Effects of Fiscal Consolidation in the Czech Republic

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Abstract

This article uses the IMF's Global Integrated Monetary and Fiscal Model (GIMF) to assess the impact of fiscal consolidation on the Czech economy. Its contribution is three-fold. First, it provides estimates of dynamic fiscal multipliers for a variety of fiscal instruments (tax and expenditure), consolidation durations, assumptions about credibility, and monetary policy responses. Second, the article evaluates the impact on the economy of tightening measures envisaged in the 2011 budget. Third, the article considers alternative packages for consolidation beyond 2011 to achieve the government's balanced budget target by 2016 and identifies which forms of adjustment are more "growth-friendly."

1. Introduction

The combination of structural deficits during the boom years and recent anti-crisis stimulus measures had put Czech public finances on an unsustainable trajectory. An austerity package implemented in 2010 contained the fiscal deficit, but was not sufficient to ensure sustainability. The government that came to power in the summer of 2010 set out ambitious consolidation objectives, seeking to bring the general government deficit under 3 percent of GDP by 2013, in line with the Czech Republic's European Union (EU) commitment, and to balance the budget by 2016. As a step toward fulfilling these objectives, the 2011 budget includes a wide range of measures, mostly on the expenditure side, that would reduce the deficit in 2011 by nearly 2 percent of GDP relative to the baseline of unchanged policies.[1] These measures are expected to stay in place in subsequent years. The government has also outlined a legislative agenda covering, among others, pension, health care and social benefits reforms, but no concrete measures have been specified as of yet to achieve the government's medium-term targets.[2]

The pace of fiscal adjustment and the choice of instruments are two important issues facing policy makers. The economy has considerable excess capacity and monetary policy has limited room to cushion the impact of the consolidation. In these circumstances, the confidence-building benefits of a front-loaded fiscal adjustment should be weighed against the cost to growth in the short run. For that reason, it is particularly important at the current juncture to have reliable estimates of the impact of fiscal consolidation on the economy.

That impact depends not only on the size of the tightening in a given year, but also on a variety of other factors, including the length of the adjustment, its credibil-

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[1] The reduction in deficit relative to 2010 would be smaller, since the fiscal balance would deteriorate in 2011 under unchanged policies.

[2] One exception is a new lottery tax that the government plans to put in place in 2012. The tax is projected to yield 0.15 percent of GDP.

ity, the choice of fiscal instruments, and the ability of monetary policy to accommodate the fiscal shock. It should be kept in mind that the effect of even a short-term shock is typically spread over several years. The choice of the instrument matters because various taxes differ in their distortionary impact, and because components of government expenditure have different effects on private-sector behavior, aggregate demand, and potential output.

This article uses a modern, open-economy dynamic structural general equilibrium model with non-Ricardian features, calibrated to the Czech economy. It makes three principal contributions. First, it provides a set of dynamic fiscal multipliers for a standardadized shock (1 percentage point improvement in the ratio of fiscal balance to GDP) implemented through a variety of fiscal instruments (taxes and expenditures), for different shock durations (1 year, 10 years, and a permanent improvement), and under different assumptions about the credibility of adjustment and the flexibility of monetary policy. These results are of interest by themselves as they reflect country-specific characteristics. They could also be used to evaluate the impact of any proposed package as it could be represented as a linear combination of basic shocks.[3] Second, the article assesses the effect of the consolidation package introduced in the 2011 budget on the economy. Third, it takes up the issue of which instruments should be used to achieve further consolidation in line with the government's medium-term objectives. The article demonstrates that both the short-term and the long-term impact on GDP can vary dramatically depending on the choice of the instruments.

The article is structured as follows. The next section reviews the literature on fiscal multipliers, particularly the estimates for the Czech Republic. Section III provides a brief overview of the Global Integrated Monetary and Fiscal (GIMF) model – the model used in this article – focusing on the features relevant for fiscal policy and on calibration to the Czech Republic. The following three sections present the main results of the article: the dynamic multipliers; the impact of the 2011 package; and the alternative paths toward further consolidation. The last section concludes.

2. Literature Review

The literature on fiscal multipliers and more broadly on the effects that fiscal policy shocks have on the economy is large and inconclusive. Over the last three years, the interest in the topic has been spurred first by fiscal stimulus and then by subsequent consolidation undertaken across the globe. We refer the reader to a survey paper by Spilimbergo, Symansky, and Schindler (2009) for a broad literature review and a range of estimates for a variety of countries. Broadly, the literature finds that fiscal multipliers are higher for larger countries with less trade openness. Also multipliers are found to be larger when monetary authorities do not offset the impact of the fiscal shock, as highlighted by Christiano, Eichenbaum, and Rebelo (2009). Expenditure measures, particularly changes in government investment, tend to have higher multipliers than revenue measures. The Spilimbergo, Symansky, Schindler paper suggests a rule-of-thumb government consumption multiplier of 0.5 or less

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[3] This includes a discretionary loosening of fiscal policy – e.g., to provide stimulus to the economy. All that is required is to reverse the sign.

for small open economies, with smaller values (about half) likely for revenue and transfers, and slightly larger ones for investment spending.

We will focus in this section on the estimates specific to the Czech Republic. OECD (2009) reports estimates for government expenditure multiplier coming out of its reduced-form INTERLINK model. The Czech Republic has the lowest value among the countries in the sample, around 0.3. The same publication also provides multipliers for several specific fiscal instruments, obtained by first averaging estimates across a number of studies for several different countries, and then adjusting these averages for each country's degree of openness. For the Czech Republic, these derived multipliers vary in the first year from 0.1 for indirect taxes to 0.7 for government investment, rising to a range of 0.2 to 1.1 in the second year.

Barrel et al. (2004) examined government consumption multipliers for Eastern European countries in an econometric model with some forward-looking elements. Their estimates suggest that the government consumption multiplier is around 0.4 for the Czech Republic.

In an approach similar to ours, a recent paper by Štork and Závacká (2010) uses a simple DSGE model with some non-Ricardian features (specifically, the presence of liquidity-constrained households) to look at the impact of several different fiscal shocks on the real economy. The quarterly frequency of the model and the way the shocks are specified makes it difficult to compare directly their results with ours, but in line with the findings of our, richer model, fiscal multipliers appear to be small.

