure by reducing policy rates, and longer-term interest rates typically decline, cushioning the impact on domestic demand. Undertaking fiscal consolidation is likely to have more negative short-term effects if—as is currently the case in a number of countries—interest rates are near zero and central banks are constrained in their ability to provide monetary stimulus.

A decline in the real value of the domestic currency typically plays an important cushioning role by spurring net exports and is usually the result of nominal depreciation or currency devaluation. Therefore, because not all countries can have real depreciations and increase their net exports at the same time, simultaneous fiscal consolidation by many countries is likely to be particularly costly. Fiscal retrenchment is also likely to be more costly for members of a monetary union where scope for a fall in the value of their currency is reduced. At the same time, in the current global environment, heightened market sensitivity to fiscal deficits and government

debt may imply that no adjustment could have a negative impact on growth.

The findings also suggest that spending-based deficit cuts, particularly those that rely on cuts to transfers, have smaller contractionary effects than tax-based adjustments. A key reason for this difference is that central banks typically provide less monetary stimulus during tax-based adjustments, particularly when they involve hikes in indirect taxes that put upward pressure on inflation. This finding again highlights that the fiscal adjustment process is likely to be more painful without the supportive role of interest rate cuts.

Fiscal retrenchment in countries that face a higher perceived sovereign default risk tends to be less contractionary. But *expansionary* effects of consolidation are unusual even for this group. This result implies that short-term negative effects are likely to be smaller in economies currently facing greater market pressure.

In addition, fiscal consolidation is likely to be beneficial over the long term. In particular, lower debt is likely to reduce real interest rates and the burden of interest payments, allowing for future cuts to distortionary taxes. These effects will likely crowd in investment and increase output in the long term.

Finally, as discussed in Chapter 1, a number of policy actions could enhance the credibility of fiscal adjustment programs, thereby mitigating the adverse effects of fiscal consolidation in the short term. Such actions could include strengthening fiscal institutions and reforming pension entitlements and public health care systems. To the extent that such measures improve household and business confidence and raise expectations about future income, they could help support activity during the process of fiscal adjustment.

Appendix 3.1. Data Sources

The sources of the data used for the analysis are listed in Table 3.2. The episodes of fiscal consolidation identified based on the action-based approach are reported in Tables 3.3 and 3.4. The episodes of fiscal consolidation identified based on the standard approach are reported on Table 3.5.

Table 3.2. Data Sources

Variable	Source
Real GDP	World Bank World Development Indicators (WDI) Database, World Economic Outlook (WEO) Database
Real Consumption	WDI Database, WEO Database
Real Investment	WDI Database, WEO Database
Real Exports	WDI Database, WEO Database
Real Imports	WDI Database, WEO Database
Unemployment Rate	WDI Database, WEO Database
Nominal Effective Exchange Rate	International Financial Statistics (IFS) Database
Real Effective Exchange Rate	IFS Database
Policy Interest Rates and 10-Year Bond Yields	Bloomberg Financial Markets, National Authorities, Thomson Datastream
Institutional Investor Rating	<i>Institutional Investor</i>
Cyclically Adjusted Primary Budget Surplus in Percent of GDP	Alesina and Ardagna (2010), Organization for Economic Cooperation and Development

Table 3.3. Action-Based Approach: Episodes of Small Fiscal Contraction*(Smaller than 1.5 percent of GDP)*

Economy	Fiscal Consolidation													
Australia	1980	1985	1988	1994	1995	1996	1997	1998	1999					
Belgium	1982	1984	1990	1992	1994	1995	1996	1997	1998	1999				
Canada	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	
	1993	1994	1995	1996	1997	1998	1999							
Denmark	1995													
Finland	1984	1988	1995	1999	2000	2006	2007							
France	1984	1986	1987	1988	1989	1991	1995	1996	1997	1998	2000	2006	2007	
Germany	1982	1983	1984	1985	1986	1987	1988	1989	1992	1993	1994	1995	1996	
	1998	1999	2000	2003	2004	2005	2006	2007						
Ireland	1984	1985	1986											
Italy	1994	1996	1998	2004	2005	2006	2007							
Japan	2003	2004	2005	2006	2007									
Portugal	2000	2001	2003	2005	2006	2007								
Spain	1983	1984	1985	1986	1987	1988	1989	1992	1993	1994	1995	1996	1997	
	1998													
Sweden	1983	1984	1986	1992	1994	1997	2007							
United Kingdom	1982	1994	1995	1996	1998	1999								
United States	1980	1981	1985	1986	1988	1990	1993	1994	2000					

Source: IMF staff calculations.

Table 3.4. Action-Based Approach: Episodes of Large Fiscal Contraction*(Greater than 1.5 percent of GDP)*

Economy	Fiscal Consolidation					
Australia	1986	1987				
Belgium	1983	1987	1993			
Canada						
Denmark	1983	1984	1985	1986		
Finland	1992	1993	1994	1996	1997	1998
France						
Germany	1997					
Ireland	1982	1983	1987	1988	2009	
Italy	1992	1993	1995	1997		
Japan	1997					
Portugal	1983	2002				
Spain						
Sweden	1993	1995	1996			
United Kingdom	1981	1997				
United States	1991					

Source: IMF staff calculations.

Table 3.5. Large Fiscal Contraction Episodes Identified by Alesina and Ardagna (2010)

Economy	Fiscal Consolidation								
Australia	1987	1988							
Belgium	1982	1984	1987	2006					
Canada	1981	1986	1987	1995	1996	1997			
Denmark	1983	1984	1985	1986	2005				
Finland	1981	1984	1988	1994	1996	1998	2000		
France	1996								
Germany	1996	2000							
Ireland	1984	1987	1988	1989	2000				
Italy	1980	1982	1990	1991	1992	1997	2007		
Japan	1984	1999	2001	2006					
Portugal	1982	1983	1986	1988	1992	1995	2002	2006	
Spain	1986	1987	1994	1996					
Sweden	1981	1983	1984	1986	1987	1994	1996	1997	2004
United Kingdom	1982	1988	1996	1997	1998	2000			
United States									

Source: Alesina and Ardagna (2010).

Appendix 3.2. Estimation Approach

The analysis in the text accounts for the current and lagged impact of fiscal consolidation. More specifically, the estimated equation is as follows:

$$g_{it} = \alpha + \sum_{j=1}^2 \beta_j g_{i,t-j} + \sum_{s=0}^2 \beta_s ABFC_{i,t-s} + u_{it}, \quad (3.1)$$

where the subscript i denotes the i th country ($i=1, \dots, 15$) and the subscript t denotes the t th year

($t=1980, \dots, 2009$); g is the percent change in real GDP; and $ABFC$ is the estimated size of the action-based fiscal consolidation measures as a percent of GDP. The disturbance term, u_{it} , is specified as a two-way error component model:

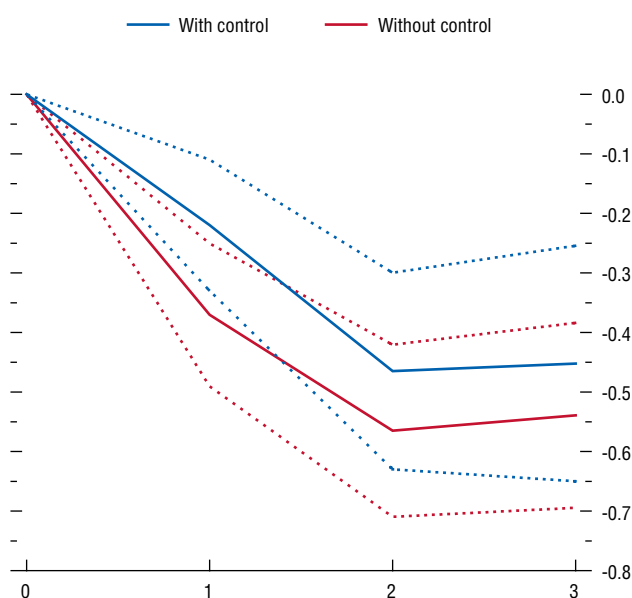
$$u_{it} = \mu_i + \lambda_t + v_{it}, \quad (3.2)$$

where μ_i denotes a country-fixed effect, and λ_t denotes a time-fixed effect. The time effects capture

Figure 3.13. Robustness: Impact on GDP of a 1 Percent of GDP Fiscal Consolidation

(With and without controlling for lagged GDP growth)

Excluding lags of growth from our estimated equation has little effect on the estimated effect of fiscal consolidation on output.



