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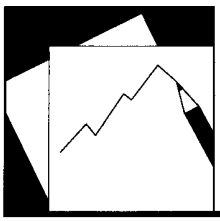

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Effects of Fiscal Consolidation in the Czech Republic

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Effects of Fiscal Consolidation in the Czech Republic

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Abstract

This paper 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 threefold. 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 paper evaluates the impact on the economy of tightening measures envisaged in the 2011 budget. Third, the paper 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."

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I. 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.[2] 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.[3]

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 credibility, 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 paper 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

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

[3] 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.

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.[4] Second, the paper 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 paper demonstrates that both the short-term and the long-term impact on GDP can vary dramatically depending on the choice of the instruments.

The paper 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 paper—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 paper: the dynamic multipliers; the impact of the 2011 package; and the alternative paths toward further consolidation. The last section concludes.

II. 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 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.

[4] This includes loosening fiscal policy—e.g., to provide stimulus to the economy. All that is required is to reverse the sign.

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 and others (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.

A number of Czech researchers have explored the impact of fiscal policy on their economy using regression analysis. Hřebíček, Král, and Říkovský (2005) rely on judgmentally-adjusted results of simple regressions and estimate the fiscal multiplier to equal 0.6. Several papers, such as Radkovský and Štiková (2008) and Prusvic (2010), use structural vector autoregressions (SVAR) and obtain a wide range of multipliers.

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.

III. Description of the Model

This paper uses an annual two-country version of the GIMF calibrated for the Czech Republic and the EU. 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 and others (2009).

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 are 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.[5]

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. International asset markets are incomplete, as 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.

Household Sector

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.

The liquidity-constrained households (LIQ) neither save nor have access to financial markets. They consume their current after-tax income in each period; the larger the share of liquidity-constrained households, the larger the effect on overall consumption for a given change in current income. Consequently, the presence of liquidity-constrained households improves the short- to medium-run horizon dynamics, better matching the cyclicality observed in the data.

Households that are not liquidity-constrained, typically referred to in GIMF as overlapping generations households (OLG), face a constant probability of death $(1-\theta)$ in each period, which implies an average planning horizon of $1/(1-\theta)$. Furthermore, they experience declining labor productivity over their lifetimes. Overlapping generation households save by acquiring domestic government bonds and through fixed-term deposits. They maximize a utility function subject to their intertemporal budget constraint. The model is calibrated so

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

that they optimize their borrowing and saving decisions over a 20-year planning horizon. Together the declining labor productivity and the higher-than-biological probability of death generate non-Ricardian effects.

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 mean lower tax obligations 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 a share of the resulting lower taxes in the future is enjoyed beyond their planning horizon.[6]

Production Sector

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 countries, capital is sector-specific and is also immobile across countries.

Fiscal Instruments

In GIMF, there are many ways that the fiscal authority can interact with the economy. In this paper, we will focus on seven such instruments for potential fiscal consolidation. These instruments can be divided into several main categories: government consumption and investment, distortionary taxes, and non-distortionary transfers. It is critical to understand the characteristics of these instruments to identify their real-world parallels as well as to interpret their impact in the model.

Government investment accumulates into a stock of public infrastructure. Government consumption accumulates into a stock of public durable goods. Both types of public capital depreciate at a rate of 4 percent per year. Their stocks affect the productivity in the production of the domestic final good. 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 more extensive or higher quality public infrastructure, such as roads, schools, and heath facilities, improves the productivity of the private sector. The elasticity of aggregate output with respect to public durable capital is assumed to be one tenth of that with respect to public infrastructure. This device reflects the

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

assumption that higher quality government employees and services, better legal services, policing, or school teachers, will also affect private-sector productivity.[7]

The fiscal authority may also utilize lump-sum transfers in the form of either general transfers or targeted transfers to LIQ households. In a consolidation, general transfers are extracted directly from the budget constraint of both OLG and LIQ households based on their share of total consumption in the economy. Thus, 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 tightens the LIQ budget constraint. As LIQ households consume their total income in each period, this results in a reduction in consumption immediately in that period. The only offsetting reaction on the part of LIQ households is a small increase in their labor supply. Examples of such targeted transfers include social welfare programs.

Revenue can accrue from distortionary taxes on labor and capital income as well as 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 losses caused by both of these taxes are significant, since they reduce the factors of production in the economy. The consumption tax is the most growth-friendly, as it does not distort a factor of production. This tax comprises sales taxes, VAT, and excises.

Although tax instruments in GIMF are relatively easy to translate into real-world parallels, the expenditure and transfer instruments are more difficult. For example, programs directed to the poor often contain elements of both government consumption and targeted transfers. Social safety net transfers, such as employment insurance, affect people who may have a temporarily high marginal propensity to consume. This could potentially affect employment opportunities and the future productivity of the economy. It is particularly difficult to assess pension transfers as the impact will be determined by how much it will affect income levels of those with little wealth or those who cannot adjust their saving or borrowing to a change in income.

[7] In the earlier versions of GIMF, government consumption had no impact on utility or productivity, so it was in some sense pure waste. This version imparts a useful function to government consumption.

Fiscal Policy

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. This replicates the properties of the deficit in business cycles.

To ensure its intertemporal solvency and to avoid default, the government operates a fiscal rule. The fiscal rule implies no uncertainty regarding government actions, and households observe the fiscal rule when contemplating their decisions. As such, the choice of a fiscal rule has important bearing on the effects of fiscal policy.[8] A specified fiscal instrument adjusts to stabilize the ratio of the overall government deficit-to-GDP ratio, gd_t^{rat}, to the target level $gdss_t^{rat}$.

$$gd_t^{rat} = gdss_t^{rat} - d^{gdp} \ln\left(\frac{g\breve{d}p_t}{g\breve{d}p_{pot}}\right) \tag{1}$$

Here $d^{gdp} \geq 0$ is the coefficient that determines the strength of the automatic stabilizer, which responds to the cyclical position of the economy expressed as log of the ratio of nominal gross domestic product (GDP) to potential GDP. Potential output is modeled as a two-sided moving average of past actual and future forecasted values of GDP to allow for the gap to close over time,[9] implying a traditional measure of the output gap. Further, defining gd_t^{rat} and $gdss_t^{rat}$acknowledges the difference between the actual deficit and structural deficit (also known as the "cyclically adjusted deficit"). The calibration of d^{gdp} comes from OECD estimates reported in Girouard and André (2005) and is 0.39 and 0.48 for the Czech Republic and the European Union, respectively. GIMF allows for any of the fiscal instruments to respond to the fiscal rule, but this paper focuses on cases where transfers or labor income taxes are used.

Consistent stock-flow accounting of the model is key in reducing government debt by fiscal consolidation. The targets for debt and deficit are linked using the standard identity

$$\mathrm{B_t} = (1 + \mathrm{i_{t-1}})\mathrm{B_{t-1}} - \mathrm{PS_t} = \mathrm{B_{t-1}} + \mathrm{GD_t} \tag{2}$$

where B_t is the nominal government debt, i_t stands for nominal interest rate, $PS_t$is the primary surplus and GD_t is the overall government deficit. Expressing the identity in

[8] Balanced-budget rules that do not acknowledge the phase of the business cycle induce volatility of the economy due to their pro-cyclical nature or may lead to multiple equilibriums.

[9] The weights of the moving-average embody a transfer function of a simple linear model of output gap and Phillips curve often used by public authorities to estimate output gaps. A special case of the filter is a Hodrick-Prescott filter extracting business cycle fluctuations of the output from the data. This is yet an undocumented feature of the model and details are available upon request from the authors.

percentage shares of GDP one obtains

$$b_t = \frac{(1+i_{t-1})}{(1+\pi_t)(1+g_t)} b_{t-1} - ps_t = \frac{1}{(1+\pi_t)(1+g_t)} b_{t-1} + gd_t^{rat} \quad (3)$$

where lower-case letters denote percentage shares on GDP and $((1+\pi_t)(1+g_t)-1)$ is the nominal GDP growth rate. It is important to realize that for efficient economies (when the real rate of interest is larger than output growth rate), the debt accumulation identity is an unstable process that needs to be stabilized by active management of primary surpluses.

In the long run, omitting the time subscript and imposing a stable solution, the government deficit target is thus linked to debt target in the following way

$$bss_t^{rat} = \frac{(1+\pi)(1+g)}{(1+\pi)(1+g)-1} gdss_t^{rat} \quad (4)$$

where g is the steady-state (potential) growth rate and π is steady-state inflation. For a given trend nominal growth rate, choosing a deficit target $gdss_t^{rat}$ implies a debt target bss_t^{rat} and therefore keeps debt from exploding. Changes to government saving preferences can be represented by shocks to $gdss_t^{rat}$.

Monetary Policy

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, $\tilde{\pi}_t$, and target inflation, $\bar{\pi}_t$, to achieve a stable target rate of inflation. The target rate is calibrated to be 2 percent in both the European Union and the Czech Republic. The monetary policy rule also assigns some weight, δ_t,to the lagged policy rate, to replicate inertia observed in central bank behavior. The monetary policy function is defined as follows:

$$1 + i_t = E_t(1+i_{t-1})^{\delta_t}\left((1+r_t^{eq})(1+\tilde{\pi}_t)\right)^{1-\delta_t}\left(\frac{1+\tilde{\pi}_t}{1+\bar{\pi}_t}\right)^{(1-\delta_t)\delta_\pi} \quad (5)$$

where $(1+r_t^{eq})(1+\tilde{\pi}_t)$ proxies the gross nominal interest rate. The equilibrium real world interest rate r_t^{eq} is a geometric moving average of the risk-adjusted real world equilibrium interest rate. Projected inflation $\tilde{\pi}_t$ is a weighted average of current and one-period-ahead inflation specified as:

$$1 + \tilde{\pi}_t = (1+\pi_t)^{\delta_{\bar{\pi}}}(1+\pi_{t+1})^{1-\delta_{\bar{\pi}}} \quad (6)$$

where the weight on current inflation, $\delta_{\bar{\pi}}$, is calibrated such that the Czech National Bank reacts to one-year-ahead inflation and the EU reacts to 3 quarters ahead inflation. For the

Czech Republic, the weight on the gap of projected to target inflation, δ_π, is calibrated to 1.4, and the weight on the lag of policy rule to 0.3. The EU has the corresponding weights for their rule of 1.483 and 0.343. These weights come from IMF staff estimates.

Calibration

The calibration of the model is based on a variety of sources. The steady-state GDP decompositions, trade data, and government debt data are taken from recent historical averages. The breakdowns of fiscal ratios and the share of liquidity-constrained consumers, with the exception of current debt levels, are adapted from Allard and Muñoz (2008). The calibration of the structural parameters relies heavily on the literature and borrows from Kumhof and others (2009). The values of adjustment parameters were informed by theory, other empirical studies, and by matching the dynamics of the model to the impulse response functions typical for the Czech Republic and other small open economies. The results of the calibration are summarized in Appendix 1.

IV. Estimates of the Impact of Fiscal Consolidation

Overview

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. Hence, to produce standardized numbers, we allow for shocks to increase $gdss_t^{rat}$ (the target 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. Given that both the shock and the response may last several years, we also provide a summary measure proposed by Uhlig (2010)—the present value multiplier, obtained as a ratio of the discounted values of the deviations of real GDP and government deficits from the baseline.

The duration of the shock may also influence the impact of the fiscal consolidation. Consequently, we explore alternative assumptions about the duration of the fiscal consolidation, 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 agent's expectations 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 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 paper, 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. Currently in the Czech Republic the main policy rate is at a historically low 75 basis points, and the discount rate is only 25 basis points. Given these 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.

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. 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.[10] 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.

Table 1. Impact of Fiscal Consolidation on Real GDP by Instrument[1]

Percent Deviation from Baseline

Instrument / Year	1	2	3	4	5	SS[2]
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

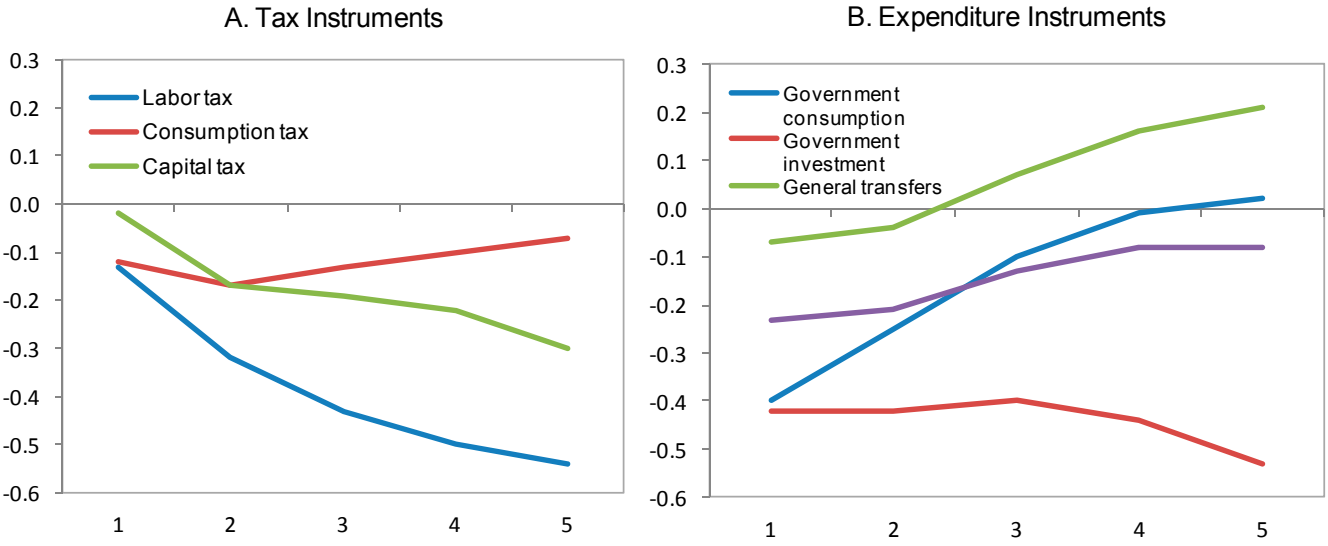
[1]The shock is a 1 percent of GDP improvement in the overall fiscal balance lasting 10 years under the assumptions of no constraint on policy interest rate and credibility starting in year 2. Labor taxes are the instrument responsible for satisfying the fiscal rule.

[2]Steady state

[10] 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.

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.

Figure 1. Impact of 10 Year 1 Percent of GDP Improvement in Fiscal Balance on Real GDP
Percent Deviation from Baseline



Source: IMF Staff Estimates

Unlike cuts in government consumption or investment, fiscal consolidation with general transfers does not have a direct impact on aggregate demand. As the government 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 distortions 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 is adjusted 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 indirect 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 savings 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 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.

Factors Affecting the Multiplier

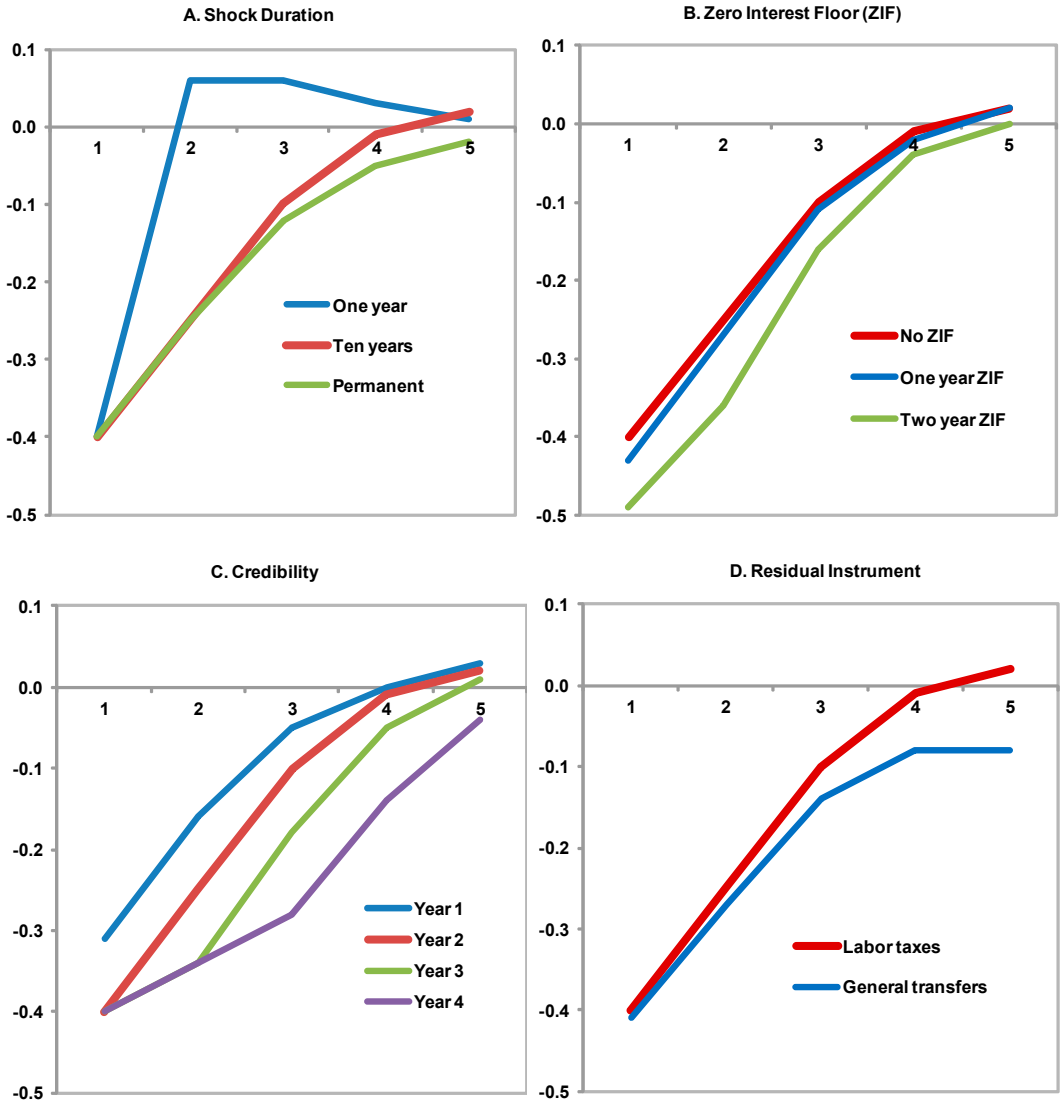
Figure 2 summarizes fiscal multipliers for government-consumption-based consolidation across a variety of factors that influence the multiplier. Panel A shows how the duration of the shock affects the multiplier. The impact is the same in the first year across the durations as we assume that it takes one year for the consolidation to achieve credibility. For a short-term shock the impact on demand reverses after a year, but for a lasting shock the reduction in demand persists. For the ten-year and permanent consolidation, output stays below the baseline for several years as lower government consumption depresses demand, but there is also crowding-in from perceived long-terms benefits of the consolidation. These benefits arise from lower future labor tax obligations required to service a lower debt and slightly lower real equilibrium interest rates. Hence, output returns to the baseline in a few years even though government consumption remains below the baseline. The impact of the 10-year and permanent consolidation in the medium term is nearly identical. However, a permanent consolidation would yield a substantially larger steady-state increase in real GDP as government debt declines considerably more.