The fiscal multiplier used by the Czech National Bank (CNB) appears to be around 0.5–0.6, as can be inferred from its estimates of the impact of fiscal consolidation measures on real GDP. A one percent of GDP reduction in fiscal deficit in 2008 was expected to reduce real GDP in that year by 0.5 percent (CNB, 2007), while a 1.3 percent of GDP reduction in the cyclically-adjusted primary balance projected for 2011 is expected to lower output by 0.8 percent.

3. Description of the Model

This article uses an annual two-country version of the GIMF calibrated for the Czech Republic and the European Union. To save space, this section focuses on the relevant aspects of the model for fiscal consolidation. A complete description of the theoretical structure of the model can be found in Kumhof et al. (2010).

3.1 Summary

GIMF is a multi-country dynamic structural general equilibrium model in wide use at the IMF and several central banks. The model is micro-founded with optimizing behavior by households and firms, and full intertemporal stock-flow accounting. Keynesian properties are derived from frictions in the form of real and nominal adjustment costs, liquidity-constrained agents, and finite planning horizons of households. These features provide non-neutrality in both spending-based and revenue-based fiscal measures. They also help portray the interaction of fiscal and monetary policies, which makes the model particularly suitable to analyze fiscal consolidation.

Labor and capital supply is endogenous in the model, allowing it to capture the impact of distortionary taxes and crowding out of private demand. In particular,

government deficits crowd out private investment and net foreign assets in the long run and can lead to a higher real world interest rate, which is endogenous in GIMF. The underlying overlapping generations and finite horizon structure allows us to explore private saving behavior that is critical in both the dynamics and comparative statics of the model.[4]

The multi-country structure of GIMF captures the effects of international spillovers from trade. Bilateral trade flows of intermediate and final goods and their relative prices are explicitly modeled between each region based on recent historical averages. In contrast to the rich trade structure, GIMF's treatment of international asset markets is somewhat rudimentary, which is common for large multi-country models. The only assets traded internationally are nominal non-contingent one-period bonds denominated in euros. Government debt is only owned domestically, in the form of nominal non-contingent one-period bonds denominated in domestic currency. Firms are also only owned domestically and pay out a share of profits in the form of lump-sum dividends. While these assumptions might be too simplistic to analyze the propagation of financial shocks, they should not be critical to the examination of the impact of fiscal consolidation, which is essentially a demand shock affecting other countries primarily via the trade channel.

There are two types of households in GIMF – those that are liquidity-constrained and those that are not. Both types of households pay direct taxes on labor income, indirect taxes on consumption spending, and a lump-sum tax. Liquidity-constrained households (LIQ) consume all their income in every period, while the unconstrained overlapping-generation households (OLG) can smooth their consumption. The presence of OLG households with finite horizons and the arrival of new generations mean that public debt is counted as net wealth by households. Lower debt levels reduce tax obligations required to service government debt. Since households discount the reduction in future tax obligations, a decrease in government debt today represents to them a decrease in their wealth. This is because some of the resulting lower taxes in the future are enjoyed beyond their planning horizon.[5]

Production in GIMF is multi-layered. Capital and labor produce tradable and non-tradable goods. Capital is supplied by entrepreneurs with a procyclical financial accelerator as found in Bernanke, Gertler, and Gilchrist (1999). Firms have finite planning horizons in accordance with the preferences of their owners, the overlapping generation households. They pay capital income taxes to governments and wages and dividends to households. Labor is mobile across sectors but not across countries. Physical capital is sector-specific and is also immobile across countries, but trade in investment goods eases the restrictiveness of this assumption.

3.2 Fiscal Instruments

In GIMF, there are seven main instruments at the disposal of fiscal authorities: government consumption and investment, three types of taxes, and transfers to two groups of households. It is helpful to understand the characteristics of these instruments to identify their real-world parallels as well as to interpret their impact in the model.

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[4] See Blanchard (1985) for the basic theoretical building blocks.

[5] For a more detailed description of fiscal implications in GIMF see Kumhof and Laxton (2007, 2009a, 2009c).

Government investment accumulates into a stock of public infrastructure that depreciates at a rate of 4 percent per year. A higher stock of public infrastructure is assumed to increase the productivity in the production of the domestic final good. This is in line with a large body of literature (e.g., Aschauer, 1989, and Devarajan et al., 1996) that found that public capital increases private-sector productivity. The elasticity of aggregate output with respect to public infrastructure is 0.14, the mid-range of estimates obtained in Ligthart and Suárez (2005). An interpretation of this relationship is that higher quality public infrastructure, such as roads, schools, and heath facilities, improves the productivity of the private sector. In contrast, government consumption expenditure is assumed to have no effect on productivity.

The fiscal authority may utilize lump-sum general transfers or targeted transfers to liquidity-constrained households. General transfers affect directly the budget constraints of both OLG and LIQ households based on their share of total consumption in the economy. Thus, in case of a cut in general transfers, a large share of the burden falls on households who have access to the financial markets (OLG agents) and can adjust their labor and saving decisions. A reduction in targeted transfers to LIQ households results in an immediate reduction in consumption of similar degree in that period. Examples of such targeted transfers include social welfare programs.

Revenue can accrue from distortionary taxes on labor and capital income or on private consumption expenditure. In GIMF, the labor income tax broadly corresponds to payroll taxes, regardless of whether they are levied on employees or employers, and personal income taxes. An increase in labor taxes results in distortionary effects in the labor market, reducing the equilibrium level of hours worked. The capital tax primarily represents the corporate income tax. An increase in the capital tax distorts investment decisions, resulting in a fall in the level of investment and a reduction in the capital stock. The output losses caused by both of these taxes are significant, since they reduce the factors of production in the economy. The consumption tax is more growth-friendly, as it does not distort a factor of production. This tax comprises sales taxes, VAT, and excises.

3.3 Policy Rules

The fiscal policy rule in the model has two main functions. The first is to stabilize the ratio of government debt to GDP ratio. This feature eliminates the possibility of default and insures dynamic stability. Second, it reacts as an automatic stabilizer to business cycle. The strength of the automatic stabilizer comes from OECD estimates reported in Girouard and André (2005). The fiscal rule targets the overall fiscal balance in accordance with the two above criteria. In this article, the instruments that are assumed to adjust to make sure the fiscal rule is satisfied are labor income taxes or general transfers.