Source: IMF staff calculations.
Note: $t = 1$ denotes the year of consolidation. Dotted lines equal one standard error bands.

shifts in global variables, such as the global business cycle. The country-fixed effect captures differences in countries' steady-state growth rates. F -tests reject the absence of country- and time-fixed effects. The impulse response function for the effect of the fiscal actions on the *level* of output, along with one-standard-error bands, is obtained via the delta method.

Several robustness checks were conducted:

- Excluding lags of growth had little effect on the results (Figure 3.13). If consolidation is less likely in a weak economy, there should be a correlation between lagged output growth and consolidation, and controlling for lagged output would have an appreciable impact on the estimates. The finding that it does not is therefore reassuring, as it suggests that this source of bias is small in our sample.⁴⁴
- Using an alternative estimation approach—the Arellano-Bond (1991) procedure—had little effect on the results (Figure 3.14). As discussed above, this result suggests that the bias due to fixed effects being correlated with the lagged dependent variables is small in this sample.
- Splitting the sample of fiscal consolidation according to size of government (tax-to-GDP ratio in the three years preceding fiscal consolidation) yielded an interesting result. Economies that initially have a larger size of government (above the median tax-to-GDP ratio of 42 percent) have smaller output costs than those with a smaller initial size of government.⁴⁵ However, larger governments are also more likely to engage in spending-based consolidation than smaller governments. Keeping composition constant, the differences due to government size are less apparent. In particular, tax-based consolidation is equally costly in terms of lost output for large and small governments. Therefore, it seems that the type of consolidation (tax- versus spending-based) is more important than the size of government in determining the output cost of fiscal consolidation.

⁴⁴ In addition, using different lag lengths (up to four) yielded similar results.

⁴⁵ Similar results were obtained using the government-spending-to-GDP ratio as a proxy for government size.

- The results were more contractionary when the sample of fiscal adjustments was limited to episodes occurring in economies with a fixed exchange rate regime. This result held up under both the IMF’s de facto and de jure classification of exchange rate regimes. The result is consistent with standard Mundell-Fleming theory and a number of recent studies, such as Ilzetki, Mendoza, and Végh (2009), who find that fiscal multipliers are larger in economies with fixed exchange rate regimes.
- Splitting the sample of fiscal consolidation episodes according to openness to trade (ratio of exports plus imports to GDP) did not materially change the results.

Appendix 3.3. Identifying Periods of Fiscal Consolidation: The Standard Approach versus the Action-Based Approach

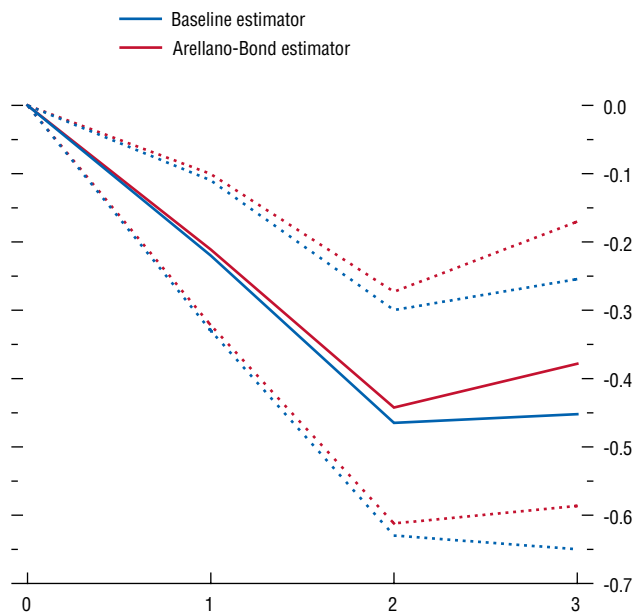
Figure 3.15 provides a scatter plot of increases in the cyclically adjusted primary budget balance (CAPB)—the standard measure of fiscal consolidation—on the vertical axis versus the size of fiscal consolidation based on the policy record on the horizontal axis. The figure reports years for which either the CAPB-to-GDP ratio increased or the policy record indicated fiscal consolidation.⁴⁶ The CAPB-to-GDP data are from Alesina and Ardagna (2010).⁴⁷ The top-right corner of the scatter plot shows cases in which the two measures agree that there was a large fiscal consolidation (greater than 1.5 percent of GDP). It includes cases such as Denmark (1983) and Ireland (1987)—the two cases highlighted by Giavazzi and Pagano (1990) in their work on expansionary fiscal contraction. However, Figure 3.15 also reports numerous cases in which the standard approach and our approach come to different conclusions regarding the presence and size of fiscal consolidation.