As the set of results summarized in Figure 2.B clearly 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. This non-linear relationship comes mainly from the non-linear properties generated by the financial accelerator responding to changes in real interest rates and inflation. Specifically, there is a nonlinear inverse relationship between the net worth and the external finance premium. As net worth decreases, the impact on the external premium increases at an increasing rate. This increases the cost of borrowing to finance investment and shrinks dividend distributions to households from lower profits, further crowding out both private investment and consumption, respectively.

Figure 2.C shows that the sooner credibility is achieved the faster the long-term benefits of consolidation are observed. 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, as Figure 2.D makes clear, 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, leaving real GDP permanently lower after consolidation.

Figure 2. Impact of 1 Percent of GDP Cut in Government Consumption on Real GDP Under Different Assumptions[1]
Percent Deviation from Baseline



[1]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 in thick red line.

Source: IMF Staff Estimates

Comparison of Czech-Specific Multipliers with Other Estimates

The size of the short-run multiplier is much smaller than those derived for the United States or the Euro Area from the models discussed in Coenen and others (2010) and OECD (2009). The results of these two papers and this paper (GIMF) for one-year shocks without a binding ZIF are summarized in Table 2.[11] In particular, we find that multipliers for government expenditure shocks are about half of those estimated for the Euro Area. As found in OECD (2009), this is attributed to domestic demand having a high degree of spillovers into imports and thus reducing the impact on domestic GDP. For the revenue instruments, the short-run multipliers for the one-year consolidation are consistent with the lower range of estimates for Europe.

Table 2: Comparison of 1-Year Temporary Fiscal Multipliers

Model (right)	GIMF	Coenen and others		OECD
Instrument (below); Country (right)	Czech Republic	U.S.	Euro Area	Czech Republic
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	0.1
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	0.43	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	-

Discounted Multipliers

Although thus far we have been discussing simple multipliers defined as the change in GDP over the change in the deficit, multipliers which discount the changes in GDP and the deficit as proposed in Uhlig (2010) may provide additional insights. Specifically, we define present-value multipliers as the ratio of the discounted change in GDP over the discounted change in the fiscal instrument. The present-value multipliers for the one, ten and permanent fiscal consolidation scenarios credible after one year and without a binding ZIF are summarized in Table 3. We discount at the real interest rate of three percent per annum. Generally we find that the multipliers are slightly larger for instruments which have an impact on productivity or impose a deadweight loss, consistent with our findings in the previous section.

Table 3: Present Value Multipliers

Discounted at 3 percent	1 yr.	10 yr.	Perm.
Labor tax	0.14	0.18	0.18
Consumption tax	0.12	0.13	0.13
Capital tax	0.03	0.06	0.06
Government consumption	0.38	0.35	0.35
Government investment	0.45	0.42	0.42
General transfers	0.06	0.06	0.05
Transfers to LIQ	0.22	0.22	0.22

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

V. 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. The outcome of that mapping is shown in Table 4.

Table 4. 2011 Budget Consolidation Measures by GIMF Instrument
(percent of GDP)

	2011	2012 and beyond
Labor tax	0.34	0.34
Consumption tax	0.01	0.01
Capital tax	0.01	0.15
Government consumption	0.95	0.95
Government investment	0.15	0.15
General transfers	0.14	0.14
Transfers to liquidity-constrained households	0.36	0.36
Total	**1.95**	**2.10**

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. It should be noted that while wages of government employees are indeed a component of government consumption in the national accounts, in GIMF there are, strictly speaking, no government employees. Instead, the government is assumed to purchase goods and services in the market. Hence, the association of the planned public wage cut with a reduction in government consumption in GIMF is approximate.[12] The reduction in expenditures of general treasury is also included in this category. This reduction is largely achieved through cuts in transfers from the central government to local ones. We assume that the local governments will decrease their consumption by the same amount. To the extent that they adjust in a different way, the impact on the general government budget and on the economy may be different.

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.[13]

[12] The current version of the model, however, features slightly higher import intensity of government spending than national account input-output tables would imply, mimicking the effect on private consumption induced by government wages.

[13] 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.

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 2 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 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.[14]

Given that the main policy rate is at the historically low 75 basis points, and the discount rate is only 25 basis points above zero, we also assume that the policy interest rate cannot be reduced further in 2011 to mitigate the impact of fiscal consolidation on real GDP and inflation. There are no constraints on monetary policy from 2012 onwards.[15] We discuss the sensitivity of our results to these assumptions at the end of this section.

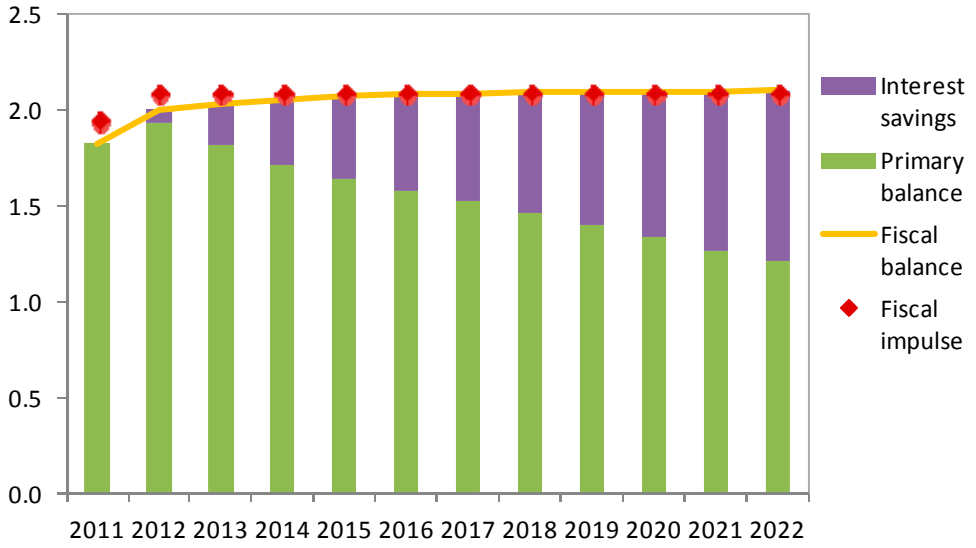
The simulations of the structural model underline the importance of consistent stock-flow dynamics. Fiscal consolidation leads to lower public debt relative to the baseline, which gradually reduces the interest bill. The simulations assume that the government targets the overall balance. Hence, lower interest payments would eventually allow the government to run a lower primary surplus for the same overall balance, letting it reduce taxes or increase some non-interest spending. It is the government's choice which path to choose. 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 set at a relatively high level in the Czech Republic.

[14] As stated in footnote 10, this is a standard assumption not singling out the Czech consolidation as less credible than those undertaken in other countries.

[15] This does not imply that the policy rate would fall below 0.75 percentage point in 2012. Rather, 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 3 shows the fiscal impulse (the planned improvement in the cyclically-adjusted primary balance); its impact on the headline fiscal balance (which is initially smaller than the fiscal impulse because of automatic stabilizers); and the split of that impact between the improvement in the primary balance and the interest savings.[16]

Figure 3. Improvement in Fiscal Balance under 2011 Budget
Percent of GDP, Deviation from Baseline



Source: IMF Staff Estimates

Figure 4 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 0.3 percent higher thanks to the eventual reduction in the distortive payroll taxes.[17] 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.

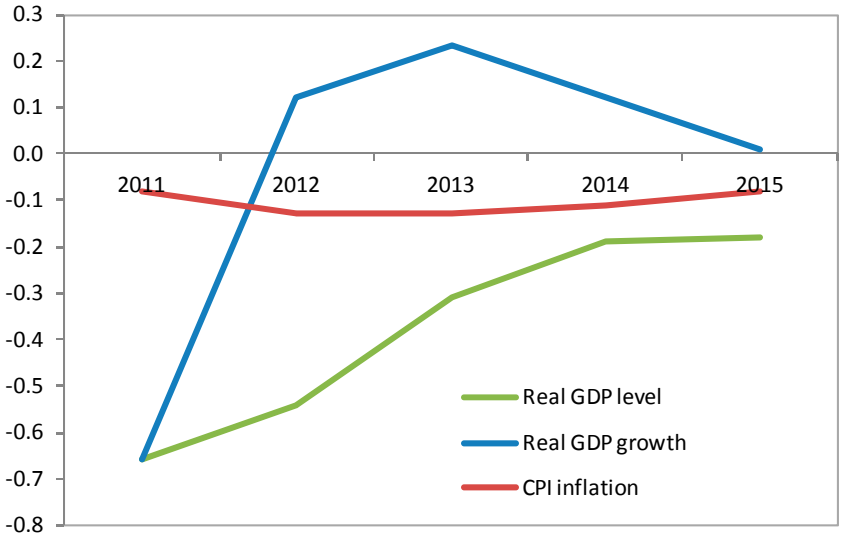
[16] The model assumes that the government will take offsetting measures if automatic stabilizers push the fiscal balance away from the target, but will not necessarily close the gap immediately. For that reason, the difference between the size of the package and the projected improvement in the budget balance exists, but is smaller than what it would be if automatic stabilizers were allowed to play out fully.

[17] In addition to an increase in labor supply due to the reduction in the payroll wedge, another mechanism through which fiscal consolidation leads to higher potential output in GIMF is a decline in interest rates leading to higher investment. The contribution of that mechanism to our results is negligible, however, since it is the global interest rates that matter, and given the size of the Czech Republic, the impact of its fiscal position on the world interest rates is insignificant.

It may be of interest to consider the impact of the consolidation package on other macroeconomic variables, such as GDP components, interest and exchange rates, and current account balance.

Figure 4. Impact of 2011 Package on Real GDP and Inflation

Deviation from Baseline, Percent or Percentage Points

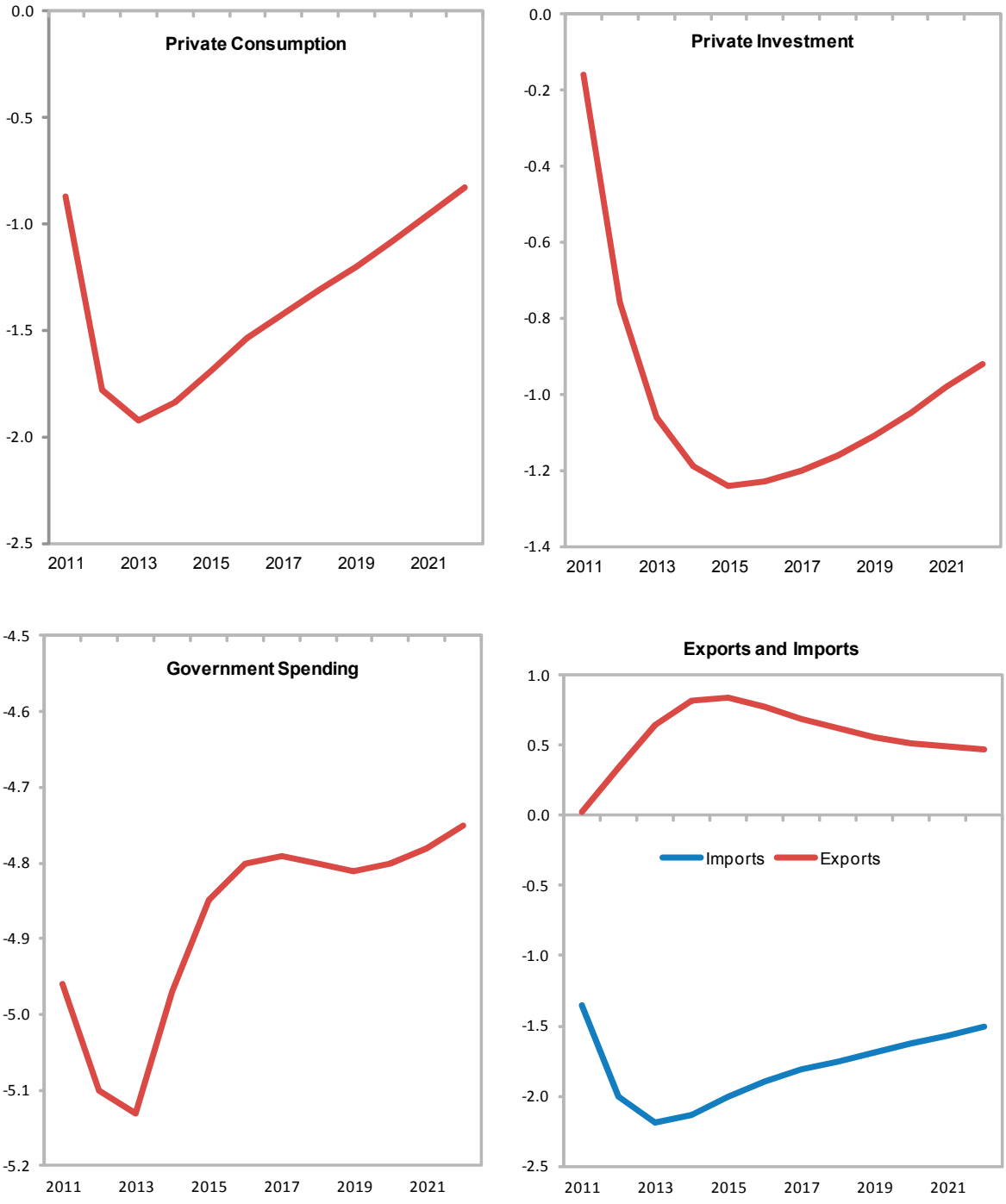


Source: IMF Staff Estimates

Private saving would decline initially as household income goes down as a result of consolidation measures, but not enough to stop consumption from falling (Figure 5). 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.[18] Given the high degree of trade openness of the Czech Republic, this offset is quite substantial, which explains a relatively low fiscal multiplier (Figure 6).

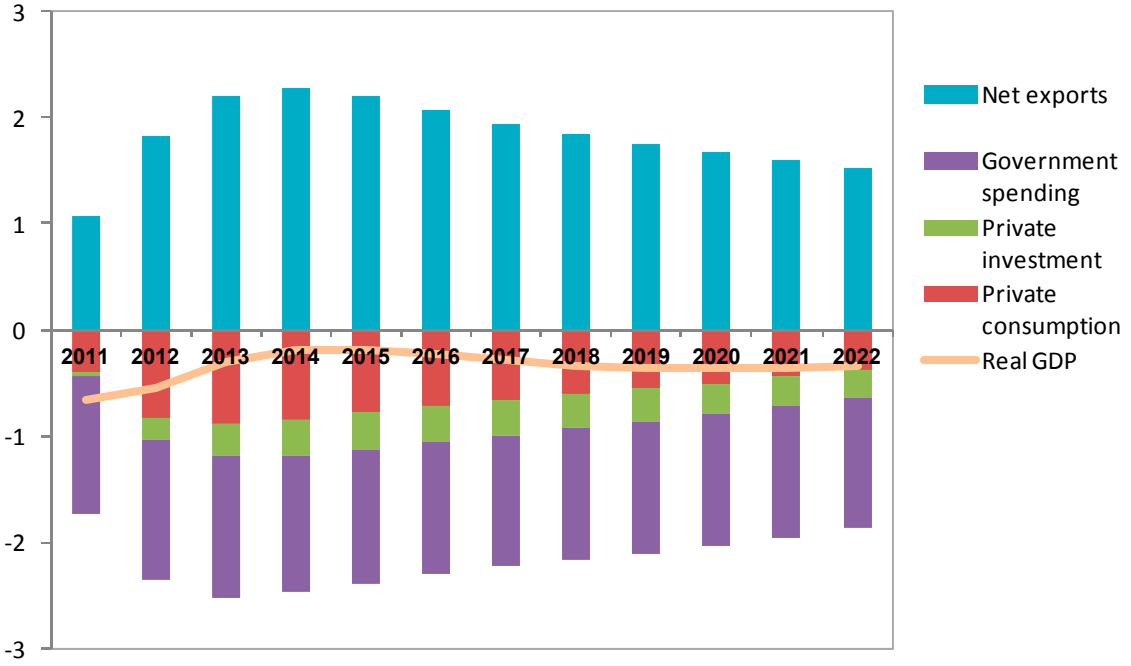
[18] As noted below, the exchange rate would depreciate (relative to the baseline) in response to a drop in aggregate demand and a reduction in the policy rate triggered by fiscal consolidation. It is possible that fiscal consolidation would improve investor confidence and lower Czech Republic's risk 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 a smaller improvement in net exports.