The central bank credibly operates under an inflation targeting regime with a Taylor-type interest rate reaction function. The policy rate responds in a forward-looking way to the gap between the projected and target inflation to achieve a stable target rate of inflation. The target rate is assumed to be 2 percent in both the European Union and the Czech Republic. The coefficient on the gap of projected to target inflation is 1.4 and the lag coefficient is 0.32 for the Czech Republic. The European

Union has respective coefficients of 1.48 and 0.34. The coefficients in the monetary policy rule have been calibrated to match desired inflation dynamics for a wide variety of shocks at annual frequency. The calibration of the monetary policy rule for the Czech Republic is informed by models in use at the CNB and is consistent with past GIMF models of the Czech Republic as in Laxton and Kumhof (2009a) and Allard and Muñoz (2008). The calibration of the monetary policy rule for the European Union is based on recent estimates by IMF staff and is consistent with models at use at IMF and European Central Bank.

3.4 Calibration

The comprehensive structure of GIMF gives it the ability to replicate the key aspects of the Czech Republic economy in its calibration. The steady-state national account decompositions are calibrated to match recent numbers from the IMF International Financial Statistics database. Goods trade flows are calibrated to replicate United Nations comtrade statistics database. The gross government debt ratios match data for 2010. The calibration of the structural parameters relies heavily on the literature as summarized in as in Kumhof et al. (2010) and is consistent with previous modeling efforts of the Czech Republic at such as in Allard and Muñoz (2008) and Laxton and Kumhof (2009a). The trade elasticities are set to match the stylized facts of trade for small open economies. The values of adjustment parameters and the shares of liquidity-constrained consumers were informed by matching the dynamics of models at use in the CNB and small open economy models at the IMF. The calibration is summarized in *Appendix I*.

4. Estimates of the Impact of Fiscal Consolidation

Many factors can influence the impact of fiscal consolidation, thus negating the possibility of one simple multiplier. As discussed above, each type of fiscal instrument will impart different effects on the economy given its particular characteristics. We examine the seven instruments already introduced in Section III to understand their properties. This includes consolidation with government consumption and investment expenditure, general transfers and targeted transfers to liquidity--constrained households, taxes on labor and capital income, and consumption taxes. The fiscal instrument that adjusts to satisfy the fiscal rule is assumed to be the labor tax. We also provide simulations where general transfers are assumed to adjust to satisfy the fiscal rule. General transfers are non-distortionary and have a small direct effect on consumption behavior, which helps isolate the impact of the fiscal instrument used for the consolidation.

The magnitude of the shock will clearly affect the response. The relationship between the size of the shock and the size of the response is approximately linear.[6] Hence, to produce standardized numbers, we allow for shocks to increase the target

[6] Since the experiments are conducted as shocks to the steady state, the output gap is assumed to be zero at the beginning of the shock. Some researchers (e.g., Baum and Koester, 2011) have found that spending multipliers depend on the cyclical state of the economy. This distinction is not incorporated in GIMF. At the same time, part of the difference may be due to the fact that monetary authorities might react differently to fiscal contraction or expansions depending on the amount of spare capacity. In some of the simulations below, we turn off the offsetting response of monetary authorities to fiscal shocks, leading to larger fiscal multipliers.

level of the deficit-to-GDP ratio by 1 percentage point. This provides a simple way to examine the "multiplier" of the shock which is defined as the change in real GDP over the size of the consolidation in terms of deficit-to-GDP.

The duration of the shock may also influence the impact of fiscal consolidation. Consequently, we explore alternative assumptions about the duration of the fiscal consolidation as show in *Appendix II*, allowing the tightening to last for one year, ten years, or to be permanent. For the one-year consolidation, we assume that there is no impact on the long-run debt-to-GDP ratio. The ten-year consolidation results in a reduction in the debt-to-GDP ratio by eight percentage points. In a permanent consolidation, the ratio goes down by 23 percentage points after 50 years. These three scenarios aim to replicate three different situations. A government that faces no underlying deficit problem, but would like to reduce its stock of debt (e.g., to satisfy the Stability and Growth Pact limit or to reverse the run-up in debt induced by the crisis), would increase the fiscal balance for a period of time until it reaches its goal. A government whose deficits are not sustainable needs to reduce them permanently. A one-year fiscal tightening may not be the most policy-relevant experiment, but reversing all the signs allows one to obtain the impact of a short-term fiscal stimulus.

The impact of fiscal consolidation will depend on private agents' assessment of credibility of the fiscal authority. If agents perceive that the consolidation is not credible, they would expect any announced consolidation to be reversed in the future and thus not to have a sustained impact on the deficit. In this scenario, the impact of the consolidation will occur without the perceived benefits of lower future tax obligations and real interest rates. In this article, we simulate a non-credible consolidation by assuming that agents perceive the consolidation to be temporary, and expect that the consolidation will be reversed after one year.

In most of the simulations we assume it will take one year for long-term consolidation to become credible. This is implemented by doing a temporary one-year consolidation in the first year of the simulation and then starting a credible consolidation in the following year. When the consolidation becomes credible, agents perceive long--term or permanent change in the deficit. To evaluate the impact of consolidation with different assumptions about credibility, we compare cases where consolidation is assumed to become credible immediately or after one, two, or three years. Comparing across instruments and credibility assumptions, we are able to gain insight into the role of credibility for different instruments.

The impact of the consolidation will depend on the interaction between the monetary and fiscal authorities. The discount rate in the Czech Republic has been 25 basis points since August 2009, and the policy rate, the two week repo rate, has been at 75 basis points since May 2010. Given the low rates, we examine the case where the monetary authority does not react to the fall in inflation. In this case, we find that consolidaion has larger adverse effects since the monetary authority cannot reduce the policy rate to mitigate the fall in real GDP and inflation resulting from the consolidation. For each instrument, duration, and credibility assumption, we evaluate the impact of the consolidation where the policy rate does not react for one or two years, as well as the standard case where it reacts immediately.

