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## Tax Reform and Debt Sustainability in Germany: An Assessment Using the Global Fiscal Model

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**IMF Working Paper**

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**Tax Reform and Debt Sustainability in Germany:  
An Assessment Using the Global Fiscal Model**

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**Abstract**

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In 2005, the German government announced a far-reaching fiscal adjustment program. This paper uses the IMF's Global Fiscal Model to study its impact and explores options for addressing long-term pressures from population aging. The growth effects of the planned VAT increase are likely modest, largely owing to the stimulating effect of other tax reductions. The reform will improve the long-term debt path but achieving fiscal sustainability requires further adjustment over the medium term. An additional package of expenditure restraint, entitlement reform, and tax-base broadening compares favorably to other adjustment options. Spillover effects to trading partners of these policies are modest.

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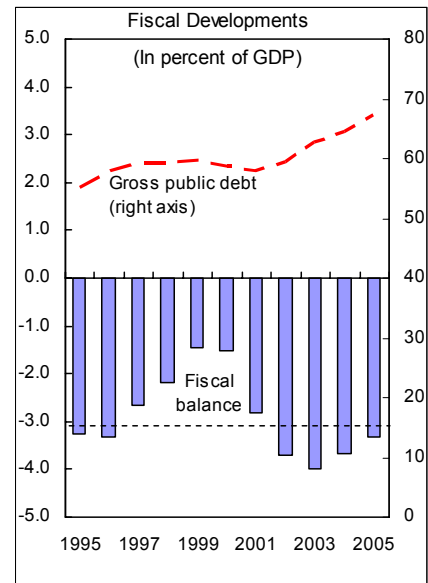
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## I. INTRODUCTION

Chronic fiscal deficits and rising aging-related future liabilities pose a serious threat to the German welfare system. In 2005, Germany violated the Maastricht deficit ceiling for the fourth consecutive year, and public debt grew to almost 70 percent of GDP. International competition and domestic adjustment have kept employment and income growth low and eroded the main tax bases. Fiscal pressures from population aging are mounting and have not been sufficiently anticipated. Even after far-reaching reforms (Agenda 2010 and Hartz reforms), aging-related expenditures are projected to increase by up to 4 percent of GDP by 2050.<sup>2</sup>

Germany's coalition government reached an agreement on three tax reform initiatives aimed at reducing the fiscal deficit and strengthening potential growth: (i) a VAT increase from 16 to 19 percent, partly offset by (ii) a reduction in payroll taxes for unemployment insurance, both effective in 2007, and (iii) a reduction in corporate income tax (CIT) rates, to become effective in 2008.<sup>3</sup>



This chapter investigates the implications of these tax reform plans and Germany's medium-term fiscal pressures for long-run debt sustainability. Specifically, the paper asks the following questions:

- What are the growth and fiscal effects of the VAT hike and the proposed relief in payroll and corporate income taxation?
- Which (combination of) tax and expenditure measures are most efficient to achieve structural balance over the medium-term?
- What are the trade-offs among up-front, delayed, and gradual deficit reduction?
- What are the international spillovers of fiscal reform in Germany, especially on the euro area and new EU member states?

<sup>2</sup> The fiscal-aging cost profile is taken from a long-term fiscal scenario developed in Braumann and others (2006), and is in between a more optimistic scenario by the authorities (Federal Ministry of Finance, 2005; and Werding and Kaltschütz, 2005) and the EU's Aging Working Group (2¾ percent), and a more pessimistic view expressed by the IFO institute (7¾ percent). Although 4 percent of GDP is used as the baseline projection of aging costs, the sensitivity to alternative estimates is also analyzed.

<sup>3</sup> In addition, the authorities' are considering health care reform, which could have fiscal implications.

In addition, we consider whether the results are robust to alternative assumptions about consumer and producer behavior and the degree of Germany's integration with international capital markets.

## II. ANALYTICAL FRAMEWORK AND CALIBRATION

The framework used is a four-country version of the IMF's Global Fiscal Model (GFM), calibrated to the German economy. The GFM is a macroeconomic model developed to examine a broad range of fiscal issues.<sup>4</sup> The GFM analyzes the impact of fiscal policy on real activity through both aggregate demand and supply channels. Aggregate demand responses result from the absence of debt neutrality and consumers' impatience. Aggregate supply responses arise from the distortionary effects of taxation. Compared with earlier applications of the model, the current version features marginal payroll taxes on workers that exceed the average rate, which allows for the consideration of the effects of tax base broadening. The calibration reflects the trading patterns between Germany, the euro area excluding Germany, new EU member states and accession countries, and the rest of the world (Table 1).