Figure 5. Real GDP Components
Percent Deviation from Baseline



Source: IMF Staff Estimates

Figure 6. Contributions to Real GDP Deviation from Baseline
Percent of Baseline GDP



Source: IMF Staff Estimates

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 7).[19] 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 8). 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 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 9). In the medium term, the improvement in the current

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

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.

Figure 7. Interest Rates
Percentage Point Deviation from Baseline

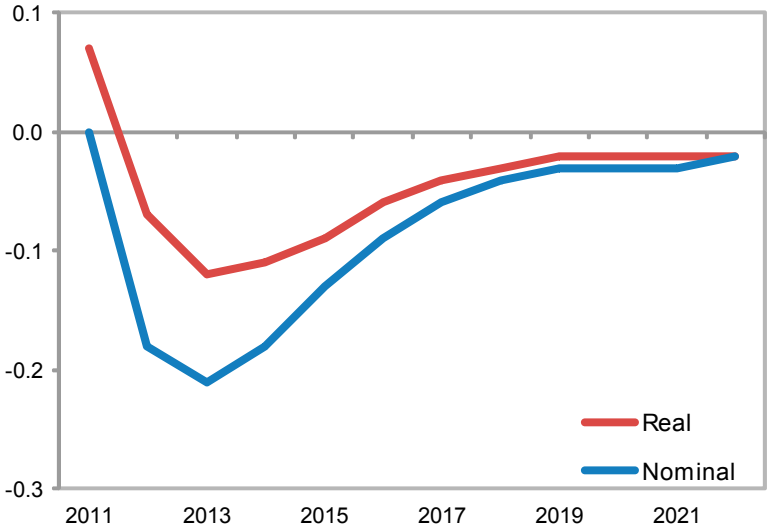
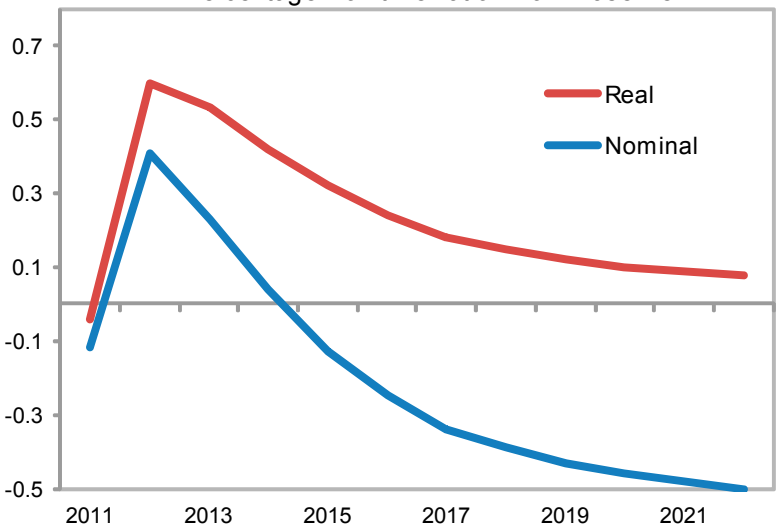
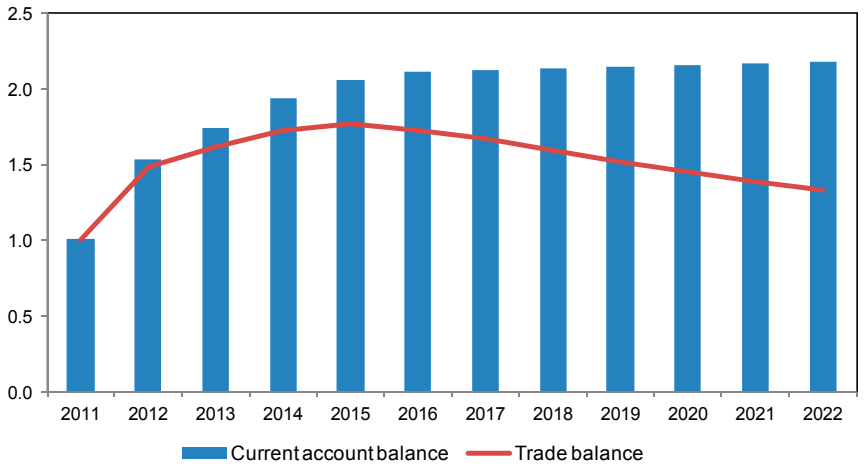


Figure 8. Exchange Rates
Percentage Point Deviation from Baseline



Source: IMF Staff Estimates

Figure 9. Current Account and Trade Balance
Deviation from Baseline, Percent of GDP

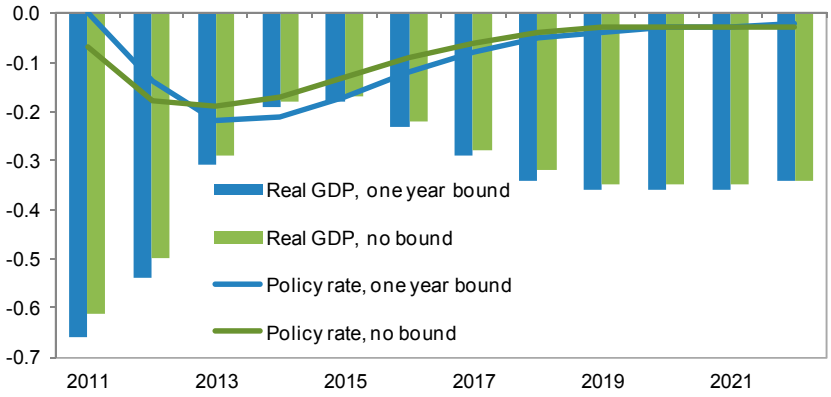


Source: IMF Staff Estimates

Finally, we explore the importance of our assumptions about monetary-policy constraints and about credibility. In our main scenario, we restricted the ability of the central bank to lower the interest rate in 2011 in response to fiscal tightening. The reason is that in our baseline scenario of no consolidation the policy rate was likely to stay at 0.75 percent. That level might be considered an effective lower bound (barring extreme events).

As Figure 10 demonstrates, this assumption does not have a major impact on our results. As discussed above, a lower interest rate pushes the koruna down, which, given the high degree of openness, has a substantial impact on consumer prices—something that an inflation-targeting central bank is mindful of. In addition, the monetary-policy rule is assumed to be fairly inertial, with the weight of about 1/3 on the previous year's interest rate. For these reasons, even if ZIF were not a concern, the central bank would only lower the interest rate by 7 basis points in the first year of our simulation, shaving 0.05 percentage point off that year's output decline.

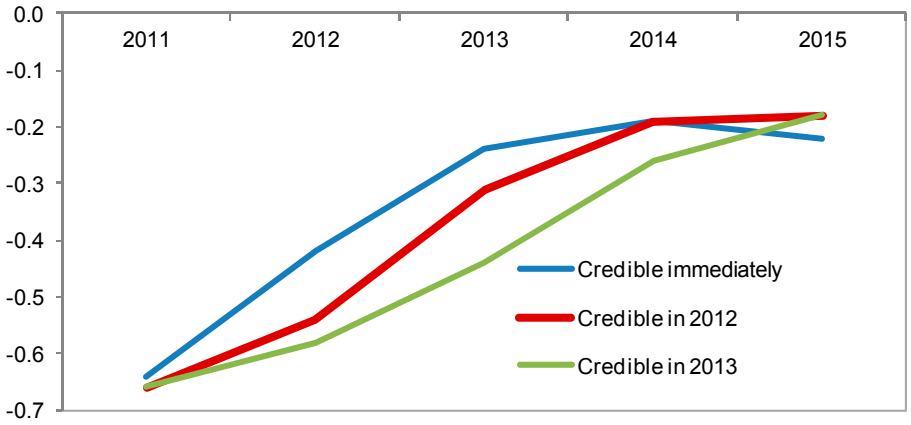
Figure 10. Real GDP and Policy Rate with and without Lower Bound on Policy Rate
Deviation from Baseline, Percent or Percentage Points



Source: IMF Staff Estimates

As discussed in Section IV, more credible fiscal consolidation may have a smaller or larger negative impact on GDP in the short run depending on instruments used. In the case of the 2011 budget package, earlier achievement of credibility would reduce near-term output loss, as illustrated in Figure 11, but not dramatically so. On the other hand, if the package only becomes credible in 2013, output will be somewhat lower in that year and the next two. All in all, 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.

Figure 11. Impact of 2011 Package on Real GDP Under Different Credibility Assumptions
Percent Deviation from Baseline



VI. 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 appropriately set a goal of balancing the budget by 2016. Under staff's projections, 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 paper. 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 are 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.

The room for these changes is available. With the planned magnitude of adjustment and the above shares, changes in consumption-tax revenue and in government consumption would have to equal 1.4 percent of GDP each, and the decline in general transfers would be half of that. In 2009, government consumption as measured by national accounts equaled 22 percent of GDP (including compensation of government employees in the amount of 8 percent of GDP, split approximately equally between wages and salaries and social contributions on their behalf). Social benefits equaled 20 percent of GDP. Better targeting, including through means-testing, would make it possible to reduce the overall level of transfers while protecting the most vulnerable groups—which also tend to be liquidity-constrained, so protecting them is justified from both social and economic points of view. In the longer run, general transfers may also be reduced through lower pension payments. Gradual savings can be achieved by changing the indexation formula (from wage to price inflation), reducing benefits of future retirees, or raising the retirement age. Rationalizing health care expenditure is another option. Regarding the consumption tax, 1.4 percent of GDP is close to the additional revenue the government would get from unifying the VAT at 19 percent.[20]

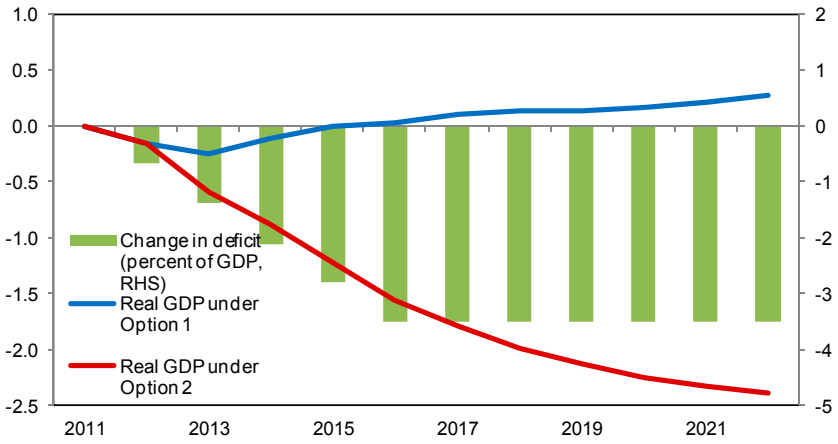
[20] One could also consider raising property taxes, which are quite low in the Czech Republic, while they constitute a major revenue source, particularly for local governments, in many advanced economies. Property

(continued…)

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.[21] However, the payroll tax is much more distortionary, and hence harmful to output, than the consumption tax.[22]

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 12.

Figure 12. Impact of Additional Consolidation on Real GDP with Different Instruments
Percent Deviation from Baseline



Option 1 comprises increase in consumption tax and cuts in government consumption and general transfers;
Option 2 comprises increase in labor taxes and cut in government investment.
Source: IMF Staff Estimates

taxes are not modeled explicitly in GIMF, so we cannot conduct that simulation. However, given that they are levied on a fairly immobile base, the distortionary impact of property taxes should be relatively small.

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

[22] 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.

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 2 percent below the baseline.

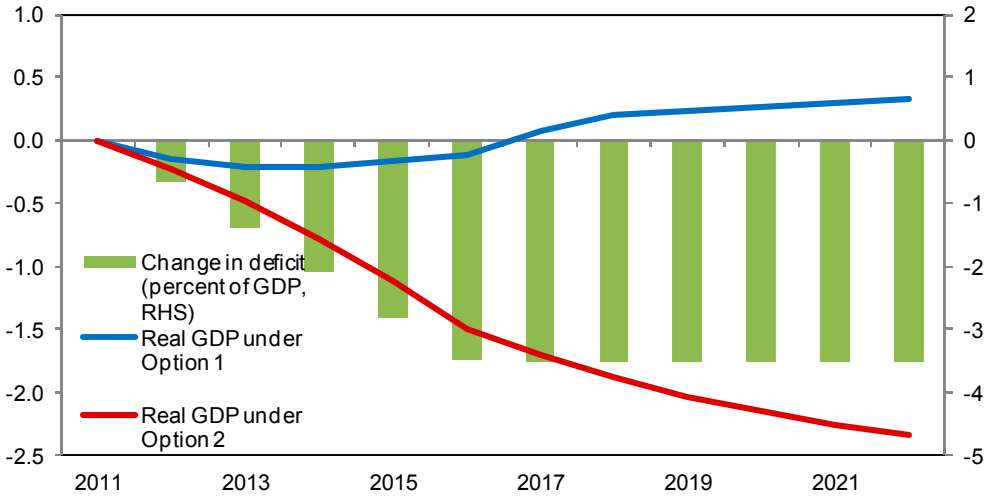
There are two reasons for the very shallow decline in output in our first package. The first is the gradual pace of consolidation. The immediate impact on aggregate demand—direct, via lower government consumption, and indirect, via lower disposable income—is rather small in the first two years of extra 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.[23]

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.

This modification does not make a big difference, as can be seen from Figure 13. 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, 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.

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

Figure 13. Impact of Additional Consolidation on Real GDP with Stepwise Increase in Credibility
Percent Deviation from Baseline



Option 1 comprises increase in consumption tax and cuts in government consumption and general transfers;

Option 2 comprisies increase in labor taxes and cut in government investment.

Source: IMF Staff Estimates

VII. Conclusion

In this paper we have estimated the impact of fiscal consolidation on the Czech economy using a version of the IMF's GIMF 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.[24] 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 corporate 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 0.3 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.

[24] Because of the lags and adjustment costs, the impact of a corporate 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.

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, and 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 2 percent in the steady state.

We would like to emphasize that the two scenarios are meant solely to illustrate the point that alternative approaches vary greatly in their impact on growth. We do not suggest that the more growth-friendly package is the optimal one that the authorities should adopt. It should also be noted that the two scenarios were designed to be plausible rather than extreme. One could conceive packages whose effect on the economy would be more beneficial or more damaging than that of the two options that we consider.

When the government decides on the pace and composition of adjustment measures beyond 2012, it will surely take into account a variety of considerations. The impact on growth must be one of them. We hope that the analysis and the estimates in this paper will help inform the government's judgment.

REFERENCES

Allard, C. and S. Muñoz, 2008, "Challenges to Monetary Policy in the Czech Republic—An Integrated Monetary and Fiscal Analysis," IMF Working Paper 08/72.

Barrel, R., D. Holland, N. Pain, M.A. Kovacs, Z. Jakab, K. Smidkova, U. Sepp, and U. Cufer, 2004, "An Econometric Model of Transition: Policy Choices in the Pre-Accession Period," Macroeconomics 0403004, EconWPA.

Bernanke, B.S., M. Gertler and S. Gilchrist, 1999, "The Financial Accelerator in a Quantitative Business Cycle Framework," in: John B. Taylor and Michael Woodford, eds., Handbook of Macroeconomics, Volume 1C, Amsterdam: Elsevier.

Blanchard, O., 1985, "Debt, Deficits, and Finite Horizons," Journal of Political Economy, Vol. 93, pp. 223-247.

Christiano, L., M. Eichenbaum, and S. Rebelo, 2009, "When is the Government Spending Multiplier Large?" NBER Working Paper 15394.

Coenen, G., C. Erceg, C. Freedman, D. Furceri, M. Kumhof, R. Lalonde, D. Laxton, J. Lindé, A. Mourougane, D. Muir, S. Mursula, J. Roberts, W. Roeger, C. de Resende, S. Snudden, M. Trabandt, J. in 't Veld, 2010, "Effects of Fiscal Stimulus in Structural Models," IMF Working Paper 10/73.

Czech National Bank (CNB), 2007, Inflation Report, December 2007.

Czech National Bank (CNB), 2010, Inflation Report, December 2010.