Table 1 Impact of Fiscal Consolidation on Real GDP by Instrument [a]
Percent Deviation from Baseline

Instrument / Year	1	2	3	4	5	SS[b]
Labor tax	-0.13	-0.32	-0.43	-0.50	-0.54	0.07
Consumption tax	-0.12	-0.17	-0.13	-0.10	-0.07	0.07
Capital tax	-0.02	-0.17	-0.19	-0.22	-0.30	0.05
Government consumption	-0.40	-0.25	-0.10	-0.01	0.02	0.07
Government investment	-0.42	-0.42	-0.40	-0.44	-0.53	0.08
General transfers	-0.07	-0.04	0.07	0.16	0.21	0.06
Transfers to LIQ	-0.23	-0.21	-0.13	-0.08	-0.08	0.07
Average tax	-0.09	-0.22	-0.25	-0.27	-0.30	0.06
Average cons and inv	-0.41	-0.34	-0.25	-0.23	-0.26	0.08
Average transfers	-0.15	-0.13	-0.03	0.04	0.07	0.07

Notes:[a] The shock is a 1 percent of GDP improvement in the overall fiscal balance lasting 10 years under the assumptions of no constraint on policy interest rate and credibility starting in year 2.
Labor taxes are the instrument responsible for satisfying the fiscal rule.
[b] Steady state

4.1 Summary of the Results

In this subsection we summarize the impact of a 10-year shock to each of GIMF's seven fiscal instrument on real GDP under the assumption that credibility is achieved in the second year and imposing no constraint on monetary policy. The labor tax is the instrument that adjusts to satisfy the fiscal rule. We also show how altering these assumptions affects the results in case of one of the instruments – government consumption expenditures. A full set of dynamic multipliers along with a detailed discussion of the impact on the economy of shocks to each instrument can be found in *Appendix II*.

Table 1 and *Figure 1* show the deviations of real GDP from the baseline in the first 5 years after a one percent of GDP fiscal tightening that lasts 10 years.[7] The table also shows the long-term (steady-state) impact. In the first year private agents assume the tightening to last only one year, and only in the second year do they start anticipating correctly the duration of fiscal adjustment.[8] We do not impose the zero-bound constraint on monetary policy, as we would like to focus on a typical rather than an exceptional situation.

Fiscal consolidation via government consumption and investment expenditure has a direct impact on aggregate demand resulting in the highest multipliers relative to the other instruments. The import components of final consumption and investment goods are 46 and 62 percent, respectively. These large import shares result in substantial leakages into imports. The impact of a cut in government investment on real GDP is persistent due to the loss of productivity from a lower stock of public infrastructure. Since the depreciation rate of public capital is rather small and the size

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[7] Since the model is calibrated rather than estimated, confidence bands around the impulse responses are not available.

[8] This standard assumption reflects the reality that expectations take time to adjust and credibility takes time to be gained. In addition, this assumption appears to capture better the dynamics of output response in many countries than the assumption of immediate credibility.

**Figure 1 Impact of 10 Year 1 Percent of GDP Improvement
in Fiscal Balance on Real GDP**

Percent Deviation from Baseline
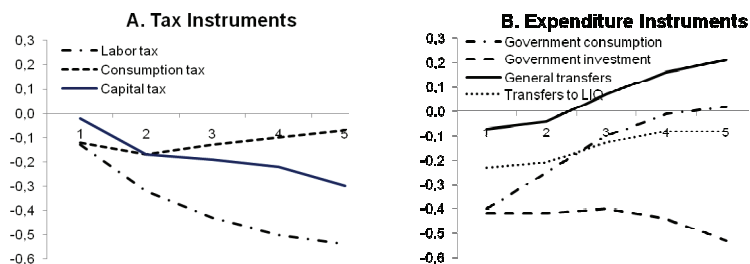
of the consolidation is rather large, representing approximately a quarter of all govern-
ment investment, there is a large and persistent reduction in public capital and it takes
a long time for the economy to return to the steady state after the consolidation.

Unlike cuts in government consumption or investment, fiscal consolidation
with general transfers does not have a direct impact on aggregate demand. As the gov-
ernment decreases transfers to households, OLG agents respond by borrowing in
the short run to finance their consumption, which they prefer to smooth. The impact
on LIQ agents is more pronounced since they consume their present income resulting
in an immediate reduction in consumption by a similar magnitude to their loss in
income. For general transfers, the impact on aggregate demand is not large since LIQ
agents account for only a fraction of overall consumption of the economy. However,
a cut in targeted transfers to LIQ households results in a reduction of consumption
close to the size of the consolidation, but the effect on output is muted because of
consumption leakages into imports.

Fiscal consolidation with labor and capital income taxes reduces the income
of households and increases distortions in the labor and capital markets. These dis-
tortions result in a fall in labor supply and capital stock, thereby reducing important
factors of production. It is interesting to note that the effect of higher capital and
labor taxes on output accumulates over time, as the factor supply adjusts gradually in
response to the tax change, while the impact of lower government consumption and
transfers is highest in the first year. Fiscal consolidation with consumption taxes
affects aggregate demand via its impact on household consumption. Although indi-
rect taxes distort the consumption decision, they do not affect a factor of production,
resulting in a smaller impact on output.

The long-run crowding-in effects come primarily from two channels. First,
the reduction in the debt level requires lower payments on interest to service the debt,
allowing for lower tax obligations in the long run. As this happens, labor taxes will
fall permanently relative to the baseline, improving the income of households and
spurring labor supply. Second, the reduction in the debt level is an increase in the sav-
ings of the economy. This reduces the equilibrium real interest rate. However, since
the economy of the Czech Republic comprises a small share of the world's GDP,
the impact of lowering its fiscal deficit by one percent of GDP for 10 years on real
interest rates is only 0.25 basis points. The model assumes no additional change in
the risk premium on government debt.

Figure 2 Impact of One Percent of GDP Cut in Government Consumption on Real GDP Under Different Assumptions[*]

Percent Deviation from Baseline
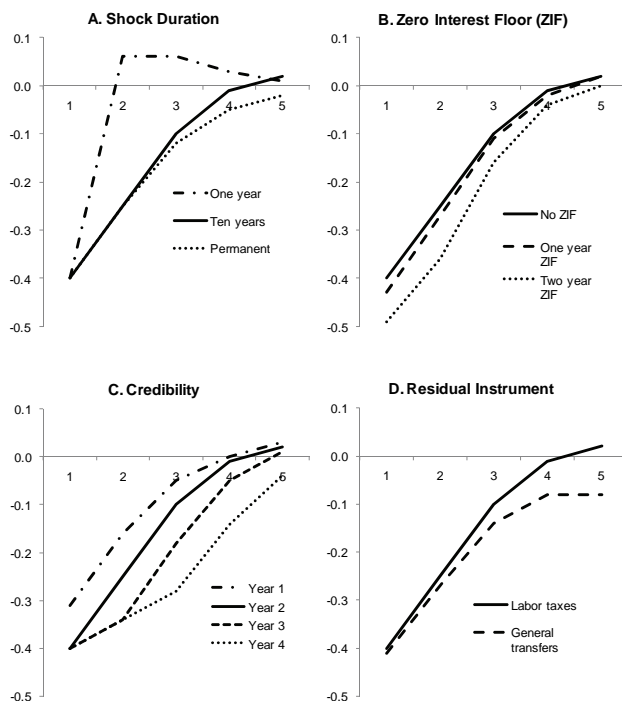
Notes: * Except for the parameter varied, the shock lasts for 10 years; it becomes credible in year 2; policy interest rate is not constrained; the residual fiscal instrument is the labor tax. That scenario is shown by the solid line.