In the GFM, fiscal policy matters because of the following departures from Ricardian equivalence:

- Consumers have finite horizons. As a result, even temporary changes in fiscal policy may affect consumption because any offsetting action required by the government's intertemporal budget constraint is (perceived to be) borne by future generations and there is no bequest motive.
- A fraction of consumers are liquidity constrained. Liquidity-constrained consumers do not save and cannot borrow, and, therefore, any change in fiscal policy that affects their disposable income immediately changes their consumption as well.
- Taxes are distortionary, affecting labor supply and saving-investment patterns.

The model is parameterized to reflect key macroeconomic features of Germany (Table 1). In particular, the ratios of consumption, investment, government spending, wage income, and income from capital relative to GDP are set to their values in 2005. Similarly, key fiscal variables—revenue-to-GDP ratios from taxation of corporate, labor, and personal income and from consumption tax, as well as government debt and current government spending—have been calibrated to Germany's fiscal structure.

Key behavioral parameters are based on microeconomic evidence. These include parameters characterizing real rigidities in investment, markups for firms and workers, the elasticity of labor supply to after-tax wages, the elasticity of substitution between labor and capital, the

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<sup>4</sup> See Botman and others (2006) for the microeconomic foundations of the model.

elasticity of intertemporal substitution, and the rate of time preference. Simulations examine the impact of changing the values of the following key parameters:<sup>5</sup>

- **The wedge between the rate of time preference and the yield on government bonds.** This parameter, which determines consumers' degree of impatience, has not been subject to extensive microeconomic analysis. We set the baseline value of the wedge to 4 percent (corresponding to a planning horizon of 25 years), with an alternative simulation using 1 percent.
- **The fraction of liquidity-constrained consumers.** The baseline assumes that 40 percent of consumers experience liquidity constraints. These consumers have no wealth and consume one-fourth of aggregate consumption. An alternative simulation assumes that 20 percent of individuals are liquidity constrained.
- **The sensitivity of labor supply to the real after-tax wage (Frisch elasticity).** The baseline value (-0.08) is at the low end of those found by microeconomic studies given that the specific German microevidence points to a more inelastic relationship (Evers, de Mooij, and van Vuuren, 2005). Alternative simulations assume almost completely inelastic labor supply (-0.01).
- **The elasticity of substitution between labor and capital in the production function.** The baseline value is -0.75, with alternative simulations using a value of -0.6.
- **The elasticity of intertemporal substitution.** The baseline value for this parameter, which describes the sensitivity of consumption to changes in the real interest rate, is -0.33. The parameter value in the alternative simulation (-0.25) is consistent with the lower end of microeconomic estimates.
- **Price markups.** The baseline assumes that the markup over marginal cost in the tradables sector in Germany is equal to 14 percent and, in the nontradables sector, 27 percent. An alternative simulation lowers these values by one-fourth to 10.5 and 20.3 percent.

Other main aspects of the model are as follows:

- Consumption and production are characterized by constant elasticity of substitution functions. Firms and workers have some market power, so that prices and wages are above their perfectly competitive levels.
- There are traded and nontraded goods that allow for a bias toward domestic goods in private or government consumption.

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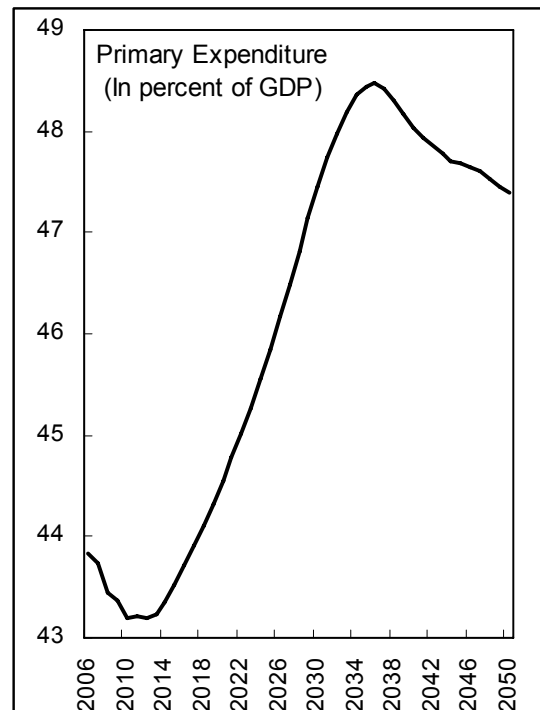
<sup>5</sup> Other structural parameters have been calibrated using evidence from Laxton and Pesenti (2003) and Batini, N'Diaye, and Rebucci (2005).