Freedman, C., M. Kumhof, D. Laxton, D. Muir, and S. Mursula, 2010, "Global Effects of Fiscal Stimulus During the Crisis," *Journal of Monetary Economics*, Vol. 57 (June), pp. 506–526.

Girouard, N. and C. André, 2005, "Measuring Cyclically-adjusted Budget Balances for OECD Countries," OECD Economics Department Working Papers, No. 434, OECD Publishing.

Hřebíček, H., P. Král, and M. Říkovský, 2005, An Update of Fiscal Impulse Quantification (Aktualizace propočtu fiskálního impulsu, in Czech only), Internal Paper of Monetary and Statistics Department, Czech National Bank, mimeo.

Kamps, C. (2004), 2004, "New Estimates of Government Net Capital Stocks for 22 OECD Countries 1960-2001" IMF Working Paper 04/67.

Kumhof, M. and D. Laxton, 2007, "A Party Without a Hangover? On the Effects of U.S. Fiscal Deficits," IMF Working Paper 07/202.

Kumhof, M. and D. Laxton, 2009a, "Simple, Implementable Fiscal Policy Rules," IMF Working Paper 09/76.

Kumhof, M. and D. Laxton, 2009b, "Chile's Structural Fiscal Surplus Rule: A Model-Based Evaluation," IMF Working Paper 09/88.

Kumhof, M. and D. Laxton, 2009c, "Fiscal Deficits and Current Account Deficits," IMF Working Paper 09/237.

Kumhof, M., D. Laxton, D. Muir and S. Mursula, 2010, "The Global Integrated Monetary Fiscal Model (GIMF) — Theoretical Structure," IMF Working Paper 10/34.

Ligthart, J.E. and R.M.M Suárez, 2005, "The Productivity of Public Capital: A Meta Analysis," Working Paper, Tilburg University.

OECD, 2009, "The Effectiveness and Scope of Fiscal Stimulus," OECD Economic Outlook, Chapter 3, pp. 105–150.

Prusvic, D., 2010, "Fiscal Stimuli and Fiscal Multipliers in Small Open Economies: The Case of the Czech Republic," 40th Conference on Medium Term Economic Assessment, September 23-25, 2010, Luxembourg.

Radkovský, Š. and R, Štiková, 2008, "Quantification of Fiscal Policy Impacts in the Czech Republic Using the SVEC Model" (Kvantifikace účinků fiskální politiky v ČR pomocí modelu SVEC, in Czech only), Internal Discussion Paper 4/2008, Czech National Bank, mimeo.

Spilimbergo, A., S. A. Symansky and M. Schindler, 2009, "Fiscal Multipliers," IMF Staff Position Note 2009/11.

Štork, Z. and J. Závacká, 2010, "Macroeconomic Implications of Fiscal Policy Measures in DSGE," Ministry of Finance of the Czech Republic Working Paper 1/2010.

Uhlig, H. 2010, "Some Fiscal Calculus," American Economic Review, 100(2), pp. 30–34.

Appendix I. Calibration Parameters

Table A.1. Long-run Growth Rates and Interest Rates (percent per annum)		
	Czech Republic	**European Union**
Technology Growth	1.5	1.5
Population Growth	1	1
Long-run Real Interest Rate	3	3
Steady-state Inflation Rate	2	2
Depreciation Rates		
Private Capital Stock	10	10
Public Capital Stock	4	4

Table A.2: Elasticities of Substitution		
	Czech Republic	**European Union**
Nontradables: Capital-Labor	1	1
Tradables: Capital-Labor	1	1
Final Good Import Agents: Different Countries	1.5	1.5
Tradables Import Agents: Different Countries	1.5	1.5
Distributors: Home-Foreign Tradables	1.5	1.5
Inv. Goods Producers: Home-Foreign Tradables	1.5	1.5
Cons. Goods Producers: Home-Foreign Tradables	1.5	1.5
Distributors: Tradables-Nontradables	0.5	0.5
Government: Consumption-Investment Goods	0.5	0.5

Table A.3: Utility Functions		
	Czech Republic	**European Union**
Average Planning Horizon in Years	20	20
Average Remaining Working Life	20	20
Intertemporal Elasticity of Substitution	0.25	0.25
Labor Supply Elasticity	0.5	0.5
Share of Liquidity-constrained Agents	0.5	0.35
Dividend Share of Liq. Constrained Agents	0.125	0.125

Table A.4: Steady-state Factor Shares		
	Czech Republic	**European Union**
Nontradables Labor Income / Value-added	60	60
Tradables Labor Income / Value-added	66	66
Nontradables Output / Manufacturing Output	50	50
Consumption Goods Input / Government Output	50	50

Table A.5. Steady-state Expenditure to GDP Ratios		
	Czech Republic	**European Union**
Share in World GDP	**1.1**	**98.9**
Consumption / GDP	46.1	59.0
OLG Consumption / GDP	30.6	47.5
LIQ Consumption / GDP	15.5	11.5
Private Investment / GDP	28.0	18.8
Government Investment / GDP	6.1	2.6
Government Consumption / GDP	19.8	19.6
Exports / GDP	**77.5**	-
Final Goods Exports / GDP	43.5	-
Intermediate Goods Exports / GDP	34.0	-
Imports / GDP	**77.5**	-
Consumption Goods Imports / GDP	22.3	-
Investment Goods Imports / GDP	17.4	-
Intermediate Goods Imports / GDP	38.8	-

Table A.6: Other Steady-State Ratios		
	Czech Republic	**European Union**
Fiscal Accounts		
Government Debt / GDP	40.4	74.3
Government Transfers / GDP	20.9	25.1
Government Consumption / GDP	19.8	19.6
Government Investment / GDP	6.1	2.6

Table A.7: Financial Accelerator Parameters

	Czech Republic	European Union
Leverage in Nontradables in %	100	100
Leverage in Tradables in %	100	100
Annual Bankruptcy Rate in Nontradables in %	8	8
Annual Bankruptcy Rate in Tradables in %	8	8
External Finance Premium in Nontradables in %	2.5	2.5
External Finance Premium in Tradables in %	2.5	2.5

Table A.8: Monetary and Fiscal Rule Parameters

	Czech Republic	European Union
Monetary-policy Reaction Function		
Lagged Nominal Interest Rate, δ_t	0.316	0.343
Inflation, δ_π	1.5	1.483
Inflation Target, $\bar{\pi}$	2	2
Lead on Inflation (in quarters)	4	3
Fiscal Rule Parameters		
Change in Deficit to Output Gap, d^{gdp}	0.39	0.48

Table A.9: Adjustment Costs

	Czech Republic	European Union
Price Adjustment Costs		
Unions	45	60
Distributors	45	60
Nontradable Sector	45	60
Tradable Sector	45	60
Imported Final Goods	4.5	20
Imported Intermediary Goods	4.5	20
Quantity Adjustment Costs		
Consumption	2	2
Investment	4	4
Labor Demand	1	1
Trade Flows of Final Goods	1	1
Trade Flows of Intermediary Goods	1	1

Appendix II. Detailed Estimates of Fiscal Multipliers

The following analysis presents the simulations summarized in Figures A.1 to A.7 and Tables A.10 to A.16 with labor income taxes satisfying the fiscal rule. Tables A.17 to A.23 summarize the real GDP values for consolidation with general transfers satisfying the fiscal rule.

Government Consumption Expenditure

Fiscal consolidation with government consumption expenditure has a direct impact on aggregate demand. For a case of a ten-year consolidation, credible after one year (Figure A.1), real GDP troughs to -0.4 percent in the first year. The decline in demand reduces incomes contributing to a fall of real consumption and investment by 0.1 and 0.2 in the second year, respectively. Inflation falls by 4 basis points and the Czech National Bank (CNB) responds with a reduction in the policy rate by 7 basis points over the period of the consolidation. There are substantial leakages into real imports which fall by over one percent. This arises since imports of consumption goods comprise 46.2 percent of final consumption. The result is an improvement in the trade balance to GDP ratio of approximately 80 basis points.

After the initial fall in demand, real private consumption and investment begin to be crowded in, increasing above baseline by 0.15 and 0.02 percent in the long run. Real GDP returns to baseline after five years, and permanently increases in the long run by 0.1 percent. The long run crowding-in of private demand comes primarily from two channels. First, the reduction in the debt level requires lower tax obligations to service the interest payments on the lower stock of debt. This results in a permanent decrease in labor taxes improving the income of households. Second, the decrease in the debt level is an increase in overall savings which increases the equilibrium level of the world real interest rate in the long run by a small amount. This amount is less than a basis point, since the Czech Republic makes up only a small proportion of global savings.

As the results summarized in Table A.10 clearly show, the longer the ZIF binds, the more real GDP falls in the short run. This arises since the monetary authority cannot reduce interest rates when the consolidation reduces inflation and so there is no offsetting effect from a lower real interest rate on demand.

The results illustrate that higher credibility of the fiscal authority leads to a smaller initial decline in real GDP. As soon as agents perceive the credible fiscal consolidation, they become aware of the lower labor income tax obligations and slightly lower real equilibrium interest rates. In particular, OLG agents increase their consumption as soon as credibility is perceived in an effort to enjoy the additional lifetime income.

In the case when the fiscal authority consolidates for only one year and does not have an impact on future debt levels, the costs to real GDP in the second and third year may be lower, but the long term benefits are not realized. Finally, in the case when the fiscal authority permanently reduces government consumption expenditure, the long term benefits are larger. In particular, real GDP in the long run increases by 0.6 percent, relative to the 0.07 percent in the case of a ten-year consolidation. It takes slightly more time for real GDP to return to baseline in the short run since demand falls throughout the full planning horizon of households, so the observed increase in income takes longer to obtain.

Government Investment Expenditure

Like consumption expenditure, fiscal consolidation with government investment expenditure has a direct impact on aggregate demand. For a case of a ten-year consolidation, credible after one year (Figure A.2), real GDP falls by 0.4 percent in the first year. The decrease in public investment expenditure results in a reduction in the stock of public capital and reduces the productivity in the production of final goods. This results in a gradual fall in real GDP to -1.2 percent after twelve years. The impact on real GDP reverses after the consolidation as the stock of public capital begins to accumulate back to baseline levels.

The reduction in demand for investment goods and lower productivity levels reduce incomes and contribute to a fall in real consumption and investment by -0.5 percent in year two. Inflation falls persistently by 7 basis points, and the CNB responds to cut rates by approximately 17 basis points over the period of the consolidation. There are substantial leakages into real imports, which fall by over one percent. This happens because imports of investment goods comprise 62 percent of the final investment good. This results in an improvement in the trade balance to GDP ratio of approximately 80 basis points.

The impact of credibility for the case of consolidation with investment expenditure is different than in the case of consolidation via government consumption expenditure, since agents perceive that the reduction in the long-run public capital stocks will reduce their future income. This particularly stands out in the case where the consolidation is immediately credible as the combination of the ZIF and the perceived reduction in future productivity result in a multiplier of 0.7 in the first year.

The one-year consolidation does not have an impact on future debt levels and has a small impact on the stock of public capital relative to longer consolidations. However, when the fiscal authority permanently reduces government investment expenditure, the long-run costs of the lower public capital stock are obvious, with real GDP falling by 1.6 percent in the long run.

General Transfers

Unlike in the case of cutting government expenditure, fiscal consolidation with general transfers does not have a direct impact on aggregate demand. As the government decreases transfers to households, OLG agents can respond by borrowing in the short run to finance their expenditure, which they prefer to smooth. The impact on LIQ agents is more pronounced since the reduction in transfers to these agents reduces their consumption immediately by a similar degree to their loss in income. However, since LIQ agents account for only a share of overall consumption of the economy, the fall is not large.

For the case of a ten-year consolidation, credible after one year (Figure A.3), real GDP falls by 0.07 percent in the first year. The main reason why the decline is so small is an improvement in the trade balance to GDP ratio, which peaks at 0.5 percentage points after five years. The fall in real consumption is pronounced, reaching 1.4 percent by the third year. There is a small reduction in real investment of 0.07 percent by the second year, but investment returns to the baseline by year eight. The reduction in demand lowers inflation by 2 basis points persistently, and the CNB responds by cutting rates by approximately 5 basis points over the period of the consolidation. In the long run, real GDP permanently increases by 0.07 percent.

Credibility plays a similar role as in consolidation with government consumption—the sooner credibility is perceived, the faster the long term benefits of consolidation are observed. For a temporary consolidation OLG households borrow to smooth their consumption such that there is only a small decrease in real GDP in the first year. For a permanent reduction in general transfers, real GDP in the long run increases by 0.78 percent since there are larger benefits from the lower debt stock.

Targeted Transfers

Fiscal consolidation with targeted transfers has an almost direct impact on aggregate demand as it lowers the income of liquidity-constrained households. LIQ agents reduce their consumption expenditure in each period by the amount of lost income. The result is a considerably larger fall in consumption than in the case of a consolidation with general transfers, with real consumption declining by over 2 percent. This comes almost entirely from the consumption of liquidity-constrained households, whose consumption falls by 7 percent. For a case of a ten-year consolidation, credible after one year (Figure A.4), real GDP falls by 0.23 percent in the first year. There is a reduction in real investment of 0.3 percent by the third year, and investment returns to the baseline by year twelve. The reduction in demand reduces inflation by 4 basis points persistently, and the CNB responds by reduction in the policy rate by approximately 7 basis points. There are substantial leakages into imports via imported consumption goods, with real imports falling 1 percent.

In the case where the ZIF binds for one year, real GDP falls by 0.25 percent. Credibility plays a similar role as in consolidation with government consumption expenditure since the sooner credibility is perceived the sooner the long term benefits of consolidation are enjoyed.

A permanent reduction in targeted transfers increases real GDP in the long run by 0.56 percent. In the long run, although total real consumption increases by 0.1 percent, there is a permanent fall in LIQ agents' real consumption by 3.6 percent.

Labor Income Taxes

Fiscal consolidation with labor income taxes decreases the income of households and increases distortions in the labor market. These distortions result in a fall in labor supply, reducing an important factor of production. The role of credibility is similar to that in the case of consolidation with government investment expenditure. When the consolidation becomes credible, households perceive a persistent fall in their incomes as well as a loss in output from higher costs of production. If OLG households perceive the consolidation to be temporary, they will try to smooth their income, but as soon as the consolidation becomes credible, they perceive the fall in future income and lower their demand immediately.

For a case of a ten-year consolidation, credible after one year (Figure A.5), real GDP falls by 0.13 percent in the first year, and falls by 0.32 percent in the second year once credibility of achieved. There is a reduction in real investment of 0.5 percent by the fifth year. Real consumption troughs at -2 percent and there is a reduction in the real consumption of LIQ households of 4 percent. In the long run real GDP permanently increases by 0.07 percent.

The reduction in demand reduces inflation by 1 basis point, and the CNB responds by reducing the policy rate by approximately 1 basis point. There are leakages into imports via imported consumption goods. There is a small impact on exports since the exchange rate movement is muted by the small effect on interest rates.

Consumption Taxes

Fiscal consolidation with consumption taxes affects OLG and LIQ households by their respective shares in total consumption. Although this tax distorts the consumption decision, it does not affect a factor of production and does not introduce a direct distortion on the supply side of the economy. In this way, a higher consumption tax acts in a similar manner to a cut in transfers. The long-run benefits are perceived once the consolidation becomes credible and offset (partially initially and more than fully later) the impact of an immediate tightening in the household budget constraint.

For a case of a ten-year consolidation, credible after one year (Figure A.6), real GDP falls by 0.12 percent in the first year. In the second year, real GDP is lower by 0.17 percent than in

the baseline. Real consumption falls by almost 2 percent and does not return to baseline levels until 40 years later. In the long run, real GDP permanently increases by 0.01 percent. Again the long-run impact arises from the reduction in lower tax obligations to service the debt and from lower equilibrium real interest rates.

The reduction in demand reduces core inflation by 1 basis point, and the CNB responds by reducing the policy rate by approximately 6 basis points. There are leakages into imports via imported consumption goods, with real imports falling by 0.75 percent. Real exports increase by 0.25 percent due to a 0.17 percent depreciation of the real exchange rate.

Capital Income Taxes

Fiscal consolidation with capital income taxes affects the income of OLG households and increases distortions in the capital market. These distortions result in a fall in the stock of capital, causing a reduction in an important factor of production. The role that credibility plays is similar to that of consolidation with labor income taxes. When the consolidation becomes credible, households perceive a persistent fall in their incomes as well as a loss in output from higher costs of production. If OLG households perceive the consolidation to be temporary, they will borrow to smooth their income, but as soon as the consolidation becomes credible, they perceive the fall in income and production, which makes them to lower consumption.

For a case of a ten-year consolidation, credible after one year (Figure A.7), real GDP falls by 0.02 percent in the first year, and by 0.17 percent the second year once credibility established. There is a reduction in real investment of almost 3 percent, and it takes 15 years for investment to return to the baseline. Real consumption troughs at -1.1 percent in the third year.

The reduction in demand reduces inflation by 8 basis points, and in response the CNB cuts rates by approximately 17 basis points. There are large leakages into imports, particularly from imported investment goods, resulting in a fall in real imports by 1 percent by the third year. Real exports increase by 0.3 percent in year four relative to the baseline thanks to a depreciation of the exchange rate by 0.2 percent. This results in an improvement in the trade balance as a percent of GDP by 0.9 percentage points after the fourth year.