4.2 Factors Affecting the Multiplier

Figure 2 summarizes fiscal multipliers for government-consumption-based consolidation across a variety of factors that influence the multiplier. Panel A shows how the duration of the shock affects the multiplier. The impact is the same in the first year for all the durations as we assume that it takes one year for the consolidation to achieve credibility. The impact on output reverses after a year for the one year of consolidation, and the ten-year and permanent consolidation suppresses output below baseline for several years. The impact of the 10-year and permanent consolidation in the medium term is nearly identical, but diverges substantially in the long run as public debt declines considerably more if the cut in government consumption is permanent.

As panel B shows, if the zero-interest floor (ZIF) is binding, the impact of the consolidation on GDP worsens. Since the monetary authority cannot reduce interest rates when the consolidation reduces inflation, there are no offsetting effects from a lower real interest rate on demand. The longer the ZIF binds, the greater the impact on GDP.

Table 2 Comparison of One-year Temporary Fiscal Multipliers

Model	GIMF	Coenen et al. (2010)		OECD (2009)
Instrument (below); Country (right)	Czech Rep.	U.S.	Euro Area	Czech Rep.
Labor tax	0.13	0.10-0.35	0.05-0.30	0.2
Consumption tax	0.13	0.30-0.35	0.20-0.30	-
Capital tax	0.03	0.01-0.11	0.03-0.06	-
Government consumption	0.41	0.80-1.20	0.95-1.00	0.3
Government investment	0.44	0.95-1.15	0.95-1.00	0.7
General transfers	0.08	0.10-0.50	0.05-0.25	0.2
Transfers to LIQ	0.23	0.40-1.15	0.25-0.70	-

The sooner credibility is achieved, as shown by panel C, the sooner agents perceive the long-term benefits of consolidation which mitigates the output losses. Credibility plays slightly different roles across instruments depending on which households are affected and whether the instrument of consolidation has a direct impact on factors of production. This is demonstrated in *Appendix II*.

Finally, in panel D, if general transfers rather than labor income taxes are used to satisfy the fiscal rule, the gains in the long run from lower distortions in labor markets and higher labor supply are not realized, and real GDP will be essentially unchanged in the long term.

4.3 Comparison of Czech-Specific Multipliers with Other Estimates

The short-run multipliers are consistent with those in Coenen et al. (2010) and OECD (2009). The one-year multipliers from these two papers without a binding ZIF for the Czech Republic, the euro area and the United States are compared to the re-sults found in this article for the Czech Republic in *Table 2*. [9]

The short-run multipliers for transfers and tax instruments are consistent with the lower range of estimates for the Euro Area and the United States in Coenen et al. (2010). They find that higher nominal rigidities and more openness to trade in the Euro Area contribute to produce smaller multipliers relative to the United States. Imports in the Czech Republic as a percent of GDP are almost quadruple those of the Euro Area. We find larger spillovers into imports in the Czech Republic relative to the Euro Area, but this is offset somewhat by a higher share of liquidity-con-strained households in the Czech Republic relative to the Euro Area calibrations in Coenen et al. (2010).

The short-run multipliers for transfers and labor taxes are smaller than those found in OECD (2009). The multipliers in OECD (2009) are calculated using an av-erage multiplier for OECD countries, scaled for openness to trade and judgmentally adjusted. Since the multipliers for other countries in OECD (2009) are consistent with estimates of GIMF, the difference with the estimates for the Czech Republic is mostly related to the degree of spillovers into imports.

The largest difference between the multipliers compared to Coenen et al. (2010) is observed for government consumption and investment shocks. We find multipliers

[9] Unlike in *Table 1*, for consistency we allow transfers to adjust to satisfy the fiscal rule.

over half of those estimated for the Euro Area. This derives from the higher openness in the Czech Republic to trade relative to the countries considered in that paper, since consumption and investment instruments have a direct impact on aggregate demand and can spill directly into imports.

The largest discrepancies between our estimates of multipliers and those in OECD (2009) are for government investment. Productivity spillovers of government investment on GDP are difficult to estimate, and empirical estimates for the Czech Republic are not available. The calibration of the relationship between public capital and potential output in GIMF is based on meta analysis as described in Ligthart and Suárez (2005). We believe, however, that since the increase in investment expenditure only lasts for one year in these simulations, there would be limited effect on the public capital stock, and hence productivity.

5. The Impact of 2011 Tightening

This section analyzes the impact on the economy of the consolidation measures adopted by the government in its 2011 budget. The package would reduce the structural primary balance (relative to the baseline of unchanged policies) in 2011 by 1.95 percent of GDP, with about ¾ of the consolidation coming from the expenditure side. *Appendix III* provides a detailed description of the package and how its components are mapped into fiscal instruments available in GIMF.

In the simulations, the largest measure is a cut in government consumption, which accounts for nearly one half of the consolidation. About a third of that cut comes from a reduction in the government's wage bill, to be implemented via a combination of salary decreases and personnel cuts. The reduction in expenditures of general treasury is also included in this category. The bulk of the revenue adjustment is coded as an increase in the labor tax. It reflects increases in social security contributions and in the personal income tax.[10]

The government intends the measures adopted for 2011 to stay in place in subsequent years as well, so we model the adjustment as permanent. The government has also announced its expenditure ceilings and fiscal balance targets for 2012–13 as well as its intention to balance the budget (providing economic growth continues) in 2016. In view of the fact that the government has not yet specified measures that would bring about that adjustment, we cannot model its impact on the economy, since the effect depends on the composition of the adjustment, not just its size. Hence, in this simulation we assume only one small additional meausure noted in footnote 3 above in 2012 and no further changes, with the improvement in the overall general government balance staying 2.1 percent relative to the baseline in perpetuity. We do, however, take up the issue of further tightening in Section VI.

Credibility of fiscal consolidation and the reaction of monetary policy are important for the assesment of fiscal policy effects. In our main scenario we assume that the consolidation package will become credible after one year, once the government has managed to stick to its commitments in 2011 and submitted a 2012 budget that maintains the 2011 measures. This means that in 2011 private agents are assumed to

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[10] The payroll tax measure keeps in place the adjustments that had already been adopted for 2010, but were supposed to expire in 2011. Again, the baseline for our assessment is given by the policies that would be in place in 2011 (and beyond) in the absence of the 2011 package, not the policies in place in 2010.

Figure 3 Impact of 2011 Package on Real GDP and Inflation
Deviation from Baseline, Percent or Percentage Points
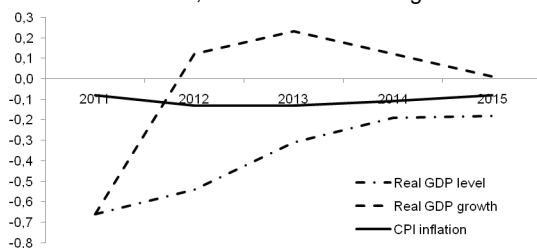
believe that the 2011 measures would be rolled back in 2012, and it is only in 2012 that they become convinced that the tightening is permanent.

We assume that the policy interest rate will not be reduced further in 2011 to mitigate the impact of fiscal consolidation on real GDP and inflation. There is very limited room for lowering the policy rates in the Czech Republic, and the central bank is likely to keep this room so it can react to a major unanticipated shock. There are no constraints on monetary policy from 2012 onwards.[11] We discuss the sensitivity of our results to these assumptions at the end of this section.

The long-term impact of fiscal consolidation depends on the residual fiscal instrument. Lower overall government deficits in the simulation will decrease public debt relative to the baseline, which gradually reduces the interest bill. For the given overall balance, lower interest payments would eventually allow the government to run a lower primary surplus, letting it reduce taxes or increase some non-interest spending. We assume that the government would cut payroll taxes when given fiscal room. Such a choice would be sensible, since payroll taxes have a large deadweight cost and are relatively high in the Czech Republic compared to other European countires.

Figure 3 shows the impact of the 2011 package on output and inflation. Real GDP would decline 0.7 percent in the first year relative to the baseline. Then *growth* would turn positive, although not enough to offset the impact on output *level* for a protracted period of time. In the long run, however, real GDP would be 0.2 percent higher thanks to the eventual reduction in the distortive payroll taxes. In the meantime, CPI inflation would be lower by about 10 basis points for a few years, ultimately converging back to its target. The fairly low short-term fiscal multiplier for this package is in line with the results obtained in Section IV for individual shocks and reflects the openness of the Czech economy and the structure of the consolidation.

To understand better the reasons for the small size of the multiplier, it is useful to consider the impact of the consolidation package on other macroeconomic variables, such as GDP components, interest and exchange rates, and current account balance.

Private saving would decline initially as household income goes down as a result of consolidation measures, but not enough to stop consumption from falling.

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[11] This reflects the expectation that in the absence of consolidation the policy rate would move up by 2012 sufficiently so that the effective floor on the interest rate would no longer be binding.

Figure 4 Contributions to Real GDP Deviation from Baseline
Percent of Baseline GDP
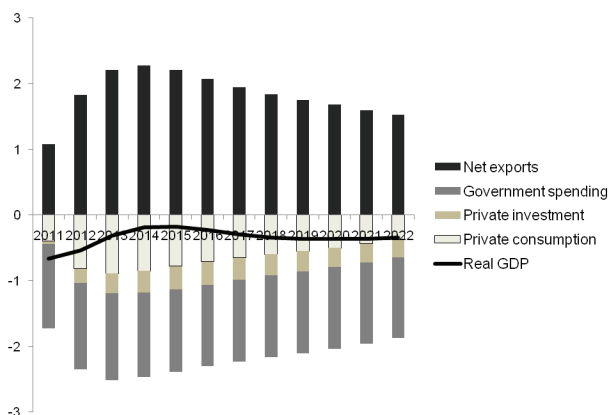
Private investment would also go down, reacting to the prospect of lower GDP in the near future. Government spending will decline by design. Partially offsetting these negatives will be a positive contribution from net exports, thanks to both lower imports and higher exports in response to a decline in domestic demand and, after 2011, a weaker real exchange rate.[12] Given the high degree of trade openness of the Czech Republic, this offset is quite substantial, which explains a relatively low fiscal multiplier (*Figure 4*).

The monetary authority would react in this simulation to a decline in observed and expected inflation by lowering the interest rate by 20 basis points by 2013, after which the rates would move slowly back to neutral (*Figure 5a*).[13] We remind the reader that we are describing the rates relative to what their path would be in the absence of fiscal consolidation, and that by assumption the policy rate does not move down in 2011. The fact that the lowest rate (relative to the baseline) is projected for 2013 is due to some inertia in the interest rate rule and a persistent fall in demand. The real interest rate would rise somewhat in 2011 as inflation declines while the nominal rate is not yet allowed to react, and then fall along with the policy rate.

The nominal exchange rate would depreciate about 0.5 percent in 2012 relative to the baseline as the interest rate cut opens a differential with foreign interest rates (*Figure 5b*). As the current account improves thanks to import compression and higher exports, the nominal exchange rate will start appreciating. The real exchange rate will behave in a similar fashion, except thanks to a somewhat smaller inflation differential with the trading partners than in the baseline, the initial depreciation is somewhat larger, and subsequent appreciation is smaller in real than in nominal

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[12] As noted below, the exchange rate would depreciate (relative to the baseline) in response to a drop in aggregate demand and a reduction in the policy rate triggered by fiscal consolidation. It is possible that fiscal consolidation would improve investor confidence and lower Czech Republic's risk premia, leading to a *stronger* exchange rate. This mechanism is outside our model. It would not necessarily imply a larger impact of fiscal consolidation, as higher confidence and lower risk premia would reduce interest rates and stimulate investment and consumption, potentially making up for the smaller improvement in net exports.

[13] With lower stock of government debt, the new equilibrium level of interest rates will be somewhat smaller.

Figure 5a Interest Rates
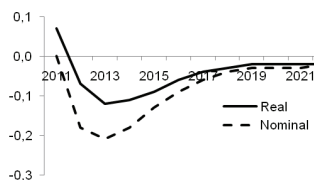Percentage Point
Deviation from Baseline

Figure 5b Exchange Rates
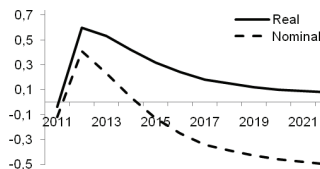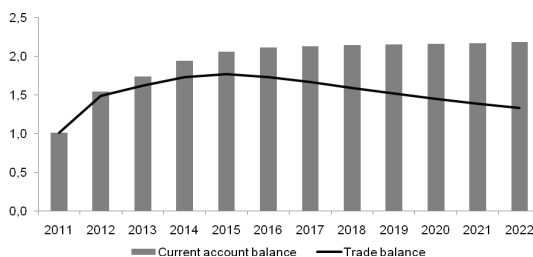Percentage Point
Deviation from Baseline

Figure 6 Current Account and Trade Balance
Deviation from Baseline, Percent of GDP

terms. In the long run, the real exchange rate essentially returns to its initial value. The trade balance and the current account improve due to stronger exports and weaker imports (*Figure 6*). In the medium term, the improvement in the current account, at 2.1 percent of GDP, reflects one for one the strengthening of the fiscal balance. The trade balance rises somewhat less, as the current account is also supported by higher net income receipts thanks to an improving net foreign asset position.

Finally, we explore the importance of our assumptions about monetary-policy constraints and about credibility. If the monetarty policy rate was to respond to the consolidation in the first year, we find that it would ease by approximtaly 10 basis points, and mitigate the fall in real GDP by only 0.06 percent. As discussed above, the small impact is due to the the high degree of openness. We also find that an immediately credible fiscal consolidation would have a slightly smaller impact on output. On the other hand, if the 2011 budget package could not earn credibility until 2013, the level of real GDP would be lower by a 0.25 percent in 2012 and 2013. While these results confirm the benefits of credible policies and room for monetary--policy maneuver, they also show that our estimates of the fiscal multiplier are not very sensitive to the specific assumptions we have made.

6. Further Consolidation

With consolidation limited to the measures in the 2011 budget, fiscal deficits in the Czech Republic would stay around 3½ percent of GDP in the medium term, and then increase further as the finances of the pension and health care systems deteriorate under demographic pressures. Hence, further adjustment is unavoidable. The government has set a goal of balancing the budget by 2016. By our estimates,

this implies a tightening of about 3½ percent of GDP, spread over 5 years from 2012 to 2016.

Given the overall amount of consolidation to achieve, the government will have to decide on the pace of adjustment and on the instruments to use. The tradeoff bearing on the speed is not considered in this article. Clearly, a more front-loaded consolidation will inflict more short-term pain, but will also bring benefits sooner. A theoretically interesting case arises when a credible promise of future tightening (say, cut in government consumption) may generate an increase in GDP today, as agents start spending some of the future increase in wealth even before the cut takes place and affects aggregate demand directly. This sounds very attractive in a situation many countries are facing now, with the economy below capacity but expected to recover in the future, as it would allow to even out the path of the output gap. The practical applicability of this case, however, is questionable, as markets tend to not put much trust in promises of future adjustment. Hence, in this section we will simply assume that the adjustment is distributed uniformly over 5 years in 0.7 percentage point increments.

We focus on the question by what means to achieve this adjustment. The key point that we would like to make is that the impact on the economy varies dramatically depending on the choice of instruments. Obviously, many other considerations, including fairness, societal preferences, political feasibility, legal constraints, and ease of implementation, have a bearing on the issue, but the impact on the economy should definitely be kept in mind.

This point was already demonstrated in Section IV, where shocks to different fiscal instruments were shown to have rather different effect on output, both in the short and in the long run. Interested readers could construct their own consolidation packages as linear combinations of the basic shocks and gauge their impact approximately by combining the responses.

We will illustrate the point further by showing the effect of two packages that we consider plausible. In the first package, the 3½ percentage point increase in the ratio of fiscal balance to GDP is achieved by cutting government consumption (40 percent of the adjustment), reducing general transfers (20 percent), and raising the consumption tax (40 percent). This package contains several attractive features. Specifically, expenditure cuts account for most of the consolidation (60 percent); public investment is not affected; transfer reductions do not target liquidity-constrained households (who have higher marginal propensity to consume); and additional revenue is raised through the least distortionary tax.

As a less attractive alternative, we consider consolidation via higher labor taxes (70 percent of the adjustment) and lower government investment (30 percent). These are two measures to which governments in need of fiscal adjustment frequently resort – indeed, they are part (although only a small part) of the 2011 consolidation package. In particular, governments often find reducing investment politically easier than laying off public employees or reducing their wages, shrinking services provided by the government, or cutting subsidies and other transfers. It should be noted, however, that reducing public investment not only dampens aggregate demand contemporaneously, but also lowers the economy's productive potential for years to come. Similarly, the payroll tax may fall on a somewhat narrower base than the consumption tax, which could be a reason why raising it may be more politically expedient.[14] How-

Figure 7 Impact of Additional Consolidation on Real GDP with Different Instruments
Percent Deviation from Baseline
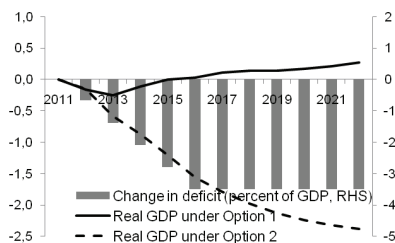
ever, the payroll tax is much more distortionary, and hence harmful to output, than the consumption tax.[15]

Since the additional consolidation starts in 2012, when the Czech Republic will likely have a fairly small negative output gap, we allow the monetary policy to respond to the fiscal impulse. We assume again that it would take a year for the new consolidation package to become credible. We show the results in *Figure 7*.

The difference between the consequences of the two approaches to consolidation is dramatic. While the impact in the first year is nearly identical, the negative impact of the more growth-friendly consolidation on output bottoms out in 2013 at negative ¼ percent, and from 2015 onwards real GDP exceeds its baseline level, with a steady-state gain of 1½ percent. In contrast, under the second option the negative impact keeps growing, with real GDP in the steady state more than 3 percent below the baseline.