⁴⁶Cases in which there was no evidence of fiscal consolidation in the historical record correspond to the observations along the zero line on the horizontal axis, with positive values on the vertical axis.

⁴⁷The cases of increases in the CAPB-to-GDP ratio greater than 1.5 percentage points in Figure 3.15 are also those reported as large fiscal adjustments in Table A1 in Alesina and Ardagna (2010).

Figure 3.14. Robustness: Impact on GDP of a 1 Percent of GDP Fiscal Consolidation
(Baseline estimator versus Arellano-Bond estimator)

Using the Arellano-Bond procedure had little effect on the results, suggesting that the bias due to correlation of the fixed effects with the lagged dependent variables is small in this sample.

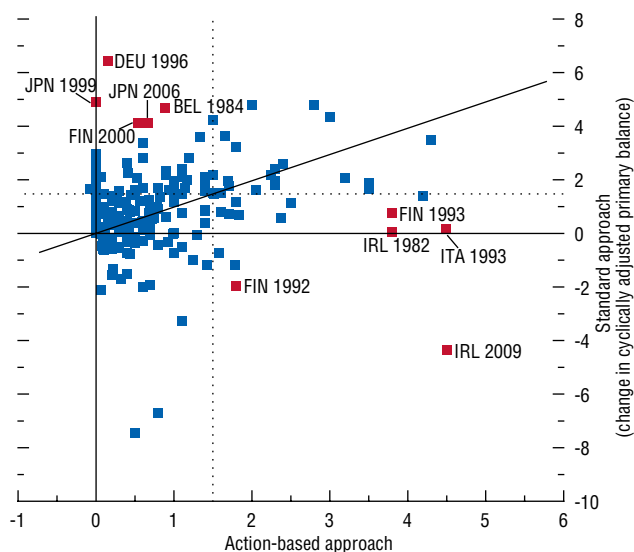


Source: IMF staff calculations.
Note: $t = 1$ denotes the year of consolidation. Dotted lines equal one standard error bands.

Figure 3.15. Size of Fiscal Consolidation: Action-Based Approach versus Standard Approach¹

(Percent of GDP)

There are numerous cases in which the standard approach and our action-based approach differ regarding the presence and size of fiscal consolidation. After analyzing in detail the 10 largest discrepancies between the two approaches, we conclude that our action-based approach more accurately identifies the size of fiscal consolidation.



Sources: Alesina and Ardagna (2010); and IMF staff calculations.

Note: The diagonal line reports the 45-degree line, where the action-based approach and standard approach agree. Dotted lines indicate episodes of consolidation equal to 1.5 percent of GDP. Highlighted observations indicate years for which the two approaches differ by more than 3 percent of GDP.

¹BEL: Belgium; DEU: Germany; FIN: Finland; IRL: Ireland; ITA: Italy; JPN: Japan.¹

Which approach typically more accurately identifies fiscal consolidation? To address this question, we focus on the largest discrepancies between the two approaches: the 10 cases for which the discrepancy between the two approaches exceeded 3 percent of GDP. In each of these cases, fiscal consolidation was assessed as large (greater than 1.5 percentage points of GDP) by at least one of the two approaches. These 10 cases are highlighted in Figure 3.15.

We start with the cases in the top-left corner of Figure 3.15, which contains five periods identified as large consolidations based on the standard approach, but for which the policy record shows either only a small consolidation or no consolidation at all.

- Germany (1996): The CAPB-to-GDP ratio increased by 6.4 percentage points, but the policy record indicates fiscal consolidation measures amounting to only 0.2 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-to-GDP ratio of about -7 percentage points in 1995 and 6.4 percentage points in 1996. The sharp increase in the CAPB in 1996 thus had nothing to do with fiscal austerity measures. In particular, as reported in the 1996 *IMF Recent Economic Developments* report (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 operation was recorded by the Organization for Economic Cooperation and Development (OECD) as a one-time increase in capital transfers that raised the general government deficit from 2.3 percent of GDP in 1994 to 9.7 percent of GDP in 1995. The deficit returned to a more normal level in 1996, at 3.3 percent of GDP. Therefore, the sharp increase in the CAPB in 1996 bears no relation to fiscal austerity measures, but instead reflects the end of a one-time capital transfer.
- Japan (1999): The CAPB-to-GDP ratio rose by about 4.9 percentage points, but the policy record shows no evidence of fiscal consolidation measures. Indeed, Japan's fiscal consolidation

program, initiated in 1997, was suspended in 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 multiyear program of fiscal consolidation (2003 *OECD Economic Survey: Japan*, p. 15). Instead, as the 1998 *OECD Economic Survey: Japan* 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 implies 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). Therefore, the sharp increase in the CAPB in 1999 bears no relation to fiscal austerity measures, but instead reflects the end of a one-time capital transfer.