A permanent increase in capital income taxes results in a decrease in real GDP in the long run of 0.42 percent relative to baseline. Real GDP in the long run falls because the distortionary impact on income of higher capital taxes is greater than the gains in income from the reduction in the labor tax rate from lower payments to service the debt.

Figure A.1 Effects of Fiscal Consolidation with Government Consumption

ZIF Not Binding; Credible After One Year; Instrument in Fiscal Rule: Labor Income Taxes

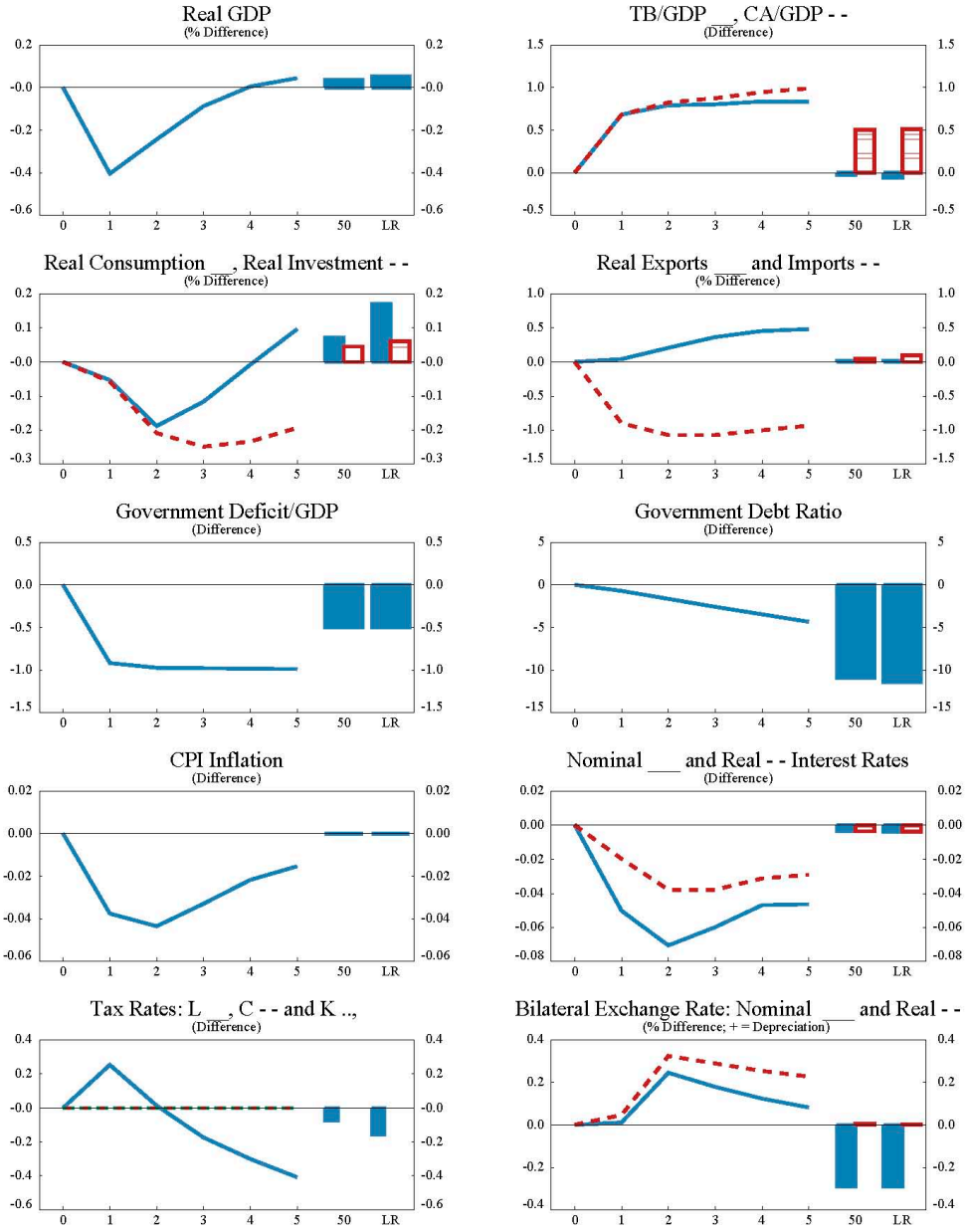


Figure A.2 Effects of Fiscal Consolidation with Government Investment

ZIF Not Binding; Credible After One Year; Instrument in Fiscal Rule: Labor Income Taxes

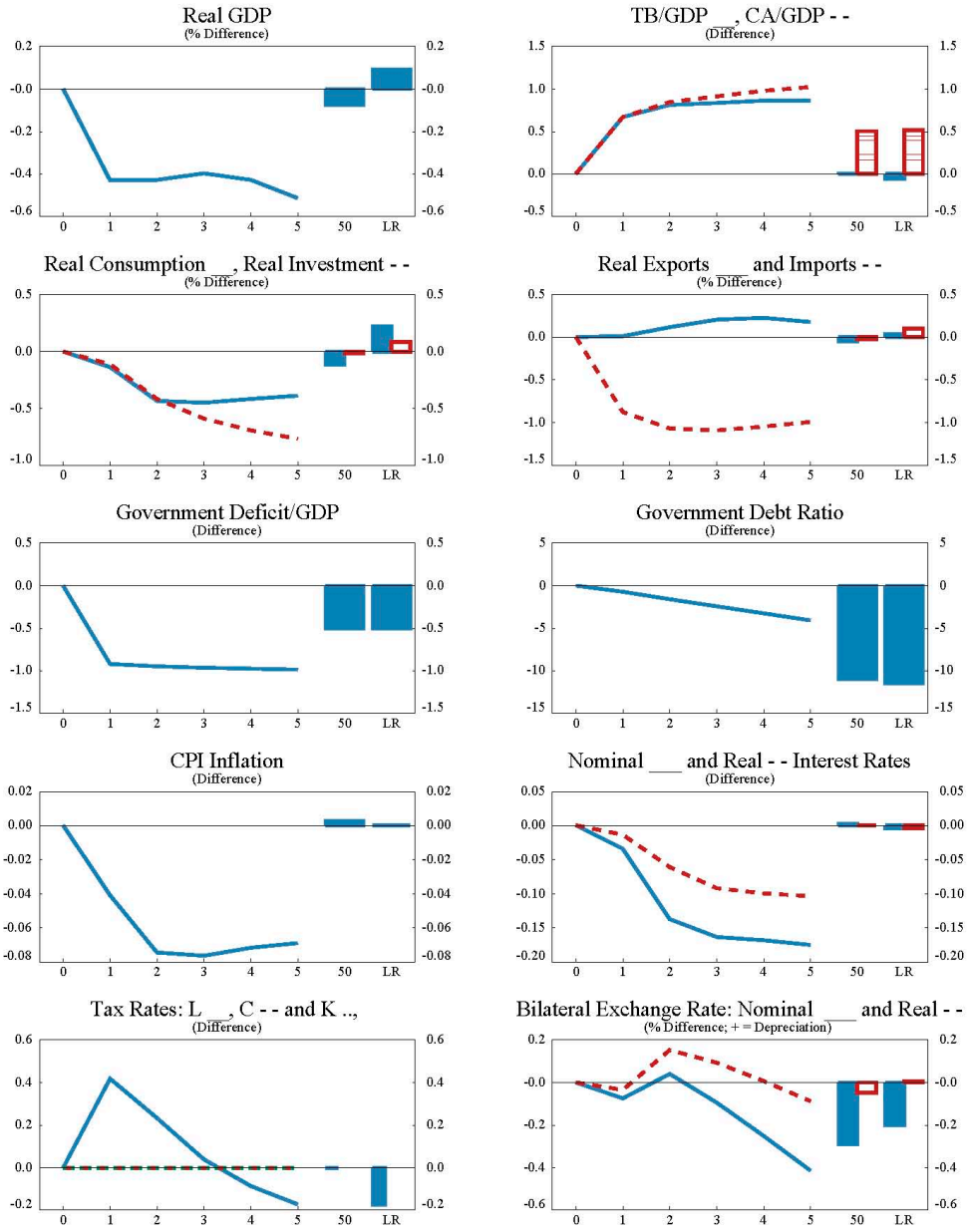


Figure A.3 Effects of Fiscal Consolidation with General Transfers

ZIF Not Binding; Credible After One Year; Instrument in Fiscal Rule: Labor Income Taxes

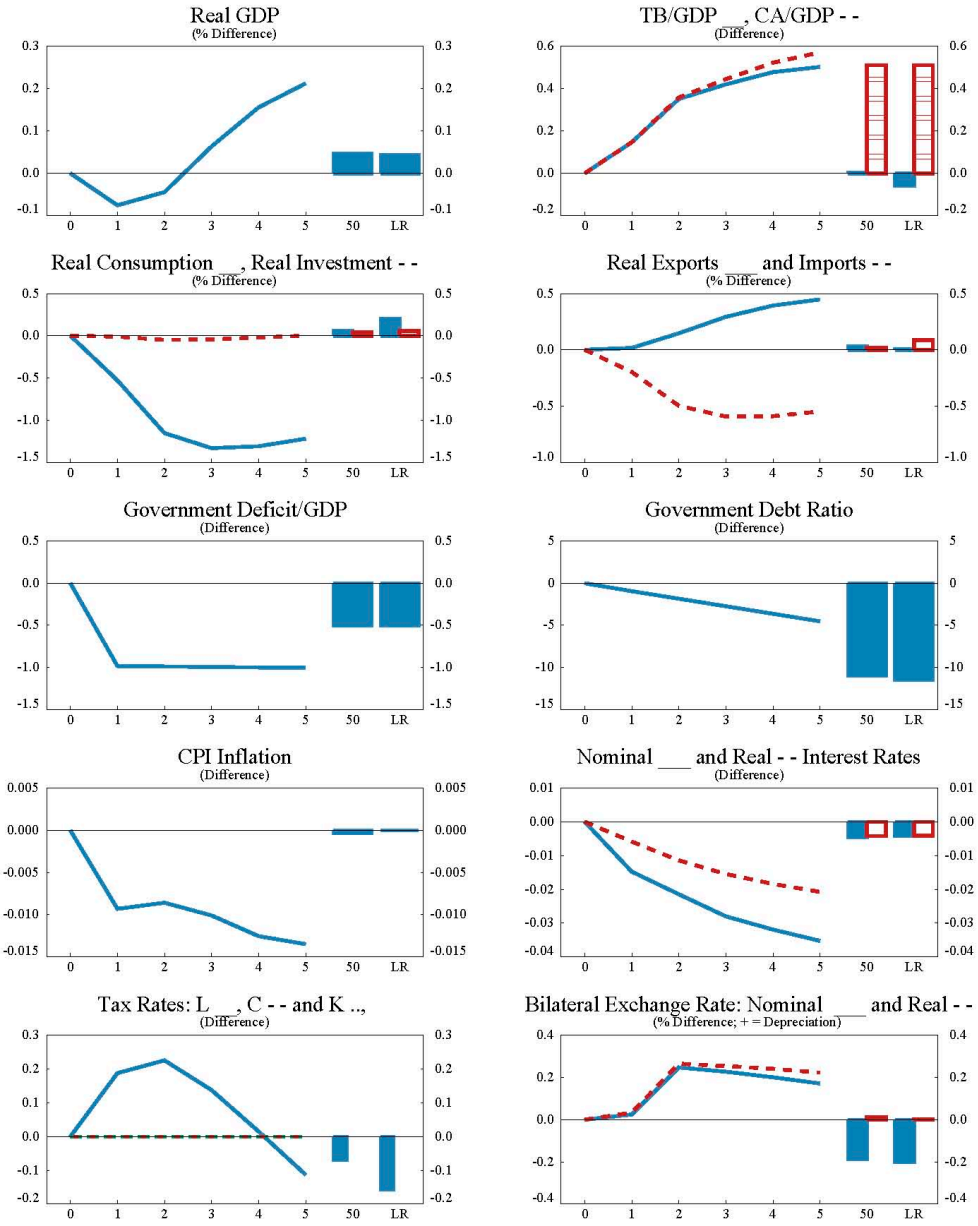


Figure A.4 Effects of Fiscal Consolidation with Targeted Transfers

ZIF Not Binding; Credible After One Year; Instrument in Fiscal Rule: Labor Income Taxes

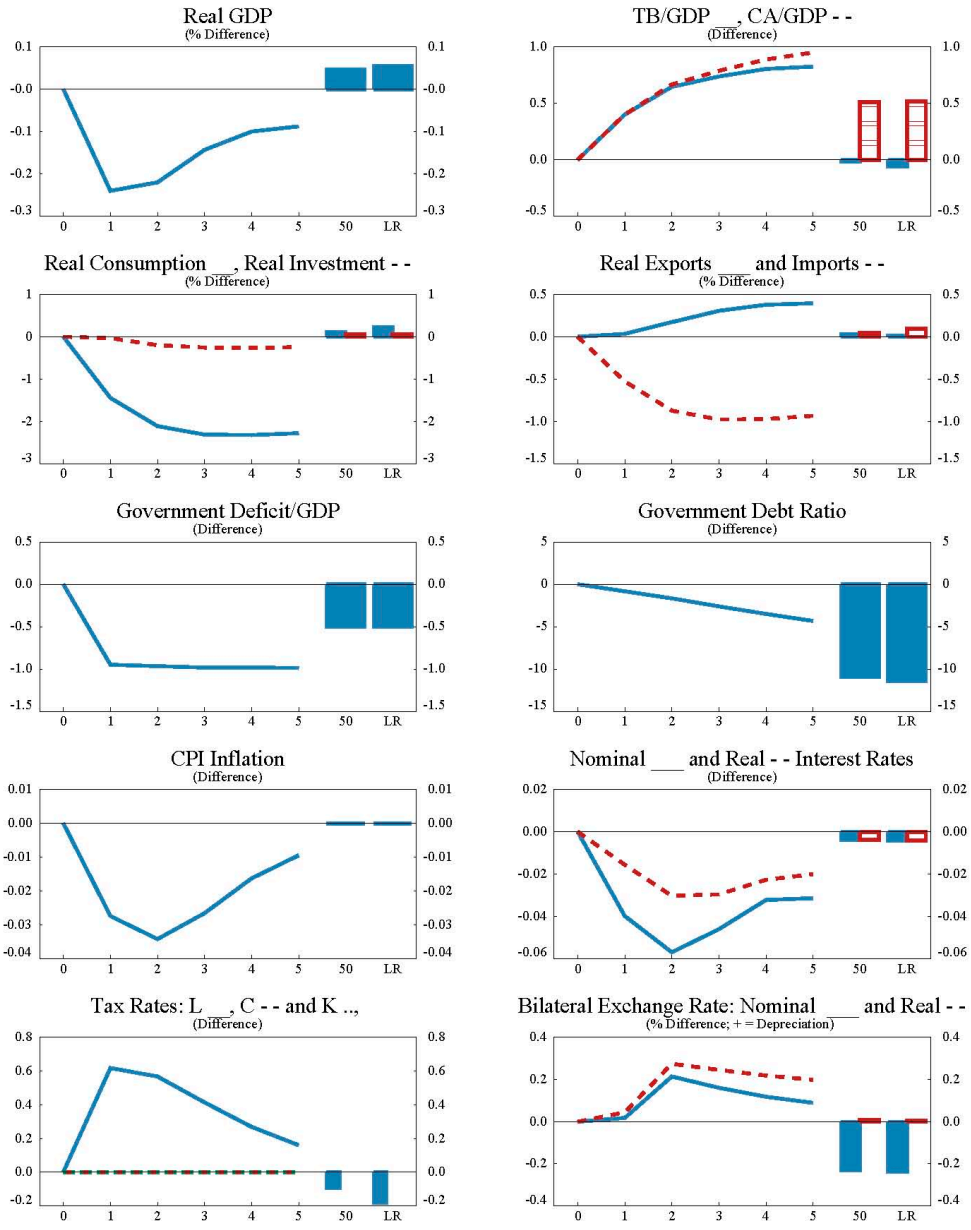


Figure A.5 Effects of Fiscal Consolidation with Labor Income Taxes

ZIF Not Binding; Credible After One Year; Instrument in Fiscal Rule: Labor Income Taxes

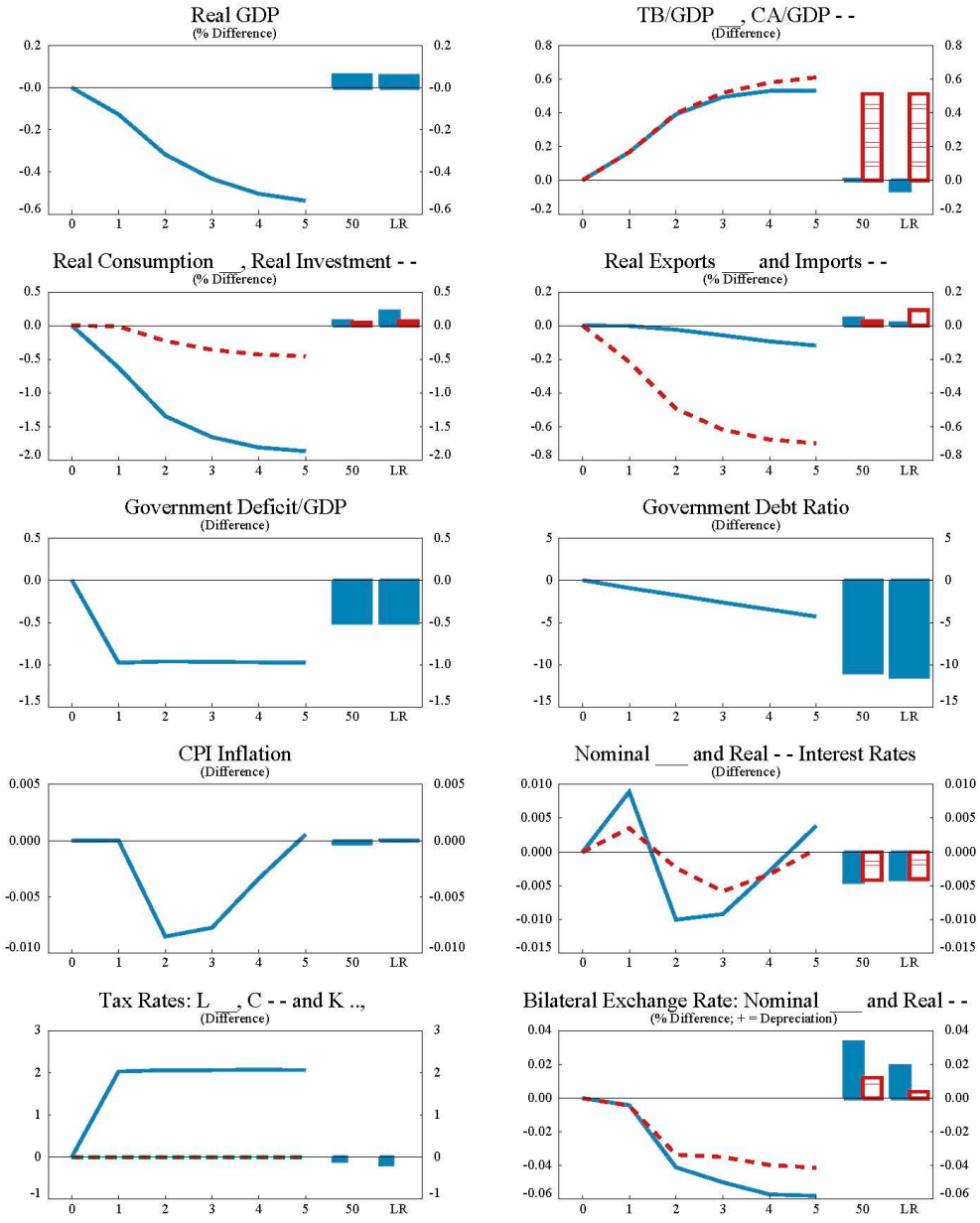


Figure A.6 Effects of Fiscal Consolidation with Consumption Taxes

ZIF Not Binding; Credible After One Year; Instrument in Fiscal Rule: Labor Income Taxes

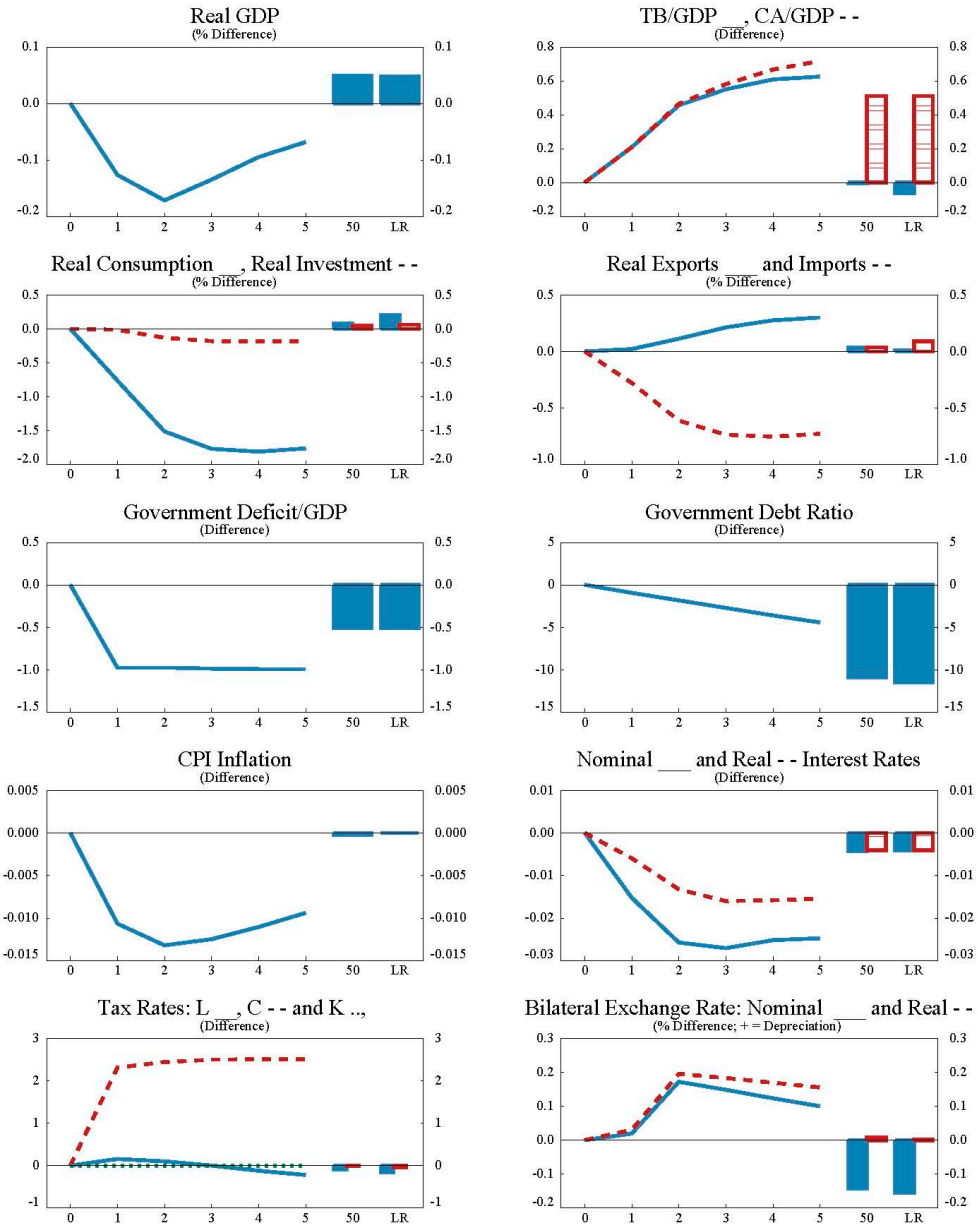


Figure A.7 Effects of Fiscal Consolidation with Capital Income Taxes

ZIF Not Binding; Credible After One Year; Instrument in Fiscal Rule: Labor Income Taxes

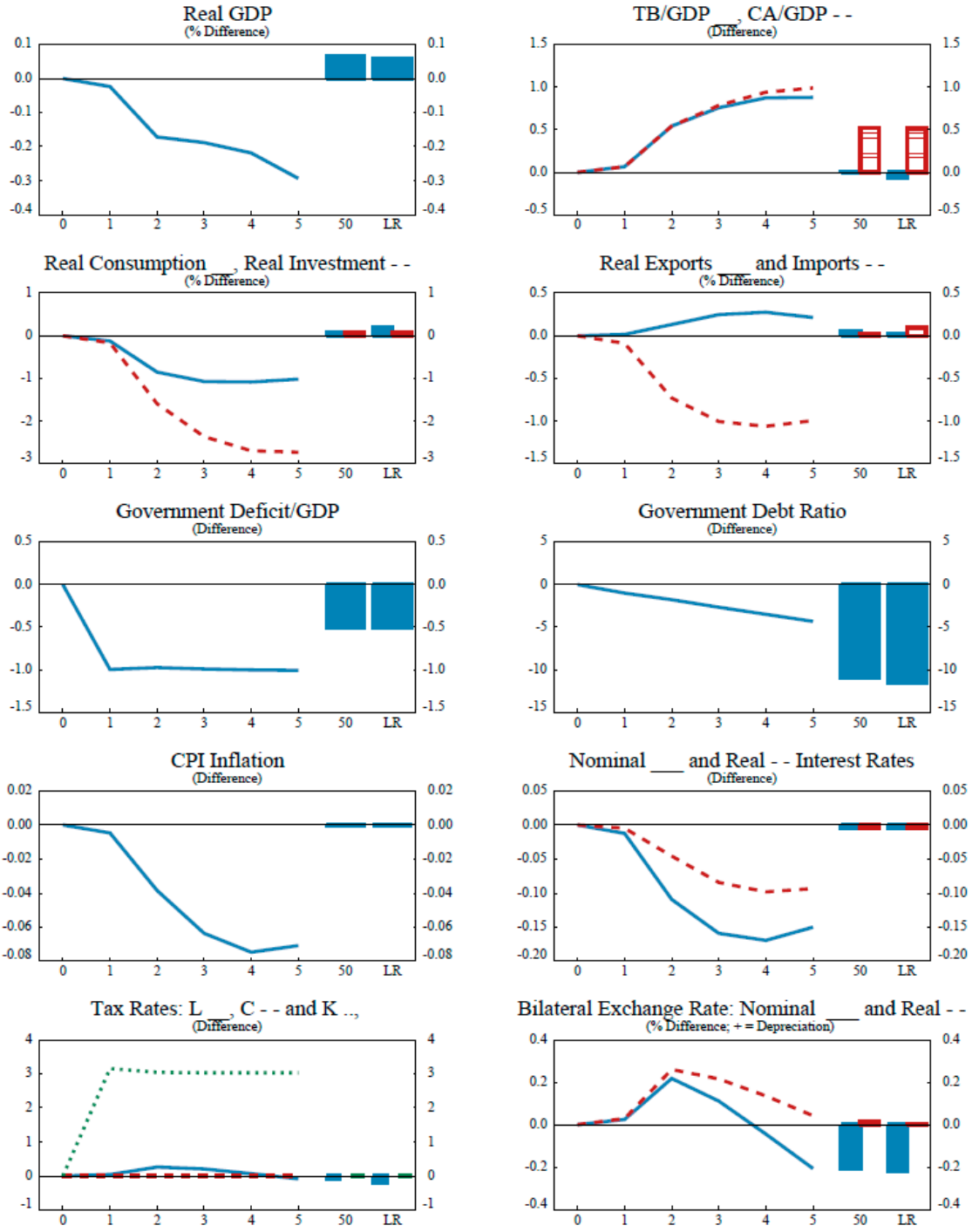


Table A.10 Fiscal Consolidation with Government Consumption Instrument in Fiscal Rule: Labor Income Taxes

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.40	0.07	0.07	0.04	0.01	0.00
1-Year ZIF	-0.44	0.04	0.05	0.03	0.01	0.00
2-Year ZIF	-0.50	-0.03	0.01	0.01	-0.00	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.32	-0.16	-0.05	0.01	0.04	0.05
1-Year ZIF	-0.34	-0.18	-0.06	0.01	0.04	0.05
2-Year ZIF	-0.40	-0.26	-0.10	-0.01	0.03	0.05
Credible in Year 2						
No ZIF	-0.40	-0.24	-0.09	0.00	0.04	0.05
1-Year ZIF	-0.44	-0.27	-0.10	-0.00	0.04	0.05
2-Year ZIF	-0.50	-0.36	-0.16	-0.03	0.02	0.05
Credible in Year 3						
No ZIF	-0.40	-0.34	-0.17	-0.04	0.03	0.05
1-Year ZIF	-0.44	-0.36	-0.18	-0.04	0.03	0.05
2-Year ZIF	-0.50	-0.47	-0.25	-0.08	0.00	0.05
Credible in Year 4						
No ZIF	-0.40	-0.34	-0.27	-0.12	-0.01	0.05
1-Year ZIF	-0.44	-0.36	-0.29	-0.13	-0.02	0.05
2-Year ZIF	-0.50	-0.47	-0.35	-0.16	-0.04	0.05
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.32	-0.17	-0.06	-0.01	-0.00	0.34
1-Year ZIF	-0.35	-0.19	-0.07	-0.02	-0.01	0.34
2-Year ZIF	-0.45	-0.31	-0.14	-0.05	-0.03	0.34
Credible in Year 2						
No ZIF	-0.40	-0.25	-0.10	-0.02	0.00	0.34
1-Year ZIF	-0.44	-0.28	-0.12	-0.03	-0.01	0.34
2-Year ZIF	-0.50	-0.38	-0.19	-0.06	-0.03	0.34
Credible in Year 3						
No ZIF	-0.40	-0.34	-0.19	-0.06	-0.01	0.34
1-Year ZIF	-0.44	-0.36	-0.20	-0.07	-0.01	0.34
2-Year ZIF	-0.50	-0.47	-0.27	-0.11	-0.04	0.34
Credible in Year 4						
No ZIF	-0.40	-0.34	-0.27	-0.15	-0.05	0.34
1-Year ZIF	-0.44	-0.36	-0.29	-0.16	-0.06	0.34
2-Year ZIF	-0.50	-0.47	-0.35	-0.19	-0.08	0.34

Table A.11 Fiscal Consolidation with Government Investment Instrument in Fiscal Rule: Labor Income Taxes

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.43	-0.07	-0.08	-0.10	-0.11	0.00
1-Year ZIF	-0.45	-0.08	-0.09	-0.11	-0.12	0.00
2-Year ZIF	-0.49	-0.13	-0.11	-0.12	-0.13	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.37	-0.33	-0.34	-0.41	-0.51	0.06
1-Year ZIF	-0.37	-0.33	-0.34	-0.41	-0.51	0.06
2-Year ZIF	-0.37	-0.33	-0.34	-0.41	-0.51	0.06
Credible in Year 2						
No ZIF	-0.43	-0.43	-0.40	-0.43	-0.51	0.06
1-Year ZIF	-0.45	-0.45	-0.41	-0.43	-0.52	0.06
2-Year ZIF	-0.49	-0.56	-0.50	-0.48	-0.55	0.06
Credible in Year 3						
No ZIF	-0.43	-0.50	-0.50	-0.49	-0.54	0.06
1-Year ZIF	-0.45	-0.51	-0.51	-0.49	-0.54	0.06
2-Year ZIF	-0.49	-0.58	-0.55	-0.52	-0.56	0.06
Credible in Year 4						
No ZIF	-0.43	-0.50	-0.57	-0.59	-0.60	0.06
1-Year ZIF	-0.45	-0.51	-0.58	-0.60	-0.61	0.06
2-Year ZIF	-0.49	-0.58	-0.63	-0.62	-0.62	0.06
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.37	-0.34	-0.35	-0.42	-0.53	-1.78
1-Year ZIF	-0.46	-0.41	-0.38	-0.44	-0.55	-1.78
2-Year ZIF	-0.70	-0.70	-0.56	-0.52	-0.61	-1.78
Credible in Year 2						
No ZIF	-0.43	-0.44	-0.41	-0.44	-0.53	-1.78
1-Year ZIF	-0.45	-0.46	-0.42	-0.45	-0.54	-1.78
2-Year ZIF	-0.49	-0.58	-0.52	-0.50	-0.57	-1.78
Credible in Year 3						
No ZIF	-0.43	-0.50	-0.52	-0.51	-0.56	-1.78
1-Year ZIF	-0.45	-0.51	-0.53	-0.52	-0.56	-1.78
2-Year ZIF	-0.49	-0.58	-0.57	-0.54	-0.58	-1.78
Credible in Year 4						
No ZIF	-0.43	-0.50	-0.57	-0.61	-0.62	-1.78
1-Year ZIF	-0.45	-0.51	-0.58	-0.62	-0.63	-1.78
2-Year ZIF	-0.49	-0.58	-0.63	-0.64	-0.64	-1.78

Table A.12 Fiscal Consolidation with General Transfers
Instrument in Fiscal Rule: Labor Income Taxes

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.08	0.03	0.04	0.04	0.04	0.00
1-Year ZIF	-0.09	0.02	0.04	0.04	0.04	0.00
2-Year ZIF	-0.11	-0.00	0.03	0.04	0.03	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.08	0.02	0.11	0.18	0.21	0.05
1-Year ZIF	-0.08	0.01	0.11	0.17	0.21	0.05
2-Year ZIF	-0.11	-0.02	0.09	0.17	0.20	0.05
Credible in Year 2						
No ZIF	-0.08	-0.04	0.06	0.16	0.21	0.05
1-Year ZIF	-0.09	-0.05	0.06	0.15	0.21	0.05
2-Year ZIF	-0.11	-0.08	0.04	0.15	0.20	0.05
Credible in Year 3						
No ZIF	-0.08	-0.05	0.00	0.11	0.19	0.05
1-Year ZIF	-0.09	-0.06	-0.00	0.11	0.19	0.05
2-Year ZIF	-0.11	-0.09	-0.02	0.10	0.18	0.05
Credible in Year 4						
No ZIF	-0.08	-0.05	-0.01	0.05	0.15	0.05
1-Year ZIF	-0.09	-0.06	-0.01	0.05	0.15	0.05
2-Year ZIF	-0.11	-0.09	-0.03	0.04	0.14	0.05
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.08	0.06	0.20	0.28	0.32	0.56
1-Year ZIF	-0.09	0.05	0.19	0.28	0.32	0.56
2-Year ZIF	-0.16	-0.02	0.15	0.26	0.31	0.56
Credible in Year 2						
No ZIF	-0.08	-0.05	0.10	0.24	0.32	0.56
1-Year ZIF	-0.09	-0.06	0.10	0.24	0.32	0.56
2-Year ZIF	-0.11	-0.10	0.07	0.23	0.31	0.56
Credible in Year 3						
No ZIF	-0.08	-0.05	-0.01	0.14	0.28	0.56
1-Year ZIF	-0.09	-0.06	-0.01	0.14	0.28	0.56
2-Year ZIF	-0.11	-0.09	-0.04	0.13	0.27	0.56
Credible in Year 4						
No ZIF	-0.08	-0.05	-0.01	0.03	0.18	0.56
1-Year ZIF	-0.09	-0.06	-0.01	0.03	0.18	0.56
2-Year ZIF	-0.11	-0.09	-0.03	0.02	0.18	0.56

Table A.13 Fiscal Consolidation with Targeted Transfers
Instrument in Fiscal Rule: Labor Income Taxes

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.24	0.03	0.04	0.03	0.01	0.00
1-Year ZIF	-0.27	0.01	0.03	0.02	0.01	0.00
2-Year ZIF	-0.31	-0.05	-0.00	0.01	-0.00	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.26	-0.20	-0.15	-0.12	-0.11	0.05
1-Year ZIF	-0.28	-0.22	-0.15	-0.13	-0.11	0.05
2-Year ZIF	-0.32	-0.28	-0.19	-0.14	-0.13	0.05
Credible in Year 2						
No ZIF	-0.24	-0.22	-0.14	-0.10	-0.09	0.05
1-Year ZIF	-0.27	-0.24	-0.16	-0.11	-0.09	0.05
2-Year ZIF	-0.31	-0.31	-0.20	-0.13	-0.11	0.05
Credible in Year 3						
No ZIF	-0.24	-0.21	-0.17	-0.10	-0.07	0.05
1-Year ZIF	-0.27	-0.23	-0.18	-0.11	-0.08	0.05
2-Year ZIF	-0.31	-0.31	-0.24	-0.14	-0.09	0.05
Credible in Year 4						
No ZIF	-0.24	-0.21	-0.17	-0.13	-0.07	0.05
1-Year ZIF	-0.27	-0.23	-0.18	-0.14	-0.08	0.05
2-Year ZIF	-0.31	-0.31	-0.23	-0.16	-0.10	0.05
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.26	-0.21	-0.17	-0.17	-0.18	0.29
1-Year ZIF	-0.28	-0.23	-0.19	-0.18	-0.19	0.29
2-Year ZIF	-0.36	-0.33	-0.24	-0.20	-0.20	0.29
Credible in Year 2						
No ZIF	-0.24	-0.23	-0.17	-0.15	-0.15	0.29
1-Year ZIF	-0.27	-0.25	-0.18	-0.15	-0.16	0.29
2-Year ZIF	-0.31	-0.33	-0.24	-0.18	-0.18	0.29
Credible in Year 3						
No ZIF	-0.24	-0.21	-0.18	-0.14	-0.13	0.29
1-Year ZIF	-0.27	-0.23	-0.19	-0.14	-0.14	0.29
2-Year ZIF	-0.31	-0.31	-0.25	-0.17	-0.16	0.29
Credible in Year 4						
No ZIF	-0.24	-0.21	-0.17	-0.15	-0.12	0.29
1-Year ZIF	-0.27	-0.23	-0.18	-0.16	-0.13	0.29
2-Year ZIF	-0.31	-0.31	-0.23	-0.19	-0.15	0.29

Table A.14 Fiscal Consolidation with Labor Income Tax Revenue Instrument in Fiscal Rule: Labor Income Taxes

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.13	-0.04	-0.03	-0.01	0.01	0.00
1-Year ZIF	-0.12	-0.03	-0.03	-0.01	0.01	0.00
2-Year ZIF	-0.10	-0.01	-0.01	-0.00	0.02	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.28	-0.40	-0.49	-0.55	-0.58	0.05
1-Year ZIF	-0.30	-0.42	-0.50	-0.56	-0.58	0.05
2-Year ZIF	-0.33	-0.45	-0.52	-0.57	-0.59	0.05
Credible in Year 2						
No ZIF	-0.13	-0.32	-0.43	-0.50	-0.54	0.05
1-Year ZIF	-0.12	-0.31	-0.43	-0.50	-0.54	0.05
2-Year ZIF	-0.10	-0.30	-0.43	-0.50	-0.53	0.05
Credible in Year 3						
No ZIF	-0.13	-0.16	-0.35	-0.44	-0.49	0.05
1-Year ZIF	-0.12	-0.16	-0.34	-0.44	-0.49	0.05
2-Year ZIF	-0.10	-0.13	-0.32	-0.43	-0.48	0.05
Credible in Year 4						
No ZIF	-0.13	-0.16	-0.19	-0.36	-0.43	0.05
1-Year ZIF	-0.12	-0.16	-0.19	-0.35	-0.43	0.05
2-Year ZIF	-0.10	-0.13	-0.17	-0.34	-0.42	0.05
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.28	-0.40	-0.48	-0.54	-0.56	0.11
1-Year ZIF	-0.29	-0.41	-0.49	-0.54	-0.57	0.11
2-Year ZIF	-0.32	-0.44	-0.51	-0.55	-0.57	0.11
Credible in Year 2						
No ZIF	-0.13	-0.32	-0.42	-0.49	-0.52	0.11
1-Year ZIF	-0.12	-0.31	-0.42	-0.49	-0.52	0.11
2-Year ZIF	-0.10	-0.30	-0.42	-0.49	-0.52	0.11
Credible in Year 3						
No ZIF	-0.13	-0.16	-0.34	-0.43	-0.48	0.11
1-Year ZIF	-0.12	-0.16	-0.34	-0.43	-0.47	0.11
2-Year ZIF	-0.10	-0.13	-0.32	-0.42	-0.47	0.11
Credible in Year 4						
No ZIF	-0.13	-0.16	-0.19	-0.35	-0.42	0.11
1-Year ZIF	-0.12	-0.16	-0.19	-0.35	-0.42	0.11
2-Year ZIF	-0.10	-0.13	-0.17	-0.34	-0.41	0.11

Table A.15 Fiscal Consolidation with Consumption Tax Revenue Instrument in Fiscal Rule: Labor Income Taxes

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.13	0.00	0.02	0.03	0.03	0.00
1-Year ZIF	-0.14	-0.01	0.02	0.03	0.03	0.00
2-Year ZIF	-0.15	-0.03	0.01	0.02	0.03	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.18	-0.16	-0.13	-0.10	-0.09	0.05
1-Year ZIF	-0.19	-0.17	-0.13	-0.10	-0.09	0.05
2-Year ZIF	-0.22	-0.21	-0.15	-0.11	-0.09	0.05
Credible in Year 2						
No ZIF	-0.13	-0.17	-0.13	-0.09	-0.07	0.05
1-Year ZIF	-0.14	-0.18	-0.14	-0.10	-0.07	0.05
2-Year ZIF	-0.15	-0.21	-0.16	-0.11	-0.08	0.05
Credible in Year 3						
No ZIF	-0.13	-0.12	-0.14	-0.10	-0.06	0.05
1-Year ZIF	-0.14	-0.13	-0.15	-0.10	-0.06	0.05
2-Year ZIF	-0.15	-0.17	-0.17	-0.11	-0.07	0.05
Credible in Year 4						
No ZIF	-0.13	-0.12	-0.10	-0.11	-0.06	0.05
1-Year ZIF	-0.14	-0.13	-0.10	-0.11	-0.07	0.05
2-Year ZIF	-0.15	-0.17	-0.13	-0.12	-0.07	0.05
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.18	-0.13	-0.06	-0.02	-0.00	0.34
1-Year ZIF	-0.19	-0.14	-0.07	-0.02	-0.01	0.34
2-Year ZIF	-0.25	-0.21	-0.11	-0.04	-0.02	0.34
Credible in Year 2						
No ZIF	-0.13	-0.18	-0.10	-0.03	0.01	0.34
1-Year ZIF	-0.14	-0.18	-0.11	-0.03	0.01	0.34
2-Year ZIF	-0.15	-0.22	-0.13	-0.05	-0.00	0.34
Credible in Year 3						
No ZIF	-0.13	-0.12	-0.15	-0.07	0.00	0.34
1-Year ZIF	-0.14	-0.13	-0.16	-0.08	-0.00	0.34
2-Year ZIF	-0.15	-0.17	-0.18	-0.09	-0.01	0.34
Credible in Year 4						
No ZIF	-0.13	-0.12	-0.10	-0.12	-0.04	0.34
1-Year ZIF	-0.14	-0.13	-0.10	-0.12	-0.04	0.34
2-Year ZIF	-0.15	-0.17	-0.13	-0.13	-0.05	0.34

Table A.16 Fiscal Consolidation with Capital Income Tax Revenue Instrument in Fiscal Rule: Labor Income Taxes

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.02	-0.01	-0.00	-0.00	-0.00	0.00
1-Year ZIF	-0.03	-0.02	-0.01	-0.01	-0.01	0.00
2-Year ZIF	-0.06	-0.05	-0.03	-0.01	-0.01	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.17	-0.19	-0.23	-0.31	-0.42	0.05
1-Year ZIF	-0.23	-0.24	-0.25	-0.32	-0.43	0.05
2-Year ZIF	-0.43	-0.49	-0.40	-0.39	-0.48	0.05
Credible in Year 2						
No ZIF	-0.02	-0.17	-0.19	-0.22	-0.29	0.05
1-Year ZIF	-0.03	-0.18	-0.19	-0.22	-0.30	0.05
2-Year ZIF	-0.06	-0.27	-0.26	-0.25	-0.32	0.05
Credible in Year 3						
No ZIF	-0.02	-0.03	-0.17	-0.18	-0.21	0.05
1-Year ZIF	-0.03	-0.04	-0.17	-0.18	-0.21	0.05
2-Year ZIF	-0.06	-0.08	-0.20	-0.20	-0.22	0.05
Credible in Year 4						
No ZIF	-0.02	-0.03	-0.04	-0.17	-0.18	0.05
1-Year ZIF	-0.03	-0.04	-0.04	-0.17	-0.18	0.05
2-Year ZIF	-0.06	-0.08	-0.07	-0.18	-0.19	0.05
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.17	-0.18	-0.20	-0.29	-0.44	-0.42
1-Year ZIF	-0.24	-0.23	-0.23	-0.31	-0.45	-0.42
2-Year ZIF	-0.46	-0.50	-0.39	-0.38	-0.51	-0.42
Credible in Year 2						
No ZIF	-0.02	-0.18	-0.18	-0.21	-0.30	-0.42
1-Year ZIF	-0.03	-0.19	-0.19	-0.21	-0.30	-0.42
2-Year ZIF	-0.06	-0.28	-0.26	-0.24	-0.33	-0.42
Credible in Year 3						
No ZIF	-0.02	-0.03	-0.19	-0.19	-0.21	-0.42
1-Year ZIF	-0.03	-0.04	-0.19	-0.19	-0.21	-0.42
2-Year ZIF	-0.06	-0.08	-0.22	-0.20	-0.22	-0.42
Credible in Year 4						
No ZIF	-0.02	-0.03	-0.04	-0.19	-0.19	-0.42
1-Year ZIF	-0.03	-0.04	-0.04	-0.19	-0.19	-0.42
2-Year ZIF	-0.06	-0.08	-0.07	-0.21	-0.20	-0.42

Table A.17 Fiscal Consolidation with Government Consumption Instrument in Fiscal Rule: General Transfers

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.41	0.05	0.04	0.00	-0.03	0.00
1-Year ZIF	-0.44	0.03	0.03	-0.00	-0.03	0.00
2-Year ZIF	-0.51	-0.05	-0.01	-0.01	-0.03	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.32	-0.19	-0.10	-0.07	-0.08	0.01
1-Year ZIF	-0.36	-0.21	-0.11	-0.08	-0.09	0.01
2-Year ZIF	-0.46	-0.33	-0.16	-0.09	-0.09	0.01
Credible in Year 2						
No ZIF	-0.41	-0.27	-0.14	-0.08	-0.08	0.01
1-Year ZIF	-0.44	-0.29	-0.15	-0.09	-0.09	0.01
2-Year ZIF	-0.51	-0.40	-0.21	-0.10	-0.09	0.01
Credible in Year 3						
No ZIF	-0.41	-0.36	-0.23	-0.13	-0.09	0.01
1-Year ZIF	-0.44	-0.38	-0.24	-0.13	-0.10	0.01
2-Year ZIF	-0.51	-0.49	-0.30	-0.15	-0.11	0.01
Credible in Year 4						
No ZIF	-0.41	-0.36	-0.32	-0.22	-0.14	0.01
1-Year ZIF	-0.44	-0.38	-0.33	-0.22	-0.15	0.01
2-Year ZIF	-0.51	-0.49	-0.39	-0.24	-0.15	0.01
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.33	-0.25	-0.21	-0.23	-0.25	-0.31
1-Year ZIF	-0.36	-0.27	-0.22	-0.23	-0.26	-0.31
2-Year ZIF	-0.47	-0.39	-0.28	-0.24	-0.27	-0.31
Credible in Year 2						
No ZIF	-0.41	-0.28	-0.21	-0.21	-0.25	-0.31
1-Year ZIF	-0.44	-0.30	-0.22	-0.22	-0.26	-0.31
2-Year ZIF	-0.51	-0.41	-0.28	-0.23	-0.26	-0.31
Credible in Year 3						
No ZIF	-0.41	-0.36	-0.24	-0.21	-0.24	-0.31
1-Year ZIF	-0.44	-0.38	-0.25	-0.21	-0.24	-0.31
2-Year ZIF	-0.51	-0.49	-0.31	-0.23	-0.25	-0.31
Credible in Year 4						
No ZIF	-0.41	-0.36	-0.32	-0.24	-0.23	-0.31
1-Year ZIF	-0.44	-0.38	-0.33	-0.24	-0.24	-0.31
2-Year ZIF	-0.51	-0.49	-0.39	-0.26	-0.24	-0.31

Table A.18 Fiscal Consolidation with Government Investment Instrument in Fiscal Rule: General Transfers

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.43	-0.07	-0.09	-0.11	-0.13	0.00
1-Year ZIF	-0.45	-0.09	-0.09	-0.12	-0.14	0.00
2-Year ZIF	-0.49	-0.14	-0.12	-0.12	-0.14	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.36	-0.31	-0.31	-0.39	-0.52	0.02
1-Year ZIF	-0.44	-0.37	-0.33	-0.40	-0.53	0.02
2-Year ZIF	-0.70	-0.66	-0.48	-0.43	-0.55	0.02
Credible in Year 2						
No ZIF	-0.43	-0.42	-0.39	-0.42	-0.52	0.02
1-Year ZIF	-0.45	-0.44	-0.39	-0.42	-0.53	0.02
2-Year ZIF	-0.49	-0.57	-0.48	-0.45	-0.54	0.02
Credible in Year 3						
No ZIF	-0.43	-0.49	-0.50	-0.49	-0.55	0.02
1-Year ZIF	-0.45	-0.51	-0.51	-0.50	-0.55	0.02
2-Year ZIF	-0.49	-0.58	-0.55	-0.51	-0.56	0.02
Credible in Year 4						
No ZIF	-0.43	-0.49	-0.58	-0.61	-0.62	0.02
1-Year ZIF	-0.45	-0.51	-0.59	-0.62	-0.63	0.02
2-Year ZIF	-0.49	-0.58	-0.63	-0.63	-0.63	0.02
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.36	-0.34	-0.37	-0.47	-0.61	-2.16
1-Year ZIF	-0.45	-0.40	-0.40	-0.48	-0.62	-2.16
2-Year ZIF	-0.72	-0.71	-0.54	-0.51	-0.64	-2.16
Credible in Year 2						
No ZIF	-0.43	-0.43	-0.42	-0.49	-0.61	-2.16
1-Year ZIF	-0.45	-0.45	-0.43	-0.49	-0.61	-2.16
2-Year ZIF	-0.49	-0.58	-0.52	-0.52	-0.62	-2.16
Credible in Year 3						
No ZIF	-0.43	-0.49	-0.52	-0.54	-0.62	-2.16
1-Year ZIF	-0.45	-0.51	-0.52	-0.54	-0.63	-2.16
2-Year ZIF	-0.49	-0.58	-0.56	-0.55	-0.63	-2.16
Credible in Year 4						
No ZIF	-0.43	-0.49	-0.58	-0.63	-0.67	-2.16
1-Year ZIF	-0.45	-0.51	-0.59	-0.63	-0.68	-2.16
2-Year ZIF	-0.49	-0.58	-0.63	-0.64	-0.68	-2.16

Table A.19 Fiscal Consolidation with General Transfers
Instrument in Fiscal Rule: General Transfers

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.08	0.02	0.03	0.02	0.01	0.00
1-Year ZIF	-0.09	0.01	0.02	0.02	0.01	0.00
2-Year ZIF	-0.11	-0.02	0.01	0.02	0.01	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.06	0.05	0.14	0.18	0.18	0.01
1-Year ZIF	-0.08	0.03	0.13	0.18	0.18	0.01
2-Year ZIF	-0.14	-0.04	0.10	0.17	0.18	0.01
Credible in Year 2						
No ZIF	-0.08	-0.04	0.07	0.15	0.19	0.01
1-Year ZIF	-0.09	-0.05	0.07	0.15	0.19	0.01
2-Year ZIF	-0.11	-0.09	0.04	0.15	0.18	0.01
Credible in Year 3						
No ZIF	-0.08	-0.06	-0.01	0.09	0.16	0.01
1-Year ZIF	-0.09	-0.07	-0.02	0.09	0.16	0.01
2-Year ZIF	-0.11	-0.11	-0.04	0.08	0.16	0.01
Credible in Year 4						
No ZIF	-0.08	-0.06	-0.03	0.01	0.10	0.01
1-Year ZIF	-0.09	-0.07	-0.04	0.01	0.10	0.01
2-Year ZIF	-0.11	-0.11	-0.06	0.00	0.10	0.01
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.06	0.07	0.19	0.24	0.25	0.03
1-Year ZIF	-0.07	0.06	0.18	0.24	0.24	0.03
2-Year ZIF	-0.15	-0.03	0.14	0.23	0.24	0.03
Credible in Year 2						
No ZIF	-0.08	-0.04	0.10	0.21	0.25	0.03
1-Year ZIF	-0.09	-0.04	0.10	0.20	0.25	0.03
2-Year ZIF	-0.11	-0.09	0.07	0.20	0.25	0.03
Credible in Year 3						
No ZIF	-0.08	-0.06	-0.01	0.12	0.22	0.03
1-Year ZIF	-0.09	-0.07	-0.01	0.12	0.21	0.03
2-Year ZIF	-0.11	-0.11	-0.03	0.11	0.21	0.03
Credible in Year 4						
No ZIF	-0.08	-0.06	-0.03	0.01	0.13	0.03
1-Year ZIF	-0.09	-0.07	-0.04	0.01	0.13	0.03
2-Year ZIF	-0.11	-0.11	-0.06	0.00	0.12	0.03

Table A.20 Fiscal Consolidation with Targeted Transfers
Instrument in Fiscal Rule: General Transfers

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.23	0.03	0.04	0.01	-0.02	0.00
1-Year ZIF	-0.26	0.01	0.03	0.01	-0.02	-0.00
2-Year ZIF	-0.32	-0.06	-0.00	-0.00	-0.02	-0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.21	-0.11	-0.03	-0.01	-0.02	0.01
1-Year ZIF	-0.24	-0.13	-0.04	-0.01	-0.03	0.01
2-Year ZIF	-0.33	-0.23	-0.09	-0.02	-0.03	0.01
Credible in Year 2						
No ZIF	-0.23	-0.17	-0.06	-0.01	-0.01	0.01
1-Year ZIF	-0.26	-0.19	-0.07	-0.01	-0.01	0.01
2-Year ZIF	-0.32	-0.29	-0.12	-0.02	-0.02	0.01
Credible in Year 3						
No ZIF	-0.23	-0.20	-0.13	-0.04	-0.01	0.01
1-Year ZIF	-0.26	-0.22	-0.14	-0.04	-0.01	0.01
2-Year ZIF	-0.32	-0.32	-0.19	-0.06	-0.02	0.01
Credible in Year 4						
No ZIF	-0.23	-0.20	-0.17	-0.11	-0.05	0.01
1-Year ZIF	-0.26	-0.22	-0.17	-0.12	-0.05	0.01
2-Year ZIF	-0.32	-0.32	-0.23	-0.13	-0.05	0.01
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.21	-0.16	-0.13	-0.15	-0.18	-0.25
1-Year ZIF	-0.24	-0.18	-0.14	-0.15	-0.19	-0.25
2-Year ZIF	-0.35	-0.30	-0.20	-0.16	-0.19	-0.25
Credible in Year 2						
No ZIF	-0.23	-0.18	-0.13	-0.13	-0.16	-0.25
1-Year ZIF	-0.26	-0.20	-0.13	-0.13	-0.17	-0.25
2-Year ZIF	-0.32	-0.30	-0.19	-0.14	-0.17	-0.25
Credible in Year 3						
No ZIF	-0.23	-0.20	-0.15	-0.12	-0.14	-0.25
1-Year ZIF	-0.26	-0.22	-0.15	-0.12	-0.15	-0.25
2-Year ZIF	-0.32	-0.32	-0.21	-0.13	-0.15	-0.25
Credible in Year 4						
No ZIF	-0.23	-0.20	-0.17	-0.14	-0.13	-0.25
1-Year ZIF	-0.26	-0.22	-0.17	-0.14	-0.14	-0.25
2-Year ZIF	-0.32	-0.32	-0.23	-0.16	-0.14	-0.25

Table A.21 Fiscal Consolidation with Labor Income Tax Revenue Instrument in Fiscal Rule: General Transfers

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.13	-0.04	-0.04	-0.03	-0.01	0.00
1-Year ZIF	-0.12	-0.04	-0.04	-0.03	-0.01	0.00
2-Year ZIF	-0.11	-0.02	-0.03	-0.03	-0.01	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.25	-0.34	-0.41	-0.46	-0.50	0.01
1-Year ZIF	-0.27	-0.36	-0.41	-0.46	-0.50	0.01
2-Year ZIF	-0.32	-0.42	-0.45	-0.47	-0.50	0.01
Credible in Year 2						
No ZIF	-0.13	-0.30	-0.39	-0.44	-0.47	0.01
1-Year ZIF	-0.12	-0.29	-0.38	-0.44	-0.47	0.01
2-Year ZIF	-0.11	-0.29	-0.39	-0.44	-0.47	0.01
Credible in Year 3						
No ZIF	-0.13	-0.17	-0.34	-0.42	-0.45	0.01
1-Year ZIF	-0.12	-0.17	-0.34	-0.42	-0.45	0.01
2-Year ZIF	-0.11	-0.14	-0.33	-0.41	-0.45	0.01
Credible in Year 4						
No ZIF	-0.13	-0.17	-0.21	-0.37	-0.43	0.01
1-Year ZIF	-0.12	-0.17	-0.21	-0.37	-0.43	0.01
2-Year ZIF	-0.11	-0.14	-0.20	-0.37	-0.43	0.01
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.25	-0.36	-0.45	-0.52	-0.56	-0.39
1-Year ZIF	-0.26	-0.37	-0.46	-0.52	-0.56	-0.39
2-Year ZIF	-0.29	-0.41	-0.47	-0.52	-0.56	-0.39
Credible in Year 2						
No ZIF	-0.13	-0.29	-0.41	-0.48	-0.53	-0.39
1-Year ZIF	-0.12	-0.29	-0.41	-0.48	-0.53	-0.39
2-Year ZIF	-0.11	-0.28	-0.41	-0.49	-0.53	-0.39
Credible in Year 3						
No ZIF	-0.13	-0.17	-0.34	-0.44	-0.50	-0.39
1-Year ZIF	-0.12	-0.17	-0.33	-0.44	-0.50	-0.39
2-Year ZIF	-0.11	-0.14	-0.32	-0.43	-0.50	-0.39
Credible in Year 4						
No ZIF	-0.13	-0.17	-0.21	-0.37	-0.45	-0.39
1-Year ZIF	-0.12	-0.17	-0.21	-0.37	-0.45	-0.39
2-Year ZIF	-0.11	-0.14	-0.20	-0.36	-0.45	-0.39

Table A.22 Fiscal Consolidation with Consumption Tax Revenue Instrument in Fiscal Rule: General Transfers

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.13	-0.01	0.00	0.00	-0.00	0.00
1-Year ZIF	-0.14	-0.02	0.00	0.00	-0.00	0.00
2-Year ZIF	-0.16	-0.05	-0.01	-0.00	-0.00	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.17	-0.16	-0.14	-0.14	-0.15	0.02
1-Year ZIF	-0.19	-0.17	-0.14	-0.14	-0.15	0.02
2-Year ZIF	-0.26	-0.25	-0.18	-0.15	-0.16	0.02
Credible in Year 2						
No ZIF	-0.13	-0.18	-0.16	-0.14	-0.14	0.02
1-Year ZIF	-0.14	-0.19	-0.16	-0.14	-0.14	0.02
2-Year ZIF	-0.16	-0.23	-0.18	-0.14	-0.14	0.02
Credible in Year 3						
No ZIF	-0.13	-0.14	-0.18	-0.15	-0.13	0.02
1-Year ZIF	-0.14	-0.15	-0.18	-0.15	-0.14	0.02
2-Year ZIF	-0.16	-0.19	-0.20	-0.16	-0.14	0.02
Credible in Year 4						
No ZIF	-0.13	-0.14	-0.14	-0.17	-0.15	0.02
1-Year ZIF	-0.14	-0.15	-0.14	-0.17	-0.15	0.02
2-Year ZIF	-0.16	-0.19	-0.16	-0.18	-0.15	0.02
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.17	-0.16	-0.13	-0.13	-0.15	-0.19
1-Year ZIF	-0.19	-0.17	-0.14	-0.13	-0.15	-0.19
2-Year ZIF	-0.26	-0.25	-0.18	-0.14	-0.16	-0.19
Credible in Year 2						
No ZIF	-0.13	-0.18	-0.15	-0.13	-0.13	-0.19
1-Year ZIF	-0.14	-0.19	-0.15	-0.13	-0.14	-0.19
2-Year ZIF	-0.16	-0.23	-0.18	-0.14	-0.14	-0.19
Credible in Year 3						
No ZIF	-0.13	-0.14	-0.18	-0.15	-0.13	-0.19
1-Year ZIF	-0.14	-0.15	-0.18	-0.15	-0.13	-0.19
2-Year ZIF	-0.16	-0.19	-0.20	-0.16	-0.14	-0.19
Credible in Year 4						
No ZIF	-0.13	-0.14	-0.14	-0.18	-0.15	-0.19
1-Year ZIF	-0.14	-0.15	-0.14	-0.18	-0.15	-0.19
2-Year ZIF	-0.16	-0.19	-0.16	-0.18	-0.16	-0.19

Table A.23 Fiscal Consolidation with Capital Income Tax Revenue Instrument in Fiscal Rule: General Transfers

	Year 1	Year 2	Year 3	Year 4	Year 5	S.S.
One Year Temporary Consolidation						
No ZIF	-0.03	-0.02	-0.02	-0.03	-0.03	0.00
1-Year ZIF	-0.04	-0.03	-0.02	-0.03	-0.03	0.00
2-Year ZIF	-0.06	-0.06	-0.04	-0.03	-0.03	0.00
Ten Year Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.15	-0.15	-0.19	-0.28	-0.42	0.01
1-Year ZIF	-0.21	-0.20	-0.21	-0.29	-0.43	0.01
2-Year ZIF	-0.46	-0.48	-0.34	-0.32	-0.44	0.01
Credible in Year 2						
No ZIF	-0.03	-0.17	-0.17	-0.21	-0.30	0.01
1-Year ZIF	-0.04	-0.17	-0.17	-0.21	-0.30	0.01
2-Year ZIF	-0.06	-0.27	-0.24	-0.23	-0.31	0.01
Credible in Year 3						
No ZIF	-0.03	-0.05	-0.18	-0.19	-0.22	0.01
1-Year ZIF	-0.04	-0.05	-0.19	-0.19	-0.22	0.01
2-Year ZIF	-0.06	-0.09	-0.21	-0.20	-0.23	0.01
Credible in Year 4						
No ZIF	-0.03	-0.05	-0.07	-0.21	-0.22	0.01
1-Year ZIF	-0.04	-0.05	-0.07	-0.21	-0.22	0.01
2-Year ZIF	-0.06	-0.09	-0.09	-0.21	-0.22	0.01
Permanent Fiscal Consolidation						
Credible in Year 1						
No ZIF	-0.15	-0.15	-0.19	-0.31	-0.47	-0.89
1-Year ZIF	-0.21	-0.20	-0.21	-0.31	-0.48	-0.89
2-Year ZIF	-0.46	-0.48	-0.34	-0.34	-0.50	-0.89
Credible in Year 2						
No ZIF	-0.03	-0.17	-0.17	-0.22	-0.34	-0.89
1-Year ZIF	-0.04	-0.17	-0.18	-0.22	-0.34	-0.89
2-Year ZIF	-0.06	-0.27	-0.24	-0.24	-0.34	-0.89
Credible in Year 3						
No ZIF	-0.03	-0.05	-0.19	-0.20	-0.25	-0.89
1-Year ZIF	-0.04	-0.05	-0.19	-0.20	-0.25	-0.89
2-Year ZIF	-0.06	-0.09	-0.21	-0.21	-0.25	-0.89
Credible in Year 4						
No ZIF	-0.03	-0.05	-0.07	-0.21	-0.23	-0.89
1-Year ZIF	-0.04	-0.05	-0.07	-0.21	-0.23	-0.89
2-Year ZIF	-0.06	-0.09	-0.09	-0.22	-0.23	-0.89

Appendix III. 2011 Consolidation Package

The 2011 budget introduced a broad array of expenditure cuts and revenue-increasing measures adding up to 1.95 percent of GDP (not counting interest savings). The table below lists the key measures and how they map into GIMF instruments introduced in Section IV.

Table A.24 Consolidation Measures in 2011 Budget

GIMF Instrument[1]	Measure	CZK billion	% GDP	Details
	Revenue	**19.9**	**0.52**	
tau_c	VAT	0.2	0.01	parametric changes
tau_k	CIT	0.2	0.01	remove 50% tax allowance related to employment of disabled persons
	PIT	6.6	0.17	
transfer	Tax on building saving scheme subsidy	*4.5*	*0.12*	
	Other	*2.1*	*0.06*	
transfer	taxation of pensioners with high income	*0.1*	*0.00*	
transfers_liq	taxation of housing allowances for military	*0.4*	*0.01*	
transfers_liq	taxation of early retirement contr for military	*0.8*	*0.02*	
tau_l	taxation of legisl and gov official compensation	*0.1*	*0.00*	
transfer	cancellation of tax exemption on building scheme interest	*0.7*	*0.02*	
tau_l	Payroll	12.9	0.34	
	Retaining 2010 ceiling on assessment base	*3.1*	*0.08*	keep the cap on the base at 6 times the average wage (raised from 4 in 2010)
	Retaining 2010 SSR rate	*9.8*	*0.26*	keep the rate of social security contributions at 25% (raised from 24% in 2010)
	Expenditure	**58.5**	**1.53**	
govcons	Public sector wages	13.3	0.35	cut public sector wage bill (excluding teacher salaries) by 10% (employment cuts or wage cuts at line ministries' discretion)
transfers_liq	Social expenditures	12.6	0.33	lower maternity and disability benefits
	Non-mandatory current and capital expenditures	13.3	0.35	
govcons	current	10.0	0.26	
govinv	capital	3.3	0.09	
govcons	Expenditures of general treasury	11.1	0.29	
	Expenditures of other budget chapters	10.9	0.29	
govinv	reduction in transport infrastructure expenditure	3.1	0.08	includes 3.5 bn reduction in subsidy to the State Fund for Transport Infrastructure
ignore	interest savings	4.0	0.10	
govcons	other	3.8	0.10	
govinv	Increase in R&D support	-0.6	-0.02	
govcons	Wage increase in education	-2.1	-0.06	teacher wages will be increased by 3.5%
	Total	**78.4**	**2.06**	
	Total ex interest savings	**74.4**	**1.95**	

[1]GIMF instruments are: tau_l - labor tax; tau_c - consumption tax; tau_k - capital tax; govcons - government consumption; govinv - government investment; transfer - general transfers; transfers_liq - transfers to liquidity-constrained households

Source: Ministry of Finance and IMF Staff Estimates

While the mapping is self-explanatory for most measures, several choices may be worth highlighting. The 50 percent tax on the government's contribution to a saving scheme is effectively a reduction in the government's transfer, hence it is coded as such. Similarly, taxation of pensions or allowances was considered a negative transfer. The decision of whether cuts in transfers were allocated to general or targeted ones was based on the perceived income level of the affected group. The official split of the 13.3 billion reduction

in non-mandatory current and capital expenditures is not available. It was assumed that one quarter of that amount would come out of capital budgets. Measures affecting public sector wages were mapped into changes in government consumption. Expenditures of general treasury include transfers to subnational levels of government. It is assumed that local governments will cut their consumption commensurately.

The government plans to introduce a new lottery tax in 2012, with 5.5 billion korunas (0.14 percent of GDP) in estimated revenue. Little detail is available regarding that tax at this point, but most likely it will be structured similarly to the regular corporate income tax.

The summary results of our mapping of the 2011 consolidation package into GIMF instruments are shown in the table below, which is also reproduced in the main text.

Table A.25 2011 Budget Consolidation Measures by GIMF Instrument
(percent of GDP)

	2011	2012 and beyond
Labor tax	0.34	0.34
Consumption tax	0.01	0.01
Capital tax	0.01	0.15
Government consumption	0.95	0.95
Government investment	0.15	0.15
General transfers	0.14	0.14
Transfers to liquidity-constrained households	0.36	0.36
Total	**1.95**	**2.10**