- There are two factors of production—capital and labor—that are used to produce traded and nontraded goods. Capital and labor can move freely between sectors but are not mobile internationally.
- Investment is driven by Tobin's  $Q$  with adjustment costs. Firms respond sluggishly to differences between the discounted value of future profits and the market value of the capital stock.
- Wages and prices are fully flexible. As a result, monetary policy is ineffective.
- There are two kinds of financial assets, government debt (traded internationally) and equity (held domestically). In the standard version of the GFM, international trade in government debt implies the equalization of nominal interest rates across countries as capital markets are fully integrated. Alternatively, however, the model can be specified such that it contains a risk premium that depends on the level of public debt.

The GFM provides a good platform for discussing the relative merits of alternative fiscal consolidation measures and has been applied to several countries.<sup>6</sup> The non-Ricardian structure of the model implies empirically plausible responses of key macroeconomic variables to changes in fiscal policy. The wide-ranging menu of taxes allows for a detailed analysis of the composition of adjustment while the strong microeconomic foundations allows one to consider the fundamental determinants of the effects of fiscal policy, such as the response of consumers and producers to changes in fiscal policy, as well as the sensitivity to the structure of the economy. Finally, as the GFM is an open economy model, it allows for the study of fiscal interdependence.

### III. ASSESSING TAX POLICY PROPOSALS

The baseline projection assumes aging-related expenditure pressures of 4 percent of GDP by 2050 (scenario A). It does not include the approved VAT increase or the reductions in payroll and corporate income taxation so that these can be evaluated separately. Responses of the economy to these spending pressures and changes in tax policy—for example on revenue, real interest rates, and growth—are then determined endogenously within the GFM.



<sup>6</sup> The model has been applied by IMF staff for background work on recent Article IV consultations with Canada, Japan, the United Kingdom, and the United States. See also Bayoumi and Botman (2005), Bayoumi, Botman, and Kumar (2005), Botman and Honjo (2006), Botman and Kumar (2006), and Botman, Edison, and Papa N'Diaye (2006).



The choice of the baseline is critical to interpret the costs and benefits of different reform strategies. The focus of this study is to analyze the implications of various fiscal adjustment scenarios for debt sustainability in order to highlight the effects of aging on the public sector balance sheet. As a result, the baseline investigates the dynamics of debt as an endogenous variable without including any particular government response to what might become a very rapid debt buildup.<sup>7</sup>

The simulations understate the long-term growth effect of population aging. An alternative modeling strategy might constrain debt accumulation by using a ceiling, which triggers endogenous (payroll) tax increases. In other words, rather than adjusting now or never, the baseline could be constructed to compare adjusting now or later. This alternative formulation of the baseline would highlight the growth effect—rather than the debt effects—of fiscal adjustment strategies. For this reason, the simulations in this study underplay long-term growth effects, since they use an unrealistic, unchanged-policies scenario as a counterfactual. This implication of the models' simulations needs to be kept in mind when interpreting the long-term growth effects presented in this study.

The analysis of tax reforms in 2007–08 distinguishes three policy experiments and contrasts them with the baseline projection:

- Scenario B extends the baseline by adding the effects of the three-percentage point increase in the standard VAT rate from 16 to 19 percent in 2007—estimated to generate additional revenue of 1 percent of GDP. Since the GFM does not incorporate VAT exemptions, we have mapped this policy into a corresponding “effective VAT rate” of 10.1 percent of total consumption in 2006, which increases by 1.9 percentage points from 2007 onward.
- Scenario C adds to scenario B the payroll-tax relief equivalent of 0.4 percent of GDP, effective January 2007.
- Scenario D is the full scenario; it adds to scenