CHAPTER 4

SEPARATED AT BIRTH? THE TWIN BUDGET AND TRADE BALANCES

How do changes in taxes and government spending affect an economy's external balance? Based on a historical analysis of documented fiscal policy changes and on model simulations, this chapter finds that the current account responds substantially to fiscal policy—a fiscal consolidation of 1 percent of GDP typically improves an economy's current account balance by over a half percent of GDP. This comes about not only through lower imports due to a decline in domestic demand but also from a rise in exports due to a weakening currency. When the nominal exchange rate is fixed or the scope for monetary stimulus is limited, the current account adjusts by as much, but the adjustment is more painful: economic activity contracts more and the real exchange rate depreciates through domestic wage and price compression. When economies tighten fiscal policies simultaneously, what matters for the current account is how much an economy consolidates relative to others. Looking ahead, the differing magnitudes of fiscal adjustment plans across the world will help lower imbalances within the euro area and reduce emerging Asia's external surpluses. The relative lack of permanent consolidation measures in the United States suggests that fiscal policy will contribute little to lessening the U.S. external deficit.

Fiscal adjustment will be one of the primary forces shaping the contours of the postcrisis global economy. Large deficits and weak output growth in the aftermath of the Great Recession have substantially increased public debt levels in many of the advanced economies, highlighting their underlying debt sustainability problems. In response to this challenge, fiscal consolidation plans in the G7 advanced economies are large—averaging close to 4 percent of GDP between 2010 and 2016—and are quite varied, ranging from about 2½ percent of GDP in Germany to over 7 percent of GDP in the United Kingdom. In emerging and developing economies, which were not as adversely affected by the crisis and are recovering faster, governments are planning to consolidate over the coming years in order to rebuild fiscal room and, in some cases, to head off overheating pressures.

Chapter 3 of the October 2010 *World Economic Outlook* looked at the implications of fiscal consolidation for output and came to some sobering conclusions. It found that fiscal consolidation typically reduces output and raises unemployment in the short term. In addition, consolidation is likely to be more painful if it occurs simultaneously across many economies and if monetary policy is not in a position to offset the negative effects on economic activity.

This chapter continues this research agenda, this time focusing on a different question: What implications will fiscal adjustment in various economies have for their external balances? In economies with twin fiscal and external deficits, such as the United States and some economies in the euro area, policymakers may be hoping that fiscal consolidation that addresses public debt sustainability concerns will also help bring down large external deficits. On the other hand, economies with large external surpluses, such as China, Germany, and Japan, may be concerned that fiscal consolidation will exacerbate their surpluses.

We attempt to shed light on this issue by addressing the following questions:

- How much does public sector adjustment affect external adjustment? This is closely related to the famous twin deficits hypothesis—the notion that a change in an economy's fiscal balance leads to a change in the same direction in its current account balance.[1]
- In what ways does fiscal adjustment influence the process of external adjustment? Is it simply a

The main authors of this chapter are Abdul Abiad (team leader), John Bluedorn, Jaime Guajardo, Michael Kumhof, and Daniel Leigh, with support from Murad Omoev, Katherine Pan, and Andy Salazar. This chapter draws heavily on a background paper by Bluedorn and Leigh (2011).

[1]The twin deficits hypothesis was invoked to help interpret the coincident large fiscal and current account deficits that characterized the United States during the 1980s. Henceforth, the term is used to refer to the potential link between fiscal and external balances, even though the analysis is not limited to deficit episodes.

matter of reduced public sector demand resulting in lower imports, or is there more to it? What happens to exports, the real exchange rate, and private saving and investment?

- How does the global environment—including characteristics that are particularly relevant at present, such as low global interest rates and synchronized fiscal adjustment across economies—shape the link between fiscal and external adjustment? How much will the fiscal adjustment currently planned and under way in various economies affect the constellation of current accounts around the world, and within regions such as the euro area?

A standard prediction of many textbook models is that fiscal consolidation leads to greater national saving and thus improves the current account. A number of empirical studies, however, find only a small effect from fiscal policy on the current account. In the literature survey by Abbas and others (2011), a majority of studies find that a 1 percent of GDP fiscal consolidation improves the current account balance by 0.1 to 0.4 percent of GDP.[2]

Because fiscal and current account balances move for many reasons, the key challenge for any empirical analysis is to identify the causal effect of fiscal policy on the current account. Two main problems complicate this task. First, both the fiscal balance and the current account balance respond to common factors, such as business cycle fluctuations. Second, governments may adjust fiscal policy in response to economic developments that affect the external balance, raising concerns about reverse causality. To deal with these pitfalls, one needs to isolate movements in the fiscal balance that are not responses to current account changes or to common factors. Then, any relationship between such fiscal changes and the external balance will represent the causal effect of fiscal policy on the current account. A conventional approach to isolating such fiscal policy changes is to identify them using a statistical concept, such as the change in the cyclically adjusted budget balance. As this chapter explains, this is an imperfect measure of actual policy actions. Furthermore, such methods can bias the results against finding evidence of a twin deficits link.

We use an alternative approach to address these problems. Specifically, we examine historical documents to identify fiscal policy changes that are explicitly not a response either to business cycle fluctuations or to the current account. Our starting point is the data set of action-based fiscal consolidations in advanced economies over the past 30 years, developed for Chapter 3 of the October 2010 *World Economic Outlook*, which we update to include fiscal expansions. We then use this data set for a statistical analysis of the short- and medium-term effects of fiscal policy on the current account. This is complemented by simulations using the IMF's Global Integrated Monetary and Fiscal Model (GIMF) that allow us to explore issues that rarely arose in the past, such as the effect of the globally synchronized fiscal consolidation in progress today.

The main findings of the chapter are the following:

- Fiscal policy has a substantial and long-lasting effect on external balances. A fiscal consolidation of 1 percent of GDP results in an improvement in the current account of over a half percent of GDP within two years—an effect larger than found in most other studies using conventional approaches—and this persists into the medium term.
- The improvement in the current account following a fiscal consolidation comes not only through lower import volumes resulting from a decline in domestic demand but also from an increase in export volumes as a result of a weaker domestic currency.
- The current account adjustment is just as large when the nominal exchange rate is fixed or when monetary policy is constrained, but it is more painful—there is a sharper contraction in economic activity, and real exchange rate depreciation over the medium term occurs through a compression of domestic wages and prices, a process sometimes referred to as "internal devaluation."
- Fiscal consolidations synchronized across a number of economies shrink any improvements in the current accounts because everyone's cur-

[2]Studies finding estimates in this range include Alesina, Gruen, and Jones (1991); Bernheim (1988); Bussière, Fratzscher, and Müller (2010); Chinn and Ito (2007); Chinn and Prasad (2003); Gagnon (2011); Gruber and Kamin (2007); Lee and others (2008); and Summers (1986).

rent account cannot rise at the same time. What matters is how much consolidation an economy undertakes relative to other economies.

- Looking ahead, the differing magnitudes of fiscal adjustment plans will help lower imbalances within the euro area and reduce emerging Asia's external surplus. The relative lack of more permanent consolidation measures in the United States suggests that fiscal policy as currently planned will contribute little to bringing down the U.S. external deficit.

The first section of this chapter provides an empirical assessment of the link between fiscal and external adjustment using a historical database of fiscal policy changes. The second section conducts model-based simulations to address additional issues, such as the effect of fiscal policy when monetary policy is constrained and the impact when many economies simultaneously undertake fiscal consolidation. It also quantifies the contributions of planned fiscal adjustments in various economies to current account adjustment around the world. The last section draws some policy implications.

Estimating the Strength of the Twin Deficits Link

This section estimates the effect of fiscal policy on the current account. We start by explaining how we identify changes in fiscal policy from the historical record and how this approach differs from conventional approaches. We then report the estimated effects on the current account and compare the results with those based on a more conventional approach. Finally, we explore the channels through which fiscal adjustment affects external balances.

Identifying Fiscal Policy Changes

At the heart of virtually all empirical studies that estimate the effect of fiscal policy on the current account balance lies a key challenge: identifying deliberate fiscal policy changes. Fluctuations in economic activity would improve the budget balance without any change in policy and would also affect the current account. Therefore, using the change in the overall fiscal balance to measure changes in fiscal policy, as some studies do, would lead to biased estimates of the effect of fiscal policy on the current account.[3]

A common approach to this challenge is to use the cyclically adjusted primary balance (CAPB) as a measure of the fiscal stance.[4] Cyclical adjustment offers an intuitive way of dealing with the fact that tax revenue and government spending move automatically with the business cycle. The hope is that cyclically adjusted changes in fiscal variables reflect policymakers' decisions to change taxes and spending. However, as discussed in Chapter 3 of the October 2010 *World Economic Outlook*, the conventional approach of using cyclically adjusted fiscal data is far from perfect. Three issues with cyclical adjustment arise that complicate tests of the twin deficits hypothesis:

- Even after cyclical adjustment, the CAPB typically includes nonpolicy factors, which may be correlated with other developments affecting economic activity and the current account.[5] For example, an asset price boom improves the CAPB by increasing capital gains and cyclically adjusted tax revenues. Such was the case in Ireland before the recent crisis. Because these booms raise domestic demand and imports, worsening the current account balance, they tend to generate a negative correlation between the CAPB and the current account, biasing the estimated effect of fiscal policy downward. Other nonpolicy factors can move the CAPB and current account balance in the same direction. For example, a positive terms-of-trade shock could raise cyclically adjusted revenues while improving the current account balance, leading to an upward bias.
- Even if the CAPB contained only discretionary fiscal policy changes, some of these could still be responses to cyclical developments. To the extent

[3]Of the 21 studies surveyed in Abbas and others (2011), 13 use the overall fiscal balance as the explanatory variable.

[4]The CAPB is calculated by taking the actual primary balance—noninterest revenue minus noninterest spending—and subtracting the estimated effect of business cycle fluctuations on the fiscal accounts.

[5]For a discussion of how cyclically adjusted fiscal data contain nonpolicy factors correlated with economic activity, see, for example, Guajardo, Leigh, and Pescatori (2011); Romer and Romer (2010); Milesi-Ferretti (2009); Morris and Schuknecht (2007); and Wolswijk (2007).

that domestic booms in economic activity tend to coincide with a worsening current account balance, countercyclical fiscal policies would be associated with a falling current account balance, biasing the estimated effect downward. An example is Denmark in 1986, where the government cut spending and raised taxes to reduce the risk of the economy overheating.

- The CAPB may contain fiscal policy changes that respond directly to external developments. In an economy with rapid import growth and a rising current account deficit, the government might raise taxes or cut government spending in order to restrain domestic demand and help unwind the current account imbalance. Such a discretionary fiscal policy response to developments affecting the current account would be a case of reverse causality and would again tend to generate a negative correlation between the CAPB and the current account, biasing the estimated effect downward. France in 1983 provides such an example, where fiscal policy tightening was motivated by a desire to reduce the current account deficit.

Other approaches also have been used to reduce the endogeneity of the fiscal measure. For example, some studies focus exclusively on government spending to avoid the strong influence of the economic cycle on government revenues. However, to the extent that at least some discretionary changes in government purchases may be motivated by a response to the business cycle, the problem persists.[6]

The Historical Approach to Identifying Fiscal Policy Changes

To address the hazards highlighted above, this chapter uses an alternative approach based on identifying changes in fiscal policy directly from the historical record. This historical approach is similar to that of Romer and Romer (2010) but has been expanded to include multiple economies and to go beyond the tax changes they examine. The starting point is the data set of action-based fiscal consolidations compiled for the October 2010 *World Economic Outlook* and subsequently revised in Devries and others (2011). Based on an analysis of contemporaneous historical records, this data set identifies fiscal consolidations that were not motivated by cyclical or external considerations. The documents used to produce the data set include IMF *Staff Reports* and *Recent Economic Developments*, Organization for Economic Cooperation and Development *Economic Surveys*, central bank reports, and budget documents, among others. Because there is no reason to expect the link between fiscal and external balances to be limited to consolidations, we have enlarged the data set to include fiscal expansions as well.

Based on this approach, we identify tax and spending changes motivated either by a desire to reduce the budget deficit or by some other noncyclical objective, such as higher potential output growth, increased social fairness, limiting the size of government, or external military actions. These types of policy changes are less likely to be systematically correlated with other developments affecting the current account in the short term and are thus valid for estimating the effects of fiscal policy on the current account. Austria in 1996 provides an example of a fiscal policy tightening motivated by budget deficit reduction. Specifically, the authorities cut government spending and raised taxes to meet the budget deficit criteria for European Monetary Union (EMU) accession, based on the 1992 Maastricht Treaty, and not because there was a risk of economic overheating or a desire to improve the current account balance.[7] Canada in 1998 provides an example of fiscal policy easing motivated by long-term considerations rather than cyclical concerns. In particular, tax cuts were part of comprehensive tax reform designed to reduce marginal income tax rates to improve long-term growth, and the additional

[6]Furthermore, taking this approach means neglecting the impact of policy changes on the revenue side, which is also of interest to policymakers. Moreover, changes in government spending are often accompanied by changes in taxes and thus cannot be used in isolation to estimate the impact on the current account balance.

[7]As the 1997 *IMF Staff Report* explains (p. 4), "With first-round participation in EMU the top economic priority since EU membership in 1995, the federal government agreed with the social partners and the lower levels of government on a phased two-year consolidation package to reduce the structural deficit."

government spending was motivated primarily by a desire to enhance education and health care.

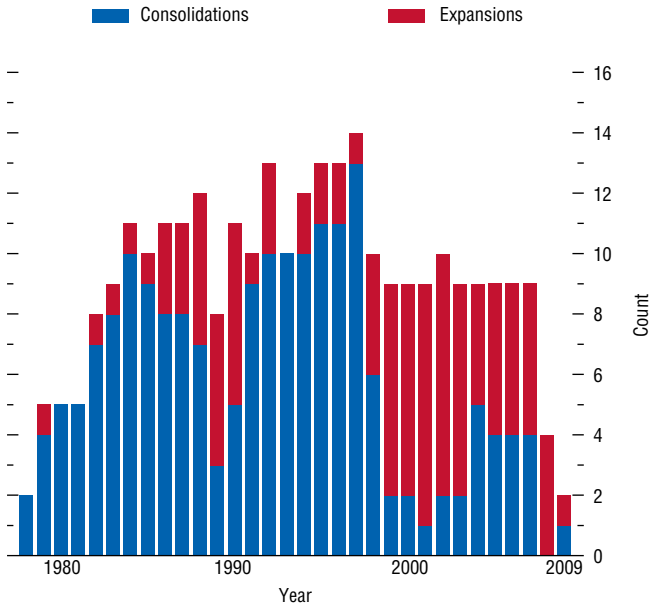
Although the historical approach addresses the aforementioned problems associated with the conventional approach, both the conventional approach and our approach remain subject to some additional criticisms. In particular, if policymakers postpone fiscal consolidation until the economy recovers, then fiscal consolidations will be associated with favorable economic developments using both the conventional approach and our approach. On the other hand, if fiscal consolidation accelerates in downturns to stay on a desired deficit-reduction track, then the identified fiscal consolidations will be associated with unfavorable economic outcomes using both the conventional approach and our approach. Thus, the overall direction of these potential biases is unclear. Furthermore, to the extent that cyclical motivations behind the timing of policy are reflected in the record, the historical approach will identify and exclude them, minimizing any bias.[8]

For the 17 economies covered over the 1978–2009 period (a total of 544 country-year observations), we identify 291 fiscal policy changes that were not motivated by cyclical or external considerations.[9] Almost two-thirds of the actions are fiscal consolidations. Figure 4.1 shows the incidence of our action-based fiscal consolidations and expansions by year across the economies in the sample. The average fiscal policy change is a fiscal consolidation of 0.4 percent of GDP, and the range of actions runs from a fiscal consolidation of 4.7 percent of GDP to a fiscal expansion of 3.5 percent of GDP.

Figure 4.1. Incidence of Action-Based Fiscal Policy Changes by Year

(Frequency count)

There were 291 fiscal policy changes identified over the past 30 years in advanced economies, of which almost two-thirds were consolidations. The average fiscal policy change is a fiscal consolidation of 0.4 percent of GDP.



Source: IMF staff calculations.

[8]Both conventional approaches and our historical approach record changes in fiscal policy when they are implemented rather than when they are announced, which ignores the role of anticipation effects highlighted by Ramey (2011). However, as Beetsma, Giuliodori and Klaassen (2008) point out, the role of anticipation effects is likely to be smaller at the annual frequency used here than at the quarterly frequency used by Ramey (2011) and Romer and Romer (2010).

[9]The economies covered include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, and the United States.

Estimated Effects of Fiscal Policy on the Current Account

With these action-based fiscal policy changes in hand, we use straightforward statistical techniques to estimate the effect of fiscal policy on the current account. The methodology is similar to that of Cerra and Saxena (2008) and Romer and Romer (2010), among others. Specifically, we regress changes in the current-account-to-GDP ratio on its lagged values (to capture the normal dynamics of the current account) as well as on contemporaneous and lagged values of our action-based fiscal policy measure, also measured relative to GDP.[10] Including lags allows for fiscal policy changes to work on the current account with a delay. The specification also includes a full set of time fixed effects to account for common shocks, such as shifts in oil prices, and economy-specific fixed effects to account for differences in economies' normal external positions.

Because we want to estimate the *overall* effect of fiscal policy changes on the current account, we do not include possible transmission channels for fiscal policy, such as the exchange rate or the monetary policy rate, as additional explanatory variables in the model. As a general rule, we rely on the exogeneity of the fiscal policy changes identified through the historical approach to deliver unbiased estimates of the causal effect of fiscal policy. This exogeneity allows us to have a minimal specification.[11]

The regression results suggest that fiscal policy changes have effects on the current account that are both large and long-lasting. Figure 4.2 shows that a 1 percent of GDP fiscal consolidation raises the current-account-to-GDP ratio by 0.6 percentage point within two years. After five years, the increase in the current account balance remains over a half percent of GDP.[12] The finding of a large and long-lasting twin deficits link also survives a variety of robustness tests, including different estimation approaches, alternative specifications, dropping outliers, and distinguishing between types of fiscal policy changes, as reported in Appendix 4.2.

By contrast, using the conventional CAPB-based approach suggests that fiscal consolidation has a much smaller effect.[13] In this case, a fiscal consolidation of 1 percent of GDP raises the current-account-to-GDP ratio by only 0.1 percentage point within two years, with the effect fading over time. This result is broadly consistent with estimates in the literature for advanced economies, suggesting that the bias associated with the conventional approach may be substantial.

Channels for External Adjustment

Having established a strong link between fiscal and external current account balances, this section looks at the ways in which fiscal policy affects the current account. Is it simply a matter of fiscal consolidation reducing domestic demand and imports, or is there more to it? We start by reviewing the effect of fiscal policy on economic activity, thus updating the results presented in Chapter 3 of the October 2010 *World Economic Outlook* using our expanded data set. We then look at the responses of saving and investment, imports and exports, and exchange rates and interest rates. To explore these channels, we use the same statistical model used for the current account, but with these other variables of interest as the dependent variable. We also repeat the analysis for some of the variables using the more conventional CAPB-based approach to shed light on why the estimated effect on the current account is larger using our approach.

[10]See Appendix 4.1 for a description of the data sources and construction, and Appendix 4.2 for further details on the estimation methodology and additional robustness tests.

[11]The estimated responses are cumulated to recover the response of the level of the current-account-to-GDP ratio to a permanent 1 percent of GDP fiscal policy change. The figures that follow illustrate the effects of a fiscal consolidation; the effects of a fiscal expansion would be the reverse. In a robustness check in Appendix 4.2, we show that fiscal consolidations and expansions have roughly symmetric effects on the current account. We cannot reject that their magnitudes are identical.

[12]The magnitude of this effect is close to that found by Kumhof and Laxton (2009) in simulations using a calibrated non-Ricardian open economy dynamic stochastic general equilibrium model featuring finitely lived households.

[13]The cyclically adjusted data come from Alesina and Ardagna (2010). We are grateful to the authors for sharing their data.

Economic activity

Fiscal consolidation typically has a contractionary effect on economic activity (Figure 4.3, blue lines).[14] In particular, a fiscal consolidation equal to 1 percent of GDP reduces real output by 0.6 percent of GDP within two years, with a partial recovery over the next few years. Domestic demand contracts by more than 1 percent within two years; this contraction in domestic demand is likely to improve the current account balance through lower import demand and domestic investment.

By contrast, using the conventional CAPB-based approach suggests that fiscal consolidation is typically painless, with output and domestic demand expanding in the short term (Figure 4.3, red lines). In particular, a 1 percent of GDP fiscal consolidation raises output by 0.3 percent within two years, while domestic demand expands by 0.5 percent. However, this result likely reflects the endogenous nature of the CAPB-based measure of the fiscal policy stance, as discussed above.[15] For example, a boom in the stock market improves the CAPB by increasing capital gains and cyclically adjusted tax revenues. Such developments are also likely to be reflected in higher consumption and investment. It is therefore not surprising that the conventional approach finds little evidence of contractionary effects on economic activity.

Saving and investment

Fiscal consolidation improves the current account balance by both lowering investment and raising national saving. As Figure 4.4 shows, a 1 percent of GDP fiscal consolidation tends to raise national saving by 0.35 percent of GDP within three years. Meanwhile, the investment-to-GDP ratio drops by 0.3 percentage point within two years, with a slight rebound thereafter.

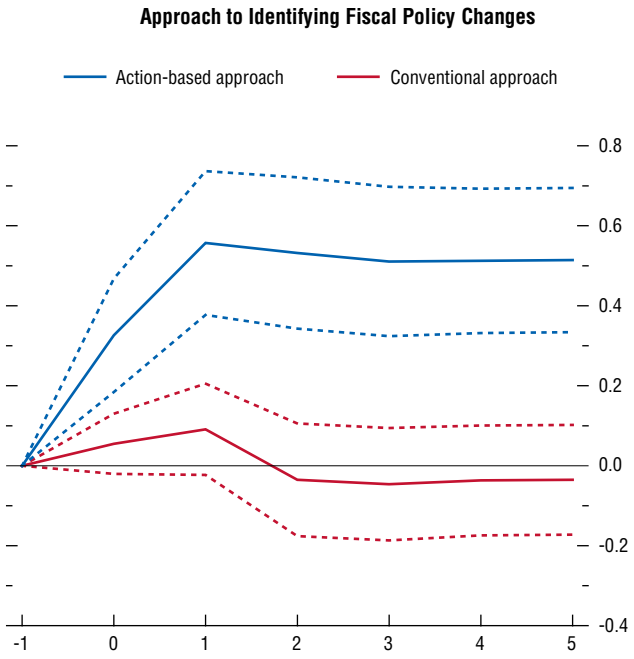
[14]These results are consistent with those reported in the October 2010 *World Economic Outlook*, based on the earlier data set of 15 countries and without the additional fiscal expansions motivated by noncyclical objectives included in this chapter.

[15]For additional discussion of the differences between the action-based and conventional approaches and the effect of fiscal policy on economic activity, see Guajardo, Leigh, and Pescatori (2011).

Figure 4.2. Effects on the Current Account of a 1 Percent of GDP Fiscal Consolidation

(Percent of GDP)

When fiscal policy changes are identified directly from historical records, the estimated effect on the current account is large and long-lasting. By contrast, estimates obtained using a conventional approach suggest fiscal policy has little effect on the current account.



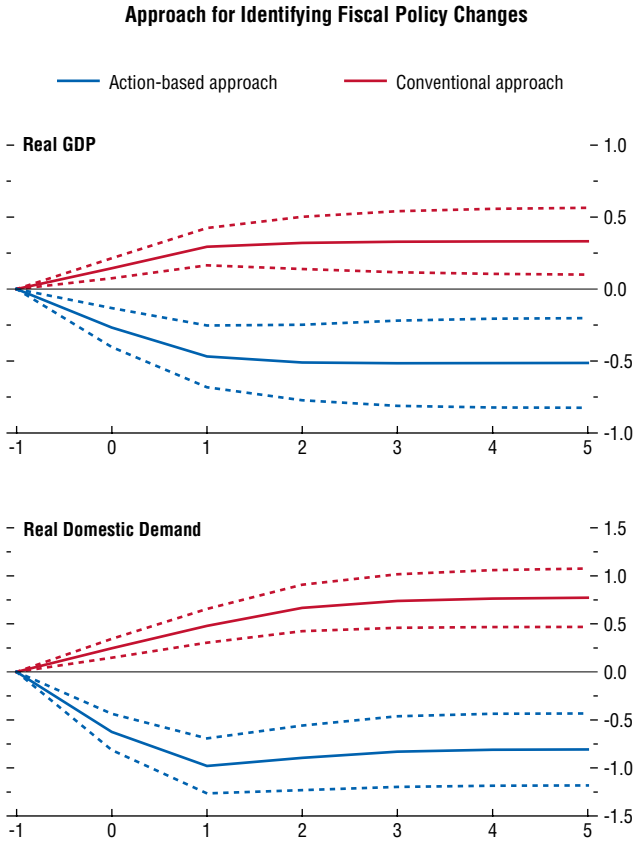
Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of consolidation. Dashed lines indicate the 90 percent confidence interval around the point estimate. The conventional approach shown here uses changes in the cyclically adjusted primary balance as the measure of change in fiscal policy. The results are broadly similar if the actual change in the overall fiscal balance is used instead. The effect of a fiscal expansion would be the reverse of the response to a consolidation.

Figure 4.3. Effects on Economic Activity of a 1 Percent of GDP Fiscal Consolidation

(Percent)

Fiscal consolidation typically has contractionary effects on output and domestic demand according to our action-based approach. By contrast, using a conventional approach suggests that the opposite is true.



Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of consolidation. Dashed lines indicate the 90 percent confidence interval around the point estimate. The conventional approach shown here uses changes in the cyclically adjusted primary balance as the measure of change in fiscal policy. The results are broadly similar if the actual change in the overall fiscal balance is used instead. The effect of a fiscal expansion would be the reverse of the response to a consolidation.

As seen in the bottom panel of Figure 4.4, under the CAPB-based approach, investment actually increases in the short term, largely offsetting the increase in national saving associated with fiscal consolidation. Specifically, a 1 percent of GDP fiscal consolidation based on the CAPB is associated with a rise in the investment-to-GDP ratio of 0.3 percentage point within three years. In the short term, the increase in investment is smaller than the rise in national saving, which climbs by 0.4 percentage point within two years—explaining the small improvement in the current account balance. However, this surge in investment likely reflects the endogenous nature of the CAPB-based measure of the fiscal policy stance, as discussed above. It is therefore not surprising that the CAPB-based approach finds little evidence of a twin deficits link.[16]

The stark difference between the estimated effects on investment across the action-based versus the CAPB-based fiscal changes highlights the importance of the fiscal policy identification choice. Henceforth, we focus only on the results using the action-based approach to fiscal policy identification.

Separating the public and private components of saving and investment, we find that public saving rises by 0.6 percent of GDP, whereas public investment declines by about 0.2 percent of GDP (Figure 4.5, top panel). Thus, fiscal policy changes enacted to deliver 1 percent of GDP in fiscal consolidation improve the overall balance by about 0.8 percent of GDP. The improvement in the fiscal balance is not one-for-one for a number of reasons. First, the fiscal consolidation has a detrimental effect on economic activity, with automatic stabilizers offsetting at least part of the budgetary savings. Second, discretionary countercyclical stimulus is sometimes implemented, again offsetting part of the potential gains.[17]

[16]The large difference between the responses to the action-based and CAPB-based fiscal changes also applies to the response of the real exchange rate, which *appreciates* in response to a CAPB-based fiscal consolidation but *depreciates* in response to an action-based fiscal consolidation, as discussed below.

[17]An example is Germany in 1982, where the government embarked on consolidation, but economic developments over the course of the year led to the introduction of some countercyclical expansionary measures, reducing the saving achieved from the consolidation package.

The response of private saving and investment to fiscal policy changes is relatively muted. There is a small decline in private saving (Figure 4.5, bottom panel) that only partially offsets the rise in public saving. As a result, national saving rises significantly.[18] Turning to investment, private investment falls in the short term, possibly in response to the weaker economic activity that results from fiscal consolidation. However, this decline in private investment is temporary. By the second year after consolidation, the private-investment-to-GDP ratio rebounds to its level prior to consolidation. Thus, it is the improvement in the public saving-investment gap that drives the improvement in the current account.

Exports, imports, and relative prices

Although the current account improves in response to fiscal consolidation, it might not be viewed favorably if it is simply due to a decline in imports coming from the domestic demand contraction. To see whether this is the case, we examine the behavior of exports and imports of goods and services in response to changes in fiscal policy. As it turns out, the improvement in the current account comes about through *both* higher exports and lower imports. In response to a fiscal consolidation of 1 percent of GDP, export volumes rise by just under 1 percent in the short term, while import volumes fall just over 1 percent (Figure 4.6).[19] Over the medium term, the effect on exports attenuates until it is about a half percent, while that on imports remains above 1 percent.

What is behind this rise in exports and fall in imports? As Figure 4.7 illustrates, an important factor is a shift in the real exchange rate (top-left panel). The real exchange rate depreciates by 1 percent within one year and remains depreciated over the next few years. In the short term, the real depreciation is driven entirely by nominal depreciation (top-right panel). Over the medium term, the real value of the currency stays low because domestic

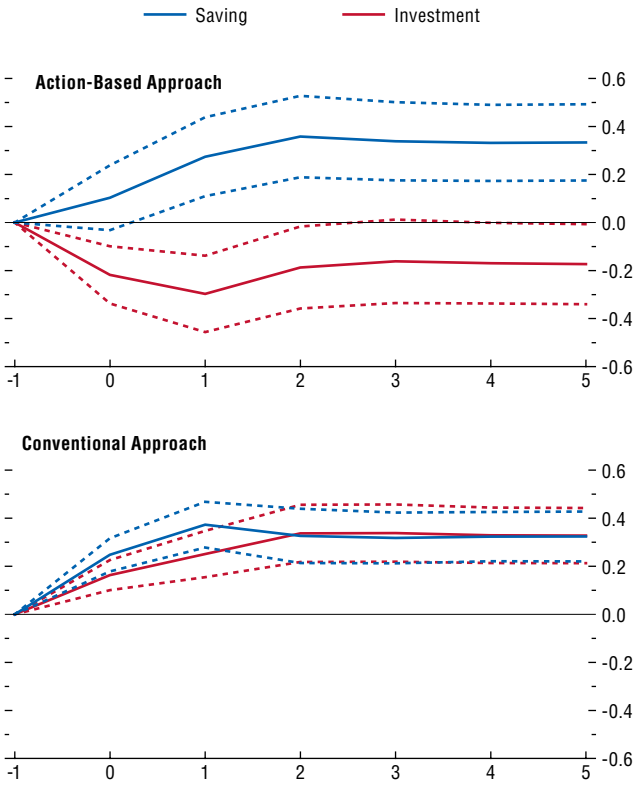
[18]This provides evidence against Ricardian equivalence, which posits that an increase in government saving is fully offset by a fall in private saving in response to lower anticipated future taxes.

[19]When expressed in *percent of GDP*, the improvement in the current account is driven primarily by the rise in exports.

Figure 4.4. Effects on Saving and Investment of a 1 Percent of GDP Fiscal Consolidation

(Percent of GDP)

The current account adjustment in response to fiscal consolidation occurs through both an increase in saving and a fall in investment. Conventional approaches to measuring fiscal policy changes find a rise in investment following a consolidation, which offsets the rise in saving and reduces the effect on the current account.



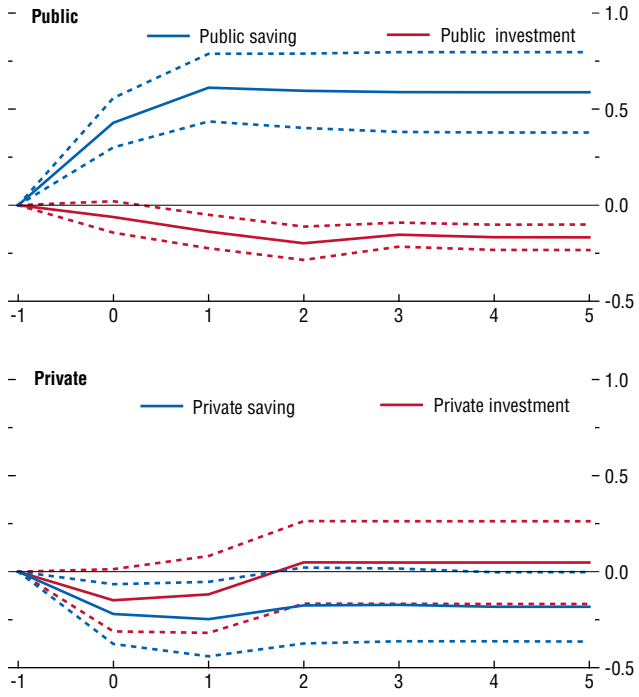
Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of consolidation. Dashed lines indicate the 90 percent confidence interval around the point estimate. The conventional approach shown here uses changes in the cyclically adjusted primary balance as the measure of change in fiscal policy. The results are broadly similar if the actual change in the overall fiscal balance is used instead. Fiscal policy changes are action-based. The effect of a fiscal expansion would be the reverse of the response to a consolidation.

Figure 4.5. Effects on the Composition of Saving and Investment of a 1 Percent of GDP Fiscal Consolidation

(Percent of GDP)

Fiscal consolidation is associated with a rise in public saving and a fall in public investment. The response of private saving and investment to fiscal policy changes is relatively muted.



Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of consolidation. Dashed lines indicate the 90 percent confidence interval around the point estimate. Fiscal policy changes are action-based. The effect of a fiscal expansion would be the reverse of the response to a consolidation.

relative prices decline (middle-left panel).[20] This is evident in the decline of the domestic price vis-à-vis trading partners and especially in the decline of unit labor costs (middle-right panel). This shift in relative prices likely supports the rise in export volumes following a fiscal consolidation. Interestingly, the estimated responses of exports and imports are broadly consistent with those implied by the estimated shift in the real exchange rate and standard trade elasticities.[21] One factor that might contribute to a weaker currency is the fall in interest rates (bottom panels). Both the short-term policy rate and the long-term rate (measured here by 10-year government bond yields) decline by about 10 basis points. This is similar to the interest rate responses seen in a standard dynamic general equilibrium model (Clinton and others, 2010).

What Happens When Monetary Policy and Exchange Rates Are Constrained?

The evidence presented above suggests that a key mechanism underlying the twin deficits link is a real depreciation of the exchange rate. Usually, this occurs mainly through a fall in the nominal value of the currency. But how does the current account respond to fiscal policy changes if the nominal exchange rate cannot respond and monetary policy is constrained? Is the result a smaller current account response?

To shed light on how the twin deficits link changes when the nominal exchange rate and monetary policy are constrained, we compare the behavior of the current account under pegged and nonpegged exchange rate regimes.[22] For pegged exchange rate regimes,

[20]The relative price is defined as the ratio between the consumer price index (CPI)-based real effective exchange rate and the nominal effective exchange rate. It captures the difference between domestic prices and trade-weighted average prices in trading partners.

[21]For example, Bayoumi and Faruqee (1998, p. 32) report that, within two years, a 1 percent real depreciation should raise exports by 0.7 percent and reduce imports by 0.9 percent, all else equal. In our sample, the estimated impact of fiscal consolidation is a real depreciation of 1 percent. The conventional elasticities would thus imply an impact on exports and imports of 0.7 percent and –0.9 percent, respectively, close to our estimated effects.

[22]See Appendix 4.1 for a description of the exchange rate regime indicator.

without exiting the peg, neither changes in monetary policy in response to economy-specific developments nor nominal exchange rate depreciation is possible. The results suggest that the effect of fiscal consolidation on the current account remains large even for economies with pegged exchange rate regimes (Figure 4.8, top panel). The estimated effect of a 1 percent of GDP fiscal consolidation on the current account within two years is a half percent of GDP for the pegged exchange rate sample, which levels off to slightly less than a half percent of GDP in subsequent years.

If monetary policy is constrained and the nominal exchange rate cannot adjust, how is the external adjustment accomplished? The remaining panels in Figure 4.8 show that in the pegged exchange rate subsample, fiscal consolidation results in a more pronounced and persistent compression of domestic prices. This leads to a depreciation of the real exchange rate, even without any nominal depreciation. Such cost compression, sometimes referred to as "internal devaluation," is also visible in the larger decline in unit labor costs. The compression of domestic prices vis-à-vis trading partners helps support the current account improvement over the medium term.

Insights from Model-Based Simulations

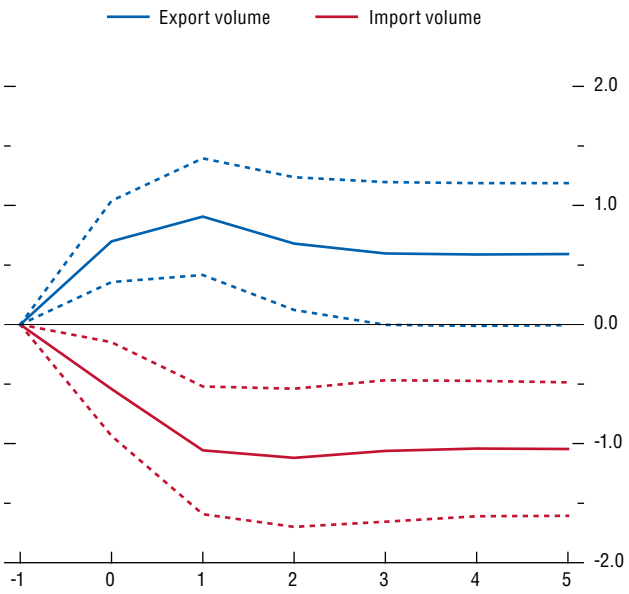
The previous section analyzed historical episodes of fiscal consolidation to assess the effects of fiscal policy on external balances. However, historical analysis can draw only on patterns that have been seen before; it cannot fully address issues that are relevant today but that rarely arose in the past, such as the zero lower bound on nominal interest rates. Therefore, to complement the empirical analysis, this section examines the twin deficits link in the controlled "laboratory" setting of the Global Integrated Monetary and Fiscal Model (GIMF), a dynamic general equilibrium model designed to simulate the effects of fiscal and monetary policy changes.[23]

[23]For a description of the theoretical structure of the GIMF, see Appendix 4.3 and Kumhof and others (2010). Kumhof and Laxton (2009) and Clinton and others (2010) examine the effects of fiscal consolidation on external balances using the GIMF. As those papers report, GIMF simulations produce results for the effect of fiscal policy on the current account that are in line with those reported in the previous section of this chapter.

Figure 4.6. Effects on Export and Import Volumes of a 1 Percent of GDP Fiscal Consolidation

(Percent)

Import volumes fall and export volumes rise following a fiscal consolidation.

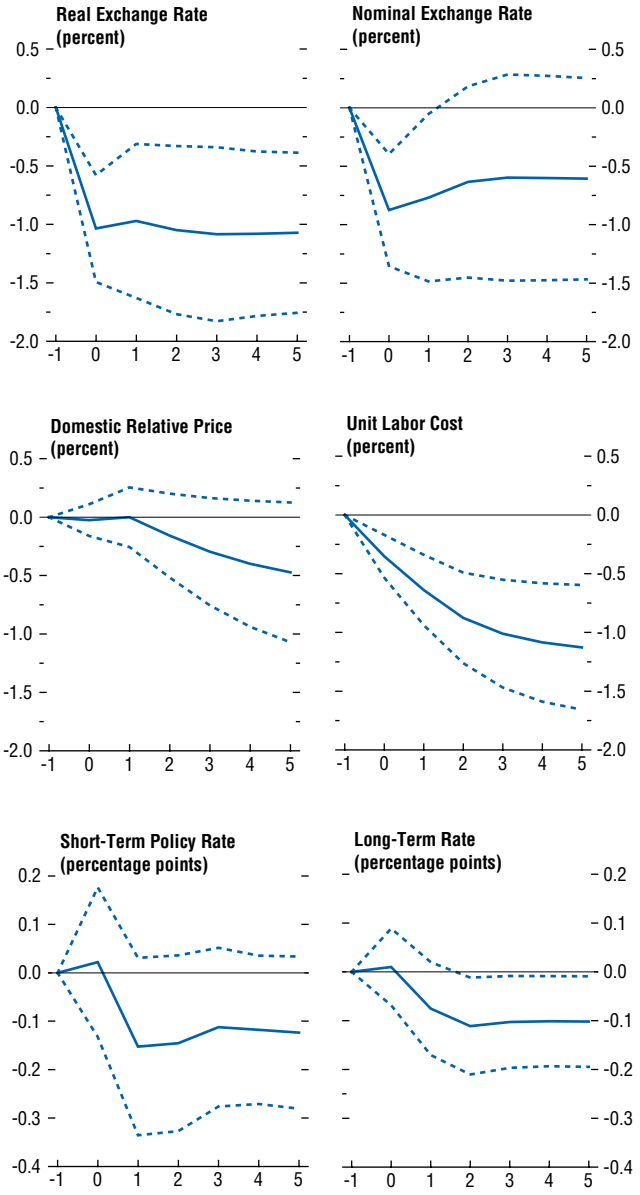


Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of consolidation. Dashed lines indicate the 90 percent confidence interval around the point estimate. Fiscal policy changes are action-based. The effect of a fiscal expansion would be the reverse of the response to a consolidation.

Figure 4.7. Effects on Exchange Rates, Prices, and Interest Rates of a 1 Percent of GDP Fiscal Consolidation

Behind the rise in net exports is a shift in the real exchange rate, driven by nominal depreciation and a decline in domestic relative prices. Interest rates tend to decline.



Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of consolidation. Dashed lines indicate the 90 percent confidence interval around the point estimate. The nominal and real exchange rates are indices of trade-weighted bilateral exchange rates (effective exchange rates). The domestic relative price is the difference between home and foreign price levels. Fiscal policy changes are action-based. The effect of a fiscal expansion would be the reverse of the response to a consolidation.

In particular, we explore the following questions:

- How do the effects of fiscal consolidation change when nominal interest rates are near zero and can fall no further?
- How do the effects change when many economies simultaneously undertake fiscal consolidations of comparable magnitudes?
- How much will the varied fiscal adjustments being undertaken and planned in various economies affect the constellation of current accounts around the world and within regions such as the euro area?

External Adjustment When Monetary Policy Is Constrained

Since the onset of the Great Recession, short-term interest rates in the largest advanced economies have been near zero. 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 were possible and typically followed fiscal consolidation.

Therefore, to illustrate the effects of fiscal consolidation on external balances when interest rates are near zero and can fall no further, we use model simulations. In particular, we examine what happens when a small open economy, which we calibrate to fit the main features of Canada, implements fiscal consolidation with and without constrained monetary policy. The consolidation considered here is a reduction in the deficit equivalent to 1 percent of GDP, composed entirely of spending cuts.[24]

The results suggest the following:

- When the interest rate is free to move, the improvement of the current account in response to consolidation is about a half percent of GDP after two years (Figure 4.9, top panel, blue line).[25] This response is similar to the estimates from the empirical analysis in the previous section. Furthermore, the mechanisms at work in the model are

[24]Specifically, three-quarters of the spending cuts fall on government consumption, with the rest falling on government investment. As seen in Appendix 4.3, the effects on the current account are similar when the adjustment is implemented using different fiscal instruments.

[25]In the model, when monetary policy is unconstrained, it follows a Taylor rule to set interest rates.

consistent with what was shown in the preceding section. Fiscal consolidation reduces economic activity, which improves the current account through lower imports. Monetary policy easing in response to this negative demand shock spurs depreciation of the exchange rate. This boosts exports, further improving the current account.

- When interest rates cannot move, the response of the current account to a fiscal consolidation is still of the same magnitude, just slightly higher than a half percent of GDP (Figure 4.9, top panel, red line). Here, the simulation assumes that interest rates are fixed for two years.[26] The inability of the central bank during this period to offset the slump induced by the cut in government spending results in a sharper fall in aggregate demand and inflation than when monetary policy is unconstrained. The resulting fall in economic activity and domestic relative prices results in an "internal devaluation" that boosts net exports and the current account.[27] Thus, the model simulation corroborates the finding of the empirical analysis that external balances adjust just as much even when monetary policy is constrained.

Simultaneous and Uniform Global Fiscal Consolidation

How do the effects of fiscal consolidation on the current account change when many economies consolidate at the same time? This question is relevant today, because many economies have set fiscal consolidation in motion.

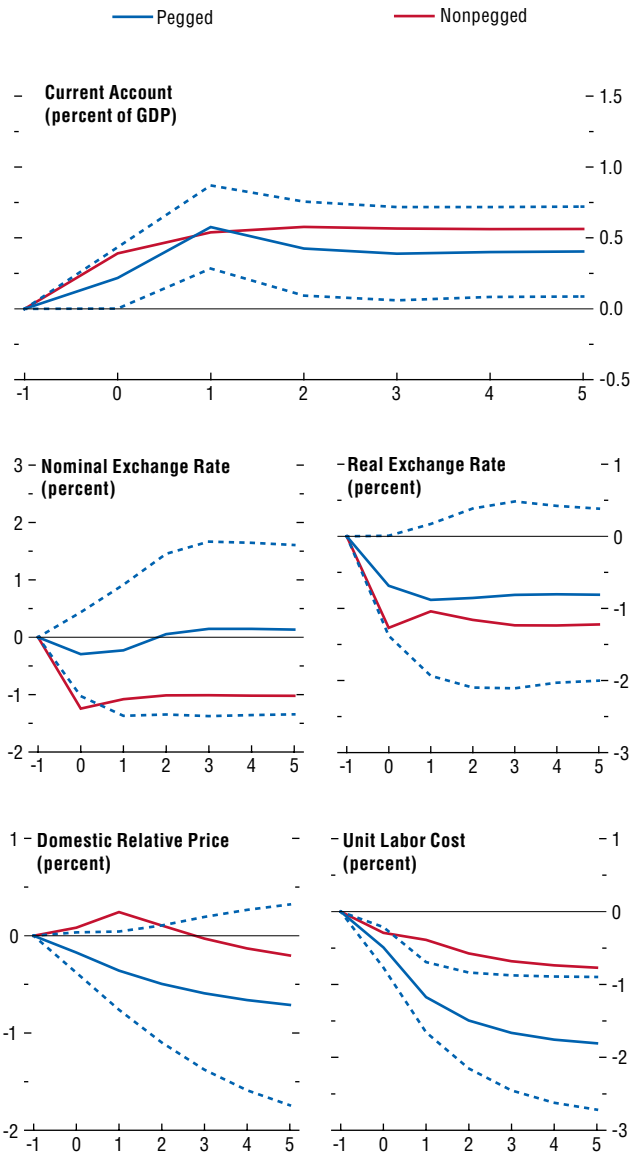
To address this issue, the simulations compare a situation in which only Canada cuts its fiscal deficit

[26]When the option of cutting interest rates is removed for a long time—in the GIMF, three or more years—the model generates unstable macroeconomic dynamics, which complicates the computation of simulation results. For simplicity, the analysis ignores the possibility of the central bank responding to the consolidation by using unconventional monetary tools, such as quantitative or qualitative 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 lower bound.

[27]Similarly, as additional simulations suggest, when the nominal exchange rate is fixed and the response of monetary policy to domestic developments is thus constrained, aggregate demand and domestic relative prices fall more than when the exchange rate is flexible. However, the current account adjustment is of the same size.

Figure 4.8. Effects of a 1 Percent of GDP Fiscal Consolidation under Pegged and Nonpegged Exchange Rate Regimes

Under a pegged exchange rate, the current account adjustment is just as large, but it is accompanied by a greater reduction of relative prices and unit labor costs.

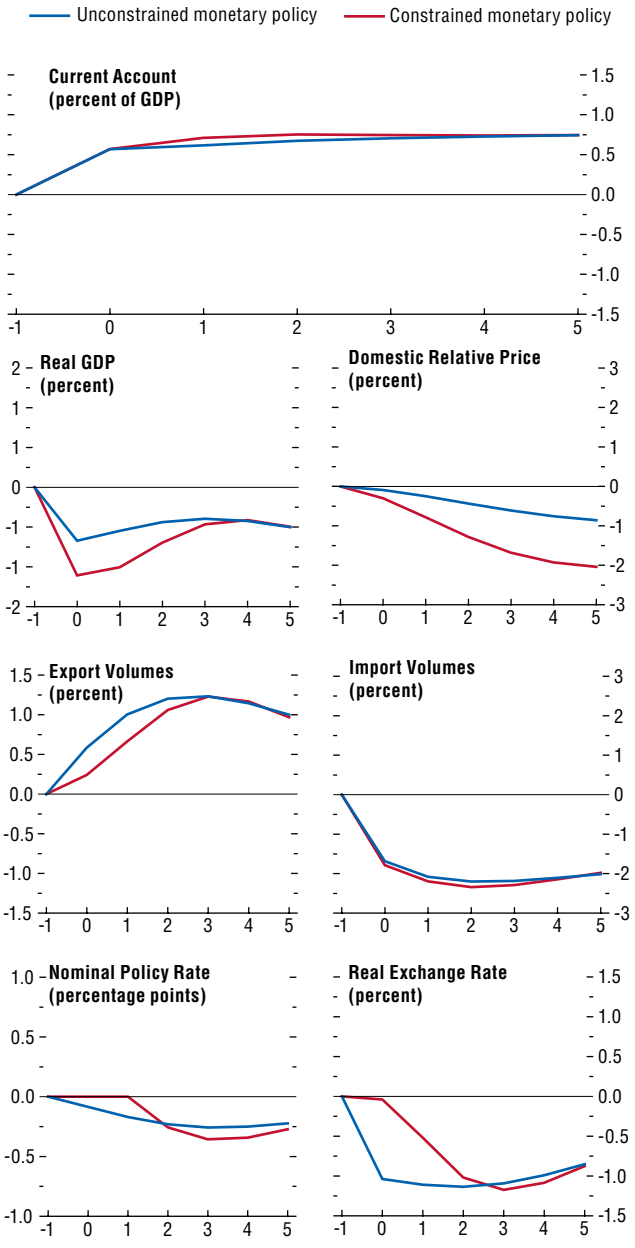


Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of consolidation. Dashed lines indicate the 90 percent confidence interval around the point estimate. Fiscal policy changes are action-based. The effect of a fiscal expansion would be the reverse of the response to a consolidation.

Figure 4.9. Effects of a 1 Percent of GDP Fiscal Consolidation under Constrained Monetary Policy: GIMF Simulations

When the scope for monetary easing is constrained, the current account adjustment is just as large. In the short term, it is associated with a larger fall in economic activity and smaller real exchange rate depreciation.



Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of a 1 percent of GDP fiscal consolidation. The responses in the figures are model simulations for Canada from the IMF's Global Integrated Monetary and Fiscal Model (GIMF).

with one in which the entire world does so simultaneously (global fiscal consolidation) by the same amount. We again use Canada to illustrate the case of an economy small enough to have only minimal spillover effects on the rest of the world but open enough that fiscal contraction in the rest of the world has significant effects on its external balance and output.[28]

As before, the adjustment involves reducing the deficit-to-GDP ratio by 1 percentage point across all economies, with the adjustment composed entirely of spending cuts. Three-quarters of the spending cuts fall on government consumption, and the rest falls on government investment. We assume that monetary policy cannot respond in both Canada and the rest of the world for two years, to more closely resemble current conditions in which interest rates in many advanced economies are near the zero lower bound.[29]

In stark contrast to the situation where only Canada consolidates, a synchronized global consolidation equal in size does not improve Canada's external balance (Figure 4.10, top panel, red line). Canada's exports decline as global demand falls because of the synchronized fiscal consolidation, and unlike in the case of unilateral consolidation, there is no boost from the exchange rate.[30] This finding of no improvement in the external balance should not be surprising. Because the sum of all current accounts in the world must be zero according to the balance-of-payments identity, it is impossible for all economies' current account balances to improve at the same time. Fiscal consolidation does not automatically result in an improved current account—what matters is how much consolidation an economy undertakes relative to other economies.

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

[29]Eighty percent of Canada's trade is with the United States and Europe, and so the assumption of constrained monetary policy for the rest of the world is more reasonable than allowing interest rates to move freely.

[30]Canada's real exchange rate appreciates because there are fewer liquidity-constrained households in Canada compared with the rest of the world. Liquidity-constrained households cannot borrow, and so fiscal consolidation results in a larger fall in consumption and domestic prices—and hence a real depreciation—in the rest of the world or, equivalently, a real appreciation in Canada.

Current Fiscal Adjustment Plans and Their Implications for External Balances

The fiscal adjustments currently planned by various economies over the coming years are, of course, not uniform in size or timing. The United Kingdom has embarked on an ambitious fiscal consolidation path, with policies aimed at improving the structural primary balance by more than 7 percent of GDP over the next six years. By contrast, some emerging and developing economies envision much smaller or even negative changes in their structural primary balance over the same period, as exit from stimulus is offset by increased fiscal spending on infrastructure investment or on strengthening social safety nets. What are the implications of these fiscal adjustments for the global constellation of current accounts?

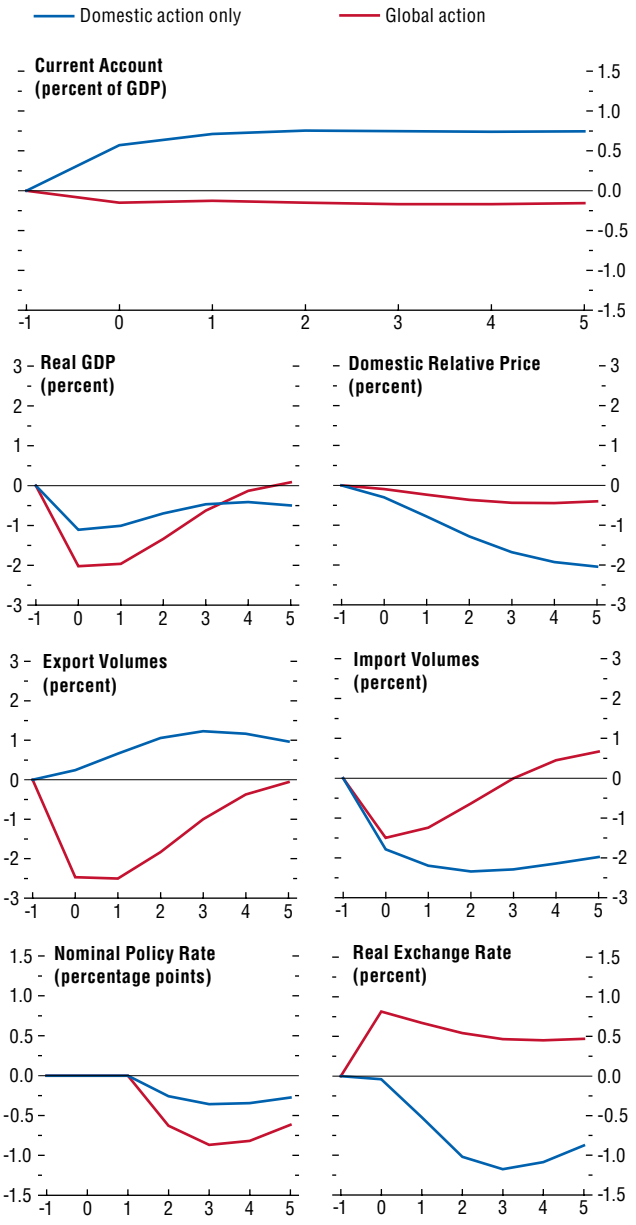
To examine this question, we utilize a six-region version of the GIMF. The six regions are the United States, Japan, Germany, the euro area excluding Germany, emerging Asia, and the rest of the world.[31] Across these regions, the size of the planned fiscal adjustment between 2010 and 2016 ranges from a high of 4.6 percent of GDP in the United States to a low of 1.6 percent of GDP in emerging Asia (Figure 4.11, top-left panel). One important difference across the regions, however, is how much of the improvement in the structural primary balance in the coming years is the result of new permanent consolidation measures and how much is due to the expiration of temporary stimulus measures implemented in the wake of the crisis. For example, almost two-thirds of the projected improvement in the U.S. fiscal position is from letting temporary stimulus measures expire; about 1.7 percent of GDP of the improvement is due to new, permanent fiscal consolidation measures.[32] In contrast, most of

[31]The emerging Asia region includes China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore, and Thailand. The rest of the world region includes both advanced economies, such as Australia, New Zealand, and the United Kingdom, and emerging and developing economies, excluding emerging Asia.

[32]Fiscal consolidation plans for the United States are based on the president's budget proposal of February 2011. The budget plan passed August 2 outlines measures that generate a deficit reduction of roughly the same order of magnitude. But because the second stage of the plan still needs to be decided by a bipartisan commission in Congress, there is much uncertainty regarding the exact size and timing of the new plan.

Figure 4.10. Effects of a Synchronized Global 1 Percent of GDP Fiscal Consolidation: GIMF Simulations

If all economies engage in synchronized fiscal consolidations of the same size, then there is little effect on the current account, and the short-term output contraction is larger. This is because it is not possible to have simultaneous real depreciation and current account improvement in all economies.



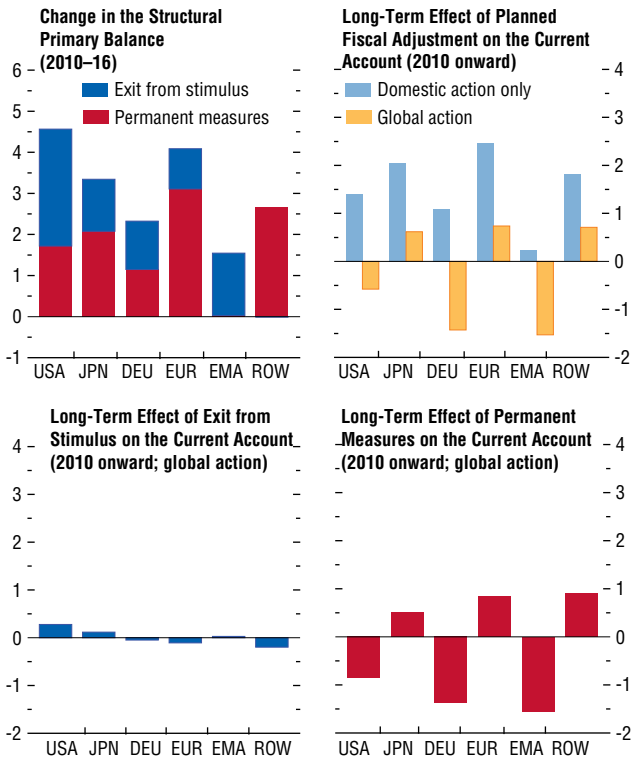
Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of a 1 percent of GDP fiscal consolidation undertaken either by the domestic economy alone or by all economies together. The responses in the figures are model simulations for Canada from the IMF's Global Integrated Monetary and Fiscal Model (GIMF). Monetary policy is assumed to be constrained, with rates fixed for two years.

Figure 4.11. Planned Fiscal Adjustment and Its Current Account Impact: GIMF Simulations

(Percent of GDP)

The differing magnitudes of fiscal adjustment plans across economies imply lower imbalances within the euro area, smaller external surpluses in emerging Asia, and a larger U.S. current account deficit.



Source: IMF staff calculations.

Note: The current account impacts are model simulations from the IMF's Global Integrated Monetary and Fiscal Model, using the planned fiscal adjustment for each region, which show the long-term effect of the planned fiscal adjustment on the current account relative to 2010. When the long-term effects are weighted by their region's share of world GDP, they sum to zero, as required by the global balance-of-payments identity. The shares of each region in world GDP are Germany (6%); emerging Asia (13%); euro area (16%); Japan (8%); rest of the World (32%); United States (25%). The stylized compositions of the fiscal instruments used within each region are United States (30% government consumption, 40% labor taxes, 20% targeted transfers, 10% general transfers); euro area (40% government consumption, 30% labor taxes, 20% targeted transfers, 10% general transfers); all other regions (35% government consumption, 35% labor taxes, 20% targeted transfers, 10% general transfers). DEU: Germany; EMA: emerging Asia; EUR: euro area excluding Germany; JPN: Japan; ROW: rest of the world; USA: United States.

the improvement in the fiscal position of the euro area excluding Germany is due to permanent fiscal measures. It is these more permanent fiscal policy measures that have a substantial long-term effect on external balances (Clinton and others, 2010).[33]

We perform two experiments—unilateral consolidation and global consolidation.[34] First, we determine the long-term effect of fiscal adjustment on current accounts if each region undertakes its fiscal adjustment from now until 2016 as planned, but other regions do not.[35] As shown by the light blue bars in the top-right panel of Figure 4.11, unilateral consolidation by any region would improve its external balance as compared with its 2010 level, in line with the analysis above. The relative magnitudes of the improvement in the current account are roughly proportional to the height of the red bars—representing the size of permanent fiscal measures—in the top-left panel. This is because, as stated above, the permanent measures have a long-term effect on the external balance, whereas exit from temporary stimulus has a much smaller, short-term effect on the current account.

If all economies consolidate simultaneously, the *relative* amount of permanent fiscal measures determines how a region's current account responds. As shown by the yellow bars in the top-right panel of Figure 4.11, the relatively large scale of permanent fiscal consolidation being undertaken by the euro

[33]The reason for this is that permanent fiscal consolidation significantly reduces the stock of domestic public debt over time. A temporary stimulus, however, has little impact on the stock of domestic public debt, and thus only a very small effect on portfolio rebalancing and on the current account.

[34]Note that these simulations are not a prediction of where current accounts are headed in the coming years—they focus *only* on the impact of fiscal adjustment on the current account. Many other factors that affect the behavior of private saving and investment over the coming years—including growth differentials, inflation and interest rate developments, structural reforms, and so on—will also affect the current account. As a result, the projected change in the current account will differ from what these simulations suggest.

[35]More specifically, six simulations are run (one for each region) in which the region of interest undertakes its planned permanent fiscal measures and exit from stimulus (the red and blue bars in the top-left panel of Figure 4.11), while none of the other regions undertake any fiscal measures. All fiscal plans are assumed to be expected and fully credible.

area excluding Germany would improve that region's current account by about 0.7 percent of GDP; the smaller scale of fiscal adjustment by Germany would reduce its current account surplus by 1.4 percent of GDP. Thus, the varying size of planned fiscal adjustments contributes to a lowering of external imbalances within the euro area as a whole. In emerging Asia, not only is the improvement in the structural balance smaller than in other regions, but much of it results from letting stimulus measures expire. Consequently, planned fiscal adjustment would contribute to reducing that region's large external surplus. Finally, because the bulk of the large fiscal adjustment in the United States is due to the expiration of temporary fiscal stimulus and not because of new, permanent fiscal measures, the planned fiscal adjustment around the world is not likely to help narrow the U.S. current account deficit. In fact, it may widen.

Summary and Implications for the Outlook

We conclude this chapter with a brief summary of the results and a discussion of possible policy implications. First, as policymakers formulate their fiscal plans to achieve various goals—which at present are focused on securing fiscal sustainability, rebuilding fiscal room, or containing overheating pressures—the fact that fiscal adjustments have large effects on external balances is something they will need to keep in mind. For some economies, such as the United States and some euro area economies, the results suggest that fiscal consolidation of the right magnitude can help reduce twin fiscal and external deficits. For other economies, such as Germany, Japan, and China, there could be a trade-off between budget deficit reduction and a desire to reduce external surpluses.

Second, external adjustment is not driven solely by the fall in domestic demand from fiscal consolidation. The contractionary effect of fiscal consolidation is now well established, with consequent effects on import demand, and this is something policymakers cannot ignore—fiscal consolidation hurts. But the current account also improves because exports get a boost from the real exchange rate depreciation that tends to accompany fiscal consolidation.

Third, the painful aspects of external adjustment are amplified if an economy's monetary policy or exchange rate is constrained. When policy rates cannot decline—because they are already at or close to zero or because they are outside the domestic monetary authority's realm of control—policymakers should expect a long and rough road ahead. In such cases, external adjustment still occurs, but it takes place through a sharper contraction in economic activity because monetary policy cannot soften the blow. This results in a greater decline in imports. The real exchange rate still depreciates, but it occurs through greater compression of domestic wages and prices. This is the kind of adjustment awaiting some of the euro area economies.

When many economies consolidate at the same time, what matters for the current account is how much consolidation an economy undertakes relative to others. Taking current fiscal plans as an example, some economies—including the United Kingdom, some members of the euro area, and other advanced economies such as Canada and Australia—are expected to have much larger fiscal adjustments based on permanent measures. As a result, fiscal adjustment in these economies is expected to contribute positively to their external balances. Germany and emerging Asia are also consolidating, but by a lesser amount. This should contribute to a lowering of their external surpluses. However, the relatively small size of permanent fiscal measures currently envisioned for the United States suggests that fiscal consolidation there will do little to reduce the U.S. external deficit.

Appendix 4.1. Data Construction and Sources

The data sources used in the analysis are listed in Table 4.1. We draw primarily on the databases of the World Economic Outlook (WEO) and the Organization for Economic Cooperation and Development Economic Outlook (OECD-EO).

The current account, exports, imports, public saving, investment, and public investment are all taken relative to GDP for the analysis, using the corresponding source database's measure of GDP. For example, this means that the current-account-to-GDP ratio is calculated by taking the ratio of the WEO current account measure (which is in U.S. dollars) to the WEO GDP measure in U.S. dollars. In the case of variables from the OECD-EO, such as public saving, we divide by the appropriate OECD-EO GDP measure. Real variables (export volumes, import volumes, real GDP) are taken as natural logarithms. Price, cost, and exchange rate indices are also taken as natural logarithms. Interest rates are in percentage points.