There are two reasons for the very shallow decline in output in our first package. The first is the gradual pace of consolidation. The immediate impact on aggregate demand – direct, via lower government consumption, and indirect, via lower disposable income – is rather small in the first two years of extra consolidation. The second reason comes through expectations. As private agents come to expect higher GDP and lower payroll taxes (the payoff from consolidation) in the future, they feel wealthier and decrease their saving. This partially offsets the negative impact of lower government consumption on aggregate demand.[16]

In case the assumption that as early as 2013 private agents will fully anticipate the total extent of future consolidation appears too strong, we have simulated a different scenario. In this "I'll believe it when I see it" scenario, households are assumed to expect that the adjustment achieved up to the current year is there to stay, but they do not anticipate further tightening until it happens. So in 2012 they expect a permanent adjustment of 0.7 percent of GDP. In 2013, they come to expect another permanent fiscal balance improvement of 0.7 percent of GDP on top of that, i.e. a cumulative tightening of 1.4 percent of GDP. It is not until 2016 that their expectations catch up fully with the government's program.

[14] Particularly when levied on employers, even though in general equilibrium the incidence does not matter – but it affects the perceptions.

[15] The above applies even more to the capital tax, which falls on a still narrower group, but may be more damaging to real GDP, than the payroll tax.

[16] As in Section V, another offset comes from net exports.

**Figure 8 Impact of Additional Consolidation on Real GDP
          with Stepwise Increase in Credibility**
Percent Deviation from Baseline
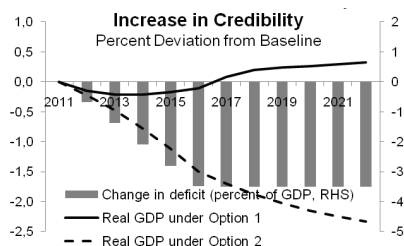
This modification does not make a big difference, as can be seen from *Figure 8*. Under the first option, output lingers slightly longer below the baseline in the case of slower gains in credibility, but makes up ground quickly once the expectations adjust fully. As to the second option, less credibility would actually reduce the negative impact on GDP in the short run, as the channel under which expectations of future deterioration affect current behavior does not operate fully until 2016. But again, the difference is not major.

7. Conclusion

In this article we have estimated the impact of fiscal consolidation on the Czech economy using a version of the IMF's Global Integrated Monetary and Fiscal Model calibrated for the Czech Republic and the EU. The model is firmly rooted in economic theory and rich enough to allow quantitative policy analysis.

We found fiscal multipliers to be quite small, ranging from virtually zero to 0.5, depending on the instrument and auxiliary assumptions, in terms of first year impact on real GDP. This reflects the openness of the Czech economy to trade and capital flows as well as the flexibility of its exchange rate and is broadly in line with most of the literature, although considerably lower than the generic multiplier of 0.5–0.6 that the CNB appears to use.

We have emphasized that the effect of fiscal consolidation cannot be summarized in one number. First, the impact goes beyond one year. Second, one might be interested in the behavior of many variables – the current account, the exchange rate, the interest rates, the inflation rate – and not just real GDP in response to a fiscal shock. Third, the response depends not only on the size of the reduction in the budget deficit, but also on the instrument – expenditure or revenue category – through which the reduction is achieved. It also depends on the reaction of monetary policy – which may be constrained if the policy rate is at or close to the low bound. Finally, it matters whether the tightening is short-lived or sustained, and also what the private sector believes about the durability of the adjustment in case of consolidation spanning several years.

For these reasons we have compiled the responses of output to a standardized fiscal shock (a one percent of GDP tightening) for a variety of instruments (three different taxes and four different ways to cut government expenditure), consolidation time horizons, and assumptions about monetary policy and the credibility of adjustment. We hope researchers and policy analysts working on the Czech Republic and

other small open economies will find these detailed estimates useful in evaluating the impact of any consolidation (or stimulus, for that matter) package of interest to them. Obviously, these responses can also serve as an input into a discussion about the optimal size, pace, and composition of fiscal adjustment – which is a very relevant issue around the globe.

To highlight a few of these results, cuts in general transfers have the smallest negative impact on output, and cuts in government investment have the largest. Among the taxes, for a lasting consolidation, higher consumption taxes have the lowest negative impact in the first few years, and the labor taxes the highest.[17] Monetary policy has the ability to counteract the contractionary effect of fiscal consolidation, but the offset it provides is relatively small in the short run for most instruments. Higher credibility of fiscal adjustment reduces the negative impact of fiscal tightening in the short term for all instruments, except labor and capital income taxes.

We have evaluated the impact of the consolidation package specified in the 2011 budget. The package envisages a permanent tightening of 2 percent of GDP (relative to the baseline of unchanged policy), implemented mostly through expenditure cuts, particularly to government consumption. This composition is fairly benign in terms of its impact on growth. According to the model, implementation of the package would reduce real GDP by 0.7 percent in 2011, implying a first-year multiplier of 1/3. Then output would start to recover gradually, and in the long run real GDP would be 0.2 percent higher than in the baseline, as a stronger fiscal position (particularly, lower debt level) would allow the government to reduce distortive labor taxes.

The package would be mildly deflationary. It would lead to temporary real exchange rate depreciation, reaching 0.6 percent at the peak, and to a gradual, permanent strengthening of the current account balance. It is an improvement in net exports that largely offsets the negative fiscal impulse and explains the small magnitude of the multiplier, even as other components of GDP go down.

Finally, we consider two possible ways through which the government could achieve further consolidation in line with its objective of balancing the budget by 2016. The two alternatives both assume a gradual improvement in the fiscal balance of 3½ percent of GDP over the 2012–16 period, but differ in the choice of instruments. The simulations illustrate the fact that the growth impact of fiscal tightening depends dramatically on that choice. In the case of a growth-friendly package, consisting of cuts in government consumption and general transfers and an increase in the consumption tax, the negative impact on output is mild and short--lived, and in the long run output actually increases. In contrast, the alternative option, comprising a hike in the labor tax and a cut in government investment, would put output on a downward slide for a number of years, lowering it by over 3 percent in the steady state.

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[17] Because of lags and adjustment costs, the impact of a capital income tax hike is fairly small in the first year, particularly if it is expected to be reversed soon. The effect, however, grows over time once the private sector realizes that the increase will persist.

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