- Finland (2000): The CAPB-to-GDP ratio increased by 4.1 percentage points, but the policy record shows fiscal consolidation measures amounting to only 0.9 percent of GDP.⁴⁸ This episode corresponds to an asset price boom: real stock prices in Finland rose by 70 percent in 1999 and by 86 percent in 2000 (Haver Analytics). Of the 4.1 percentage point increase in the CAPB-to-GDP ratio, 2 percentage points reflect a rise in revenue from one-time factors unrelated to policy actions.⁴⁹ These one-time factors included a rise in tax revenue associated with stock-option and capital gains and an increase in non-tax (property income) revenue partly due to an extraordinary dividend issued by the fully state-owned bank Leonia on the eve of its merger with the private insurance company Sampo. Regarding the remaining 1.2 percentage point discrepancy relative to the historical record (2.1 versus 0.9), the OECD Economic Outlook database indicates a fall in cyclically adjusted social security outlays of about 1 percentage point.

⁴⁸ The fiscal measures reflected mainly central government spending restraint (*OECD Economic Surveys 1999–2000*, p. 36).

⁴⁹ The 2001–02 issue of *OECD Economic Surveys: Finland* reports the 2000 budget outcome as “a very high surplus mainly due to one-off factors” (p. 37).

However, we can find no mention of social security cuts in the historical record, such as in the *OECD Economic Survey*.⁵⁰ Overall, therefore, we conclude that the increase in the CAPB-to-GDP ratio of 4.1 percentage points overstates the amount of consolidation in 2000 by at least 2 percentage points and probably closer to 3.

- Japan (2006): The CAPB-to-GDP ratio increased by 4.1 percentage points, but the policy record indicates fiscal consolidation measures amounting to only 0.67 percent of GDP, implying a discrepancy of about 3.4 percent of GDP. In terms of actual consolidation measures, the policy record indicates a cut in public investment of about 0.27 percent of GDP (2007 *IMF Staff Report*, pp. 32–33) and income tax hikes worth about ¥2 trillion (0.4 percent of GDP—Takahashi and Tokuoaka, 2010). At the same time, the CAPB-to-GDP ratio reported in the 2008 *OECD Economic Surveys: Japan* rose by 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 between the *OECD Economic Survey* and Alesina and Ardagna (2010) in the method used to compute the CAPB. In addition, the *OECD Economic Survey* 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.⁵¹ Without these one-time asset operations, the 2008 *OECD Economic Survey: Japan* estimates that the CAPB-to-GDP ratio increased by only 0.4 percentage point in 2006 (OECD 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 increase

⁵⁰ Note that cuts to social security spending, which is not recorded as central government spending, are not part of the measures amounting to 0.9 percent of GDP that we identify in the policy record.

⁵¹ The 2008 *OECD Economic Survey: Japan* 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).

in the CAPB-to-GDP ratio is close to our estimate of policy measures of 0.67 percent of GDP.

- Belgium (1984): The CAPB-to-GDP ratio increased by 4.7 percentage points, but the policy record indicates fiscal consolidation measures amounting to 0.88 percent of GDP, implying a discrepancy of about 3.8 percent of GDP.⁵² At the same time, the CAPB-to-GDP ratio reported in the OECD Economic Outlook database rises by 4.1 percentage points in 1984. Thus, some of the discrepancy (0.6 percentage point) is due to differences in the method used to compute the CAPB. Of the remaining discrepancy (3.2 percentage points), most is explained by the end of a one-time capital transfer made in 1983. In particular, the OECD Economic Outlook database indicates a one-time increase in capital transfers in 1983 that reduced the CAPB-to-GDP ratio by 2.1 percentage points in 1983. When this one-time transfer came to an end in 1984, it caused the CAPB-to-GDP ratio to rise by 2.1 percentage points (OECD Economic Outlook database). Therefore, excluding the influence of this one-time capital transfer, the discrepancy between the standard approach and our action-based approach shrinks from 3.2 percent of GDP to 1.1 percent of GDP (3.2 minus 2.1).⁵³

Next we turn to the five cases in the bottom-right corner of Figure 3.15—periods that are identified as large consolidations based on our action-based approach, but which feature either a *fall* or a small increase in the CAPB.