To ensure that the national accounting identity holds, we calculate overall national saving, private saving, and private investment, all relative to GDP, as residuals using the following identities:

$$\begin{aligned} CA &= S - I \\ S &= S_{PUB} + S_{PRIV} \\ I &= I_{PUB} + I_{PRIV}, \end{aligned} \tag{4.1}$$

where CA denotes current account to GDP, S denotes saving to GDP, and I denotes investment to GDP. Both saving and investment are then broken down into their public and private components. We

Table 4.1. Data Sources

Variable Description	Variable Code	Source
Current Account	BCA	World Economic Outlook (WEO) Database[1]
Domestic Demand	TDDV	Organization for Economic Cooperation and Development Economic Outlook (OECD-EO) Database[2]
Export Price Index	PEXP	WEO Database
Export Volume	NX_R	WEO Database
Exports of Goods and Services	NX	WEO Database
GDP (local currency)	GDP	OECD-EO Database
GDP (local currency)	NGDP	WEO Database
GDP (real local currency)	NGDP_R	WEO Database
GDP (U.S. dollars)	NGDPD	WEO Database
GDP Price Index	PGDP	WEO Database
Import Price Index	PIMP	WEO Database
Import Volume	NM_R	WEO Database
Imports of Goods and Services	NM	WEO Database
Local Currency/U.S. Dollar Exchange Rate	ENDA	WEO Database
Long-Term Bond Rate	Various Series[3]	Datastream and Haver Analytics
National Investment	NI	WEO Database
Nominal Effective Exchange Rate	ENEER	IMF Information Notice System (IMF-INS) Database[4]
Overall Fiscal Balance	NLG	OECD-EO Database
Public Investment	CAPOG	OECD-EO Database
Public Saving	SAVG	OECD-EO Database
Real Effective Exchange Rate	EREER	IMF-INS Database
Short-Term Policy Rate	Various Series[3]	Datastream
Unit Labor Cost	ULC	OECD-EO Database
CAPB-Based Fiscal Changes[5]		Alesina and Ardagna (2010)
Coarse Exchange Rate Regime Classification		Ilzetzki, Reinhart, and Rogoff (2008)
Public Debt to GDP		Abbas and others (2010)

[1]April 2011, published version.

[2]Economic Outlook No. 89, June 2011, OLIS version.

[3]See appendix text for details on the interest rate series used.

[4]The series is extended back from its start to 1978 using inhouse calculations. See Appendix 4.1 text for details.

[5]CAPB = cyclically adjusted primary balance.

calculate overall saving as the difference between the current account and investment, private saving as the difference between overall saving and public saving, and private investment as the difference between investment and public investment.

There are some gaps in the OECD-EO data for some of the economies in the 1970s and 1980s. To address this, we splice the relevant series relative to GDP with the corresponding series relative to GDP, taken from an earlier vintage of the OECD-EO data.[36] This affects only two economies: Germany and Ireland. For Germany, we splice it with data from the former Federal Republic of Germany during 1978–90, taken from the former economies section of OECD-EO number 89. For Ireland, we splice it with data from 1978–89, taken from OECD-EO number 60 (December 1996, Public Version).

The short-term policy rate series for the economies in the sample come from Datastream: AUPRATE (Australia), OEPRATE (Austria), BGPRATE (Belgium), CNPRATE (Canada), DKPRATE (Denmark), FNPRATE (Finland), FRPRATE (France), BDPRATE (Germany), IRPRATE (Ireland), ITPRATE (Italy), JPPRATE (Japan), NLPRATE (Netherlands), PTPRATE (Portugal), ESPRATE (Spain), SDPRATE (Sweden), UKPRATE (United Kingdom), and USPRATE (United States).

The long-term government bond yield series are from Datastream and Haver Analytics. These are the Datastream series: CNGBOND (Canada), JPGBOND (Japan), and NLGBOND (Netherlands). These are the Haver Analytics series: N193G10E@G10 (Australia), C122IB@IFS (Austria), C124IB@IFS (Belgium), N172RG10@G10 (Finland), C132IB@IFS (France), N134RG10@G10 (Germany), C178IB@IFS (Ireland), C136IB@IFS (Italy), C182IB@IFS (Portugal), N184RG10@G10 (Spain), C144IB@IFS (Sweden), N112RG10@G10 (United Kingdom), and N111RG10@G10 (United States). For Denmark, we splice two series from Haver Analytics to achieve greater time coverage (N128G10E@G10 and C128IB@IFS). For their period of overlap, the two series are very similar.

[36]We do this only after confirming that there is no break introduced into the series by this procedure.

The nominal and real effective exchange rate series are from the IMF Information Notice System (IMF-INS) database, which starts in the early 1980s. We extend these series back to 1978 for each economy, applying the methodology used to construct the IMF-INS effective exchange rates (see Lee and others, 2008, for full details).

The exchange rate regime indicator is constructed from the database in Ilzetzki, Reinhart, and Rogoff (2008), which is an update of Reinhart and Rogoff (2004). We use their coarse classification at the annual frequency to construct a binary exchange rate regime indicator, distinguishing between pegged and nonpegged regimes. The pegged regime corresponds to their classification of "peg"; the nonpegged regime (the complement of the pegged regime) is the union of their crawling peg, managed float, and freely floating categories. We extend the indicator over 2008–09 by carrying the 2007 value forward.

See the main text for a description of how the action-based fiscal policy changes are identified.

Appendix 4.2. Statistical Methodology, Robustness Checks, and Selected Additional Results on Export and Import Responses

This appendix provides further details about the statistical methods used and the robustness of the regression results. It first describes the baseline regression model and estimation strategy. It then continues with a discussion and summary of a variety of robustness checks for the core results. The appendix concludes with a set of selected additional results on the export and import responses.

Model Specification and Estimation

The baseline specification is a cross-section and time fixed effects panel data model:

$$\Delta Y_{i,t} = \mu_i + \lambda_t + \sum_{s=1}^{2} \beta_s \Delta Y_{i,t-s} + \sum_{s=0}^{2} \gamma_s \Delta F_{i,t-s} + \varepsilon_{i,t} \quad (4.2)$$

where subscript i indexes economies, subscript t indexes years, and ΔY is the change in the dependent variable of interest. The term ΔF is the estimated size of our action-based fiscal consolidation or expansion

in percent of GDP. The term μ_i denotes an economy fixed effect, λ_t denotes a year fixed effect, and $\varepsilon_{i,t}$ is a mean-zero error term. β and γ denote the coefficients on the lagged dependent variable and the fiscal policy change, respectively, with s indexing the lag of the corresponding variable. The baseline regression's lag order of 2 is selected based on a review of the information criteria and serial correlation properties associated with various lag lengths.

Because we want an estimate of the overall effect of fiscal policy changes on the dependent variable of interest, we do not include any mediating variables or possible transmission channels for fiscal policy as additional explanatory variables. The inclusion of mediating variables would net out any effect of fiscal policy that works through the mediating variables, leading to a distorted picture of the overall effect. Moreover, if the additional explanatory variables are endogenous, their presence in the model would further contaminate the estimated effect of fiscal policy. These considerations lead us to adopt a conservative and simple specification, relying on the research design underlying our identified fiscal policy changes to ensure their exogeneity. This allows us to recover an unbiased estimate of the effect of fiscal policy with a minimal specification.

The equation is estimated in changes because nonstationarity tests indicate that a unit root in the level of the current-account-to-GDP ratio (the key variable of interest) over 1978–2009 cannot be rejected for 16 of the 17 economies in the sample. In order to ensure comparability of the estimation method and to address nonstationarity issues, the same specification in changes is also used for the other dependent variables of interest. The estimated responses of the changes are then cumulated to recover the response of the level of the dependent variable to a permanent 1 percent of GDP fiscal consolidation. The standard errors of the impulse responses are calculated using the delta method.

Robustness Checks

The baseline results of the effect of a fiscal policy change on the current-account-to-GDP ratio were subjected to a variety of robustness checks, including the following:

1. Estimation by two-stage least squares (TSLS): We also estimated the model under the assumption that the action-based fiscal policy change can act as an instrument for the fiscal policy change based on the CAPB.
2. Transformation of the fiscal policy change measure into deviations from the in-sample trade-weighted partner average fiscal policy change: To confirm that the relative size and sign of the fiscal policy change is what matters for the current account rather than the absolute size and sign, we constructed for each economy the trade-weighted average of its in-sample trading partners' fiscal policy changes, which was then subtracted from each economy's fiscal policy change to derive its relative change.
3. A static panel model: The lagged dependent variables were dropped from the set of explanatory variables, and five years of lags of the action-based fiscal policy changes were added to the model. The cumulated impulse response at a given horizon is then simply the sum of the coefficients on the fiscal policy change and its lags up to the given horizon.
4. Estimation by difference generalized method of moments (GMM): Because the time dimension relative to the cross-section dimension of the sample is large (32 versus 17), any dynamic panel bias arising from the correlation of the cross-section fixed effect and the lagged dependent variables should be comparatively small. To ensure that this was the case, we also estimated the model using Arellano and Bond's (1991) difference GMM procedure.[37]
5. A larger set of lags: The lags of the dependent variable and the fiscal policy changes in the dynamic model were increased to four (the baseline is two).

[37]To avoid the weak instruments problem associated with instrument proliferation in dynamic models, the instrument set was restricted to the second through fourth lags of the lagged dependent variables (in addition to the exogenous variables). The estimated model passes both the Sargan overidentification and difference-in-Sargan tests, with *p*-values over 10 percent. The model also passes the Arellano-Bond test for no serial correlation in the first differences of order 2.

6. Dropping outliers: Cook's distance statistic was calculated for all observations in the baseline model for the current account. Observations whose Cook's distance statistic exceeded the threshold of $\frac{4}{N}$, where N is the number of observations underlying the regression, were then dropped and the model reestimated. This procedure flagged 27 of the 493 observations appearing in the baseline model as outliers.
7. Trimming extreme values of the action-based fiscal policy changes: The top and bottom 5 percent of the fiscal policy changes were set to zero and the model was reestimated.
8. Comparison of the effects of fiscal expansions versus consolidations.
9. Comparison of the effects of primarily tax-based versus spending-based fiscal policy changes.

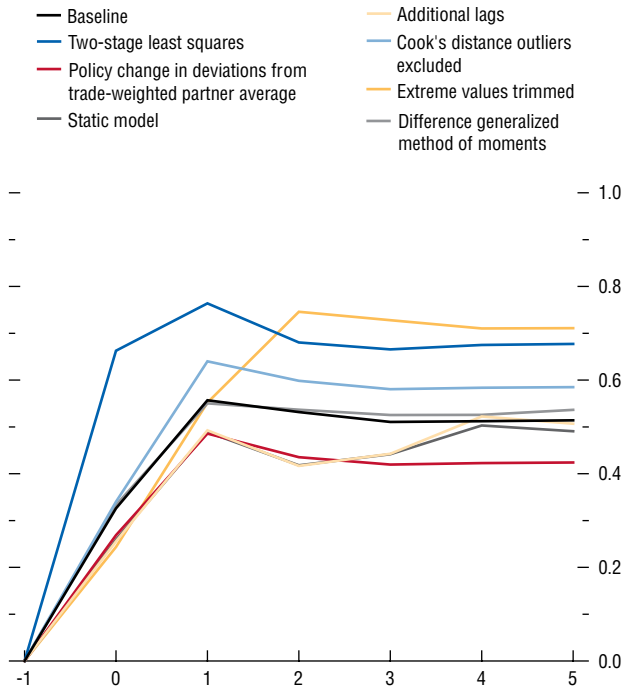
The responses of the current account to a 1 percent of GDP action-based fiscal consolidation under the first seven robustness checks are shown in Figure 4.12. At the five-year horizon, the responses range from about 0.45 (when policy changes are expressed as deviations from trade-weighted partner averages) to about 0.7 (when extreme values of the fiscal policy changes are set to zero). Apart from the TSLS estimates, the overall shapes of the responses are remarkably similar across robustness checks. The TSLS estimates show a much stronger initial response of about 0.7 on impact and 0.8 in the year after a fiscal consolidation. This then settles down at the lower level of about 0.7 in the second year. Confidence bands around the estimates (not shown) indicate a roughly similar pattern of statistical significance as seen in the baseline.[38]

Figure 4.13 shows the responses to fiscal policy changes when different types of fiscal policy changes are allowed to have different effects. As noted, we considered two cases: fiscal expansions versus consolidations, and primarily tax-based versus spending-based fiscal policy changes. The top panel shows the responses to fiscal policy changes that are allowed to differ according to whether they are expansions or consolidations. Not surprisingly, the response to fis-

[38]As a further robustness check, we also estimated the model over the set of samples where we drop one economy at a time. All the estimated responses looked similar to the baseline, indicating that no single economy is driving the results.

Figure 4.12. Robustness: Effects on the Current Account of a 1 Percent of GDP Fiscal Consolidation

(Percent of GDP)



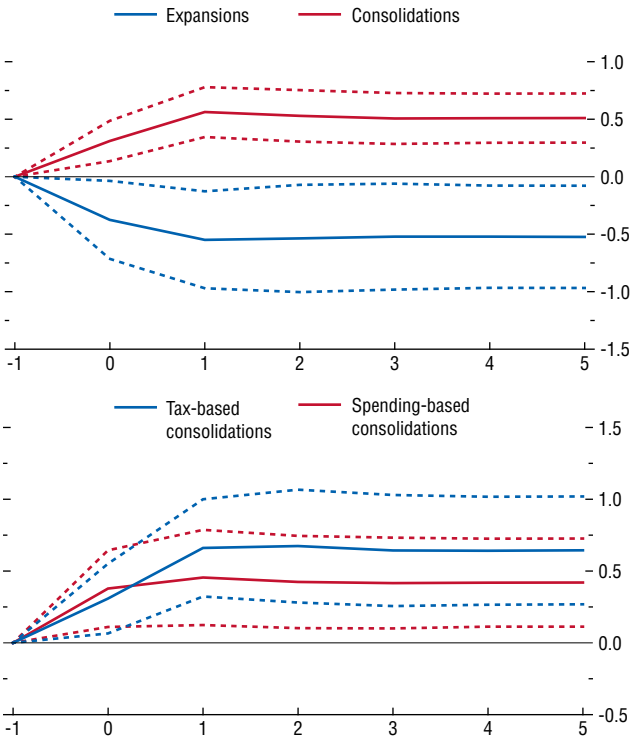
Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of consolidation. See Appendix 4.2 text for full details on the robustness checks. Fiscal policy changes are action-based. The effect of a fiscal expansion would be the reverse of the response to a consolidation.

Figure 4.13. Effects on the Current Account of a 1 Percent of GDP Fiscal Policy Change

(Percent of GDP)

Fiscal consolidations and expansions have roughly symmetric effects on the current account. Tax-based fiscal policy changes have a larger effect on the current account than spending-based changes, although the difference is not statistically significant.



Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of consolidation. Dashed lines indicate the 90 percent confidence interval around the point estimate. Fiscal policy changes are action-based. The effect of a fiscal expansion would be the reverse of the response to a consolidation.

cal expansions is of opposite sign to that for consolidations. The effects of expansions and consolidations are roughly symmetric. At the five-year horizon, it is 0.5 for consolidations and the same magnitude but of opposite sign for expansions. Both responses are statistically significant.

The bottom panel shows the responses to a fiscal consolidation that is either primarily tax-based or spending-based. A tax-based consolidation has a larger effect on the current account (about 0.7 at the five-year horizon) than does a spending-based consolidation (about 0.4 at the five-year horizon). Although both responses are significantly different from zero from the time the consolidation is implemented onward, a test of the difference between the tax-based versus spending-based fiscal change fails to reject equality.

Overall, the baseline results appear to be extremely robust.

Appendix 4.3. Global Integrated Monetary and Fiscal Model (GIMF)

This appendix gives an overview of the structure of the model that underlies the chapter's simulation results, followed by a simulation of the effects of different fiscal instruments on the current account. For more details on the model's structure, see Kumhof and others (2010). For further analysis of the twin deficits link using the GIMF, see Kumhof and Laxton (2009) and Clinton and others (2010).

Main Features of the GIMF

The GIMF is a multiregion dynamic structural general equilibrium (DSGE) model with optimizing behavior by households and firms and full intertemporal stock-flow accounting. Friction in the form of sticky prices and wages, real adjustment costs, liquidity-constrained households, along with finite planning horizons of households, gives the model certain key properties—notably, an important role for monetary and fiscal policy in economic stabilization.

The assumption of finite horizons separates the GIMF from standard monetary DSGE models and allows it to have well-defined steady states in which

economies can be long-term debtors and creditors. This allows users to study the transition from one steady state to another where fiscal policy and private saving behavior play a critical role in both the dynamic adjustment to and characteristics of the new steady state.

Asset markets are incomplete in the model. Government debt is only held domestically, as noncontingent one-period nominal bonds denominated in domestic currency. The only assets traded internationally are noncontingent one-period nominal bonds denominated in U.S. dollars, which can be issued by the U.S. government and by private agents in any region. Firms are also only owned domestically. Equity is not traded in domestic financial markets; instead, households receive lump-sum dividend payments.

Firms employ capital and labor to produce tradable and nontradable goods. There is a financial sector as found in Bernanke, Gertler, and Gilchrist (1999), which incorporates a procyclical financial accelerator, with the cost of external finance facing firms rising with their indebtedness.

The GIMF encompasses the entire world economy, explicitly modeling all the bilateral trade flows and their relative prices for each region, including exchange rates. The standard production version comprises six regions. The international linkages in the model allow the analysis of policy spillovers at the regional and global levels.

Household sector

There are two types of households, both of which consume goods and supply labor. First, there are overlapping-generation households that optimize their borrowing and saving decisions over a 20-year planning horizon. Second, there are liquidity-constrained households, which do not save and have no access to credit. Both types of households pay direct taxes on labor income, indirect taxes on consumption spending, and a lump-sum tax.

Production sector

Firms that produce tradable and nontradable goods are managed in accordance with the preferences of their owners, who are finitely lived households. Therefore, firms also have finite planning horizons. The main substantive implication of this assumption is the presence of a substantial equity premium driven by impatience. Firms are subject to nominal rigidities in price setting as well as real adjustment costs in labor hiring and investment. They pay capital income taxes to governments and wages and dividends to households.

Financial sector

The current version of the GIMF contains a limited menu of financial assets. Government debt consists of one-period nominal bonds denominated in domestic currency. Banks offer households one-period fixed-term deposits, which is their source of funds for loans to firms. These financial assets, as well as ownership of firms, are not tradable across borders. Optimizing households may, however, issue or purchase tradable U.S.-dollar-denominated obligations.

Uncovered interest parity does not hold, due to the presence of country risk premiums. The premiums create deviations, both in the short and the long term, between interest rates in different regions, even after adjustment for expected exchange rate changes.

International dimensions and spillovers

All bilateral trade flows are explicitly modeled, as are the relative prices for each region, including exchange rates. These flows include exports and imports of intermediate and final goods. They are calibrated in the steady state to match flows observed in the recent data. International linkages are driven by the global saving and investment decision, a by-product of consumers' finite horizons. This leads to uniquely defined current account balances and net foreign asset positions for each region. Because asset markets are incomplete, net foreign asset positions are represented by noncontingent one-period nominal bonds denominated in U.S. dollars.

Along with uncovered interest parity, and long-term movements in the world real interest rate, the magnitude of the international trade linkages is the main determinant of spillover effects from shocks in one region onto other regions in the world.

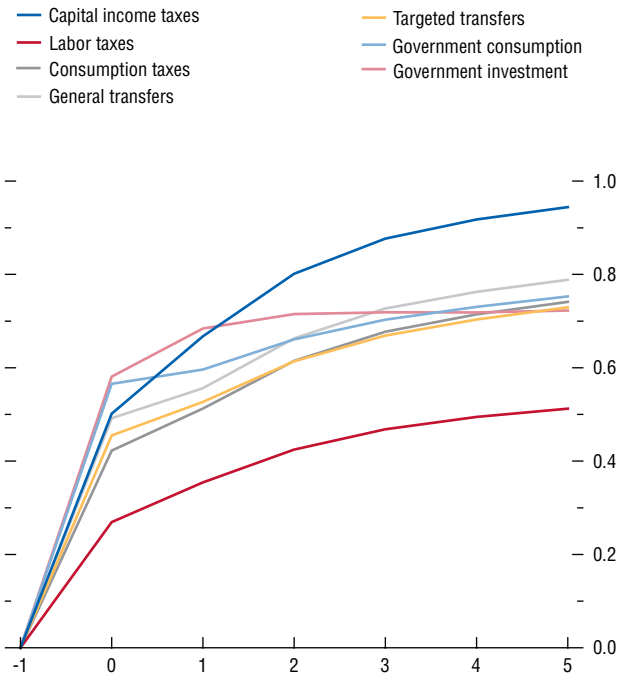
Fiscal and monetary policy

Fiscal policy is conducted using a variety of fiscal instruments related to spending and taxation. Government spending may take the form of consumption or investment expenditure or lump-sum transfers, either

Figure 4.14. Fiscal Instruments and Their Effects on the Current Account

(Percent of GDP)

The response of the current account is similar for most fiscal instruments, ranging between 0.4 and 0.6 percent of GDP in year $t = 1$, and between 0.7 and 0.8 percent in the medium term. The current account response is somewhat smaller, both in the short and medium term, when fiscal consolidation is based on labor income taxes, and somewhat larger in the medium term, when fiscal consolidation is based on capital income taxes.



Source: IMF staff calculations.

Note: X-axis units are years, where $t = 0$ denotes the year of a 1 percent of GDP fiscal consolidation in the domestic economy. The responses in the figure are model simulations for Canada from the IMF Global Integrated Monetary and Fiscal Model (GIMF). Monetary policy is unconstrained in all cases.

to all households or targeted to liquidity-constrained households. Revenue accrues from the taxes on labor income and capital, consumption taxes, and the lump-sum tax, mentioned above. Government investment spending augments public infrastructure, which depreciates at a constant rate over time.

When conducting monetary policy, the central bank uses an inflation-forecast-based interest rate rule. The central bank varies the gap between the actual policy rate and the long-term equilibrium rate to achieve a stable target rate of inflation over time.

Fiscal Instruments and Their Effects on the Current Account

Does the impact of fiscal policy on the current account differ depending on which fiscal instrument is used? To answer this question we examine what happens when a small open economy with unconstrained monetary policy, which we calibrate to fit the main features of Canada, implements fiscal consolidation using different instruments. In particular, we examine the effects of a 1 percent of GDP fiscal consolidation on the current account when this consolidation is implemented using each of the following fiscal instruments, one at a time: labor income taxes, capital income taxes, consumption taxes, government consumption, government investment, general transfers, and targeted transfers.[39]

As shown in Figure 4.14, the response of the current account balance to a fiscal consolidation of 1 percent of GDP is large regardless of the instrument. For most of these instruments, the current account improvement ranges between 0.4 and 0.6 percent of GDP during the first year, with the exception of labor income taxes, for which the improvement in the current account is about 0.3 percent of GDP. Over the medium term, the improvement in the current account balances ranges between 0.7 and 0.8 percent of GDP for most instruments, with the exception of labor income taxes, with an improvement in the current account balance of 0.5 percent of GDP, and capital income taxes, with an improvement in the current account balance of 0.9 percent of GDP.

[39]These transfers are targeted to the liquidity-constrained households.

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