- Ireland (2009): Here, the CAPB-to-GDP ratio *fell* by about 4.4 percentage points, but the historical record reports that fiscal consolidation measures of about 4.5 percent of GDP were implemented in 2009. These measures included

⁵²According to the policy record, fiscal consolidation consisted of a “levy of 2 percent a year for three years on earned incomes,” which was expected to increase revenue by 0.75 percentage point of GDP in 1984 (1984/1985 *OECD Economic Surveys: Belgium*, p. 11), and spending cuts of 0.13 percent of GDP consisting of cuts to the public sector wage bill, public sector operating costs, and social security savings (IMF, *Belgium: Recent Economic Developments*, 1984, p. 47).

⁵³The policy record suggests that the increase in capital transfers in 1983 reflected “direct aid to industry” (1985/1986 *OECD Economic Survey: Belgium*, pp. 25–26).

both tax hikes and spending cuts.⁵⁴ The fall in the CAPB despite a substantial fiscal consolidation reflects the impact of the financial crisis during which stock and house prices fell sharply.⁵⁵ 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 computed by the OECD falls by only 1.1 percentage points. As expected, the fall in the CAPB-to-GDP ratio is driven by a sharp decline in cyclically adjusted tax revenue, which falls by 2.6 percentage points in 2009 according to the OECD’s calculations. Government tax revenue directly related to asset prices—capital gains taxes and stamp duties—fell by 1 percent of GDP in 2009.⁵⁶ Another 0.8 percentage point decline in the CAPB-to-GDP ratio is driven by an increase in cyclically adjusted social security benefit payments that have no counterpart in the policy record. Excluding these cyclically adjusted items, the CAPB-to-GDP ratio rises by 2.3 percentage points (–1.1 + 2.6 + 0.8), which represents a large fiscal consolidation and is substantially closer to our estimated size of fiscal consolidation than the Alesina and Ardagna (2010) estimate of –4.4 percentage points.

- Italy (1993): The CAPB-to-GDP ratio increased by only 0.2 percentage point in 1993, but the policy record reports a large consolidation of 4.3 percent of GDP. A plausible reason for this large discrepancy is that there was a sharp economic contraction

⁵⁴The 2009 *OECD Economic Survey: Ireland* (p. 50) and EC (2008, p. D15) report spending cuts in 2009 of €1 billion (0.6 percent of GDP) announced in July 2008, and the 2009 *OECD Economic Survey: Ireland* (pp. 50–51) reports additional spending cuts and tax hikes amounting to 3.9 percent of GDP, implying a total consolidation of 4.5 percent of GDP.

⁵⁵Real stock and house prices fell by 44 percent and 20 percent in 2009, respectively (Haver Analytics database).

⁵⁶Revenue from capital gains taxes and stamp duties fell by 73 and 45 percent in 2009 (Ministry of Finance white paper on receipts and expenditures 2009 and 2010). There was also a sharp fall in the cyclically adjusted indirect-tax-to-GDP ratio, which fell by 1.4 percentage points (OECD Economic Outlook database).

in 1993 associated with the European exchange rate mechanism crisis, which, for the reasons explained above, causes the CAPB-based approach to be inaccurate. Indeed, while the CAPB-to-GDP ratio computed by Alesina and Ardagna (2010) increases by 0.2 percentage point, the CAPB-to-GDP ratio computed by the OECD increases by 1.9 percentage points (OECD Economic Outlook database). The OECD's calculation of the change in the CAPB-to-GDP ratio is therefore consistent with a large fiscal consolidation in 1993 (greater than 1.5 percent of GDP). However, even this estimate of fiscal consolidation is substantially smaller than what is in the policy record. In particular, according to the *OECD Economic Surveys* and the *IMF Recent Economic Developments* reports, fiscal consolidation measures in 1993 amounted to more than 4 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.

- Finland (1992) and (1993): The CAPB-to-GDP ratio *fell* by 2.0 percentage points in 1992 and *rose* by 0.8 percentage point in 1993, but the policy record indicates consolidation measures amounting to 1.8 and 3.8 percent of GDP in 1992 and 1993, respectively. The fall in the CAPB in 1992 despite evidence of fiscal austerity measures during those years was probably due to the depth of the recession after the outbreak of the Finnish banking crisis at the end of 1991.⁵⁷ For reasons explained above, these developments probably depressed tax revenue and increased social security transfers beyond what could have been predicted based on standard cyclical-adjustment techniques. In line with this notion, the *cyclically adjusted* tax-revenue-to-GDP ratio fell in 1992 by 1.2 percentage points, and the cyclically adjusted social-security-spending-to-GDP ratio rose by 2.3 percentage

points (OECD Economic Outlook database). Excluding these two cyclically adjusted items, the CAPB-to-GDP ratio rose by 1.5 percentage points in 1992, close to the size of consolidation based on the policy record (1.8 percent of GDP). Similarly, in 1993, as the sharp recession continued, the cyclically adjusted tax-revenue-to-GDP ratio fell by 1.1 percentage points, and the cyclically adjusted social-security-spending-to-GDP ratio rose by 1.9 percentage points. Excluding these two cyclically adjusted items, the CAPB-to-GDP ratio rose by 3.8 percentage points in 1992, in line with the size of consolidation based on the policy record (3.8 percent of GDP).

- Ireland (1982): The CAPB-to-GDP ratio increased by 0.05 percentage point, but the narrative record indicates fiscal consolidation measures totaling 3.8 percent of GDP. The small increase in the CAPB reflects the problems of cyclical-adjustment techniques during episodes in which consolidation consists of consumption tax hikes and in which there is a large decline in private consumption. In particular, Ireland's 1982 fiscal consolidation package included substantial increases in value-added tax (VAT) rates (from 10 to 18 percent in the lower rate, and from 25 to 30 percent in the standard rate) and in excise duties. At the same time, real private consumption fell by 7.1 percent, although real GDP grew by 2.3 percent, supported by external demand. This is the only year since 1970 in which private consumption fell while GDP grew. The result was a small increase in VAT receipts for a given level of GDP. The change in tax rates is not taken into account by the CAPB-based approach, as fiscal variables are cyclically adjusted with respect to overall GDP and the elasticity is assumed to be constant over time. Therefore, the CAPB-to-GDP ratio fails to pick up the large tax hikes that occurred that year. The OECD's CAPB-to-GDP ratio increases by more than that of Alesina and Ardagna (2010)—0.8 percentage point—leaving a discrepancy of 3 percent of GDP relative to our action-based fiscal consolidation measure. The following simple calculation illustrates how more than half of this remaining discrepancy could be due to the unusual behavior of consumption

⁵⁷ Real GDP fell by 6.4 percent in 1991 and 3.8 percent in 1992, and the unemployment rate increased by 5.1 percentage points in 1992. In 1993, real GDP fell by another 0.9 percent and the unemployment rate increased by 4.6 percentage points.

during this episode. If the consumption-to-GDP ratio in 1982 had remained at the 1981 level of 65 percent, instead of falling to 59 percent, the VAT hike would have added 1.6 percentage points to the cyclically adjusted tax-to-GDP ratio.⁵⁸ This increase in cyclically adjusted tax revenue would have raised the CAPB-to-GDP ratio from the OECD's 0.8 percentage point to 2.4 percentage points, far closer to our action-based measure of fiscal consolidation (3.8 percent of GDP). Overall, this is a case in which the standard approach seems to miss a large part of the fiscal austerity measures.

This examination of the 10 largest disagreements between the two approaches provides strong evidence that our action-based approach more accurately identifies the size of fiscal consolidation. We find seven cases where we are able to identify specific economic or budgetary developments that cause the CAPB-based measures used by Alesina and Ardagna (2010) to inaccurately identify the size of the consolidation and that largely explain the gap between the two measures. In the remaining three cases (Italy in 1993 and Finland in 1992 and 1993), there were crises or large economic contractions 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 substantially inaccurate.

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- ⁵⁸In particular, the indirect-tax-to-GDP ratio in 1982 was 15.3 percent, implying—given the consumption-to-GDP ratio of 59 percent—an average indirect tax rate of about 26 percent. Therefore, keeping the consumption-to-GDP ratio at the 1981 level of 65 percent could have yielded an indirect-tax-to-GDP ratio of 16.9 percent (26 percent × 65 percent)—that is, 1.6 percentage points higher than the actual 15.3 percent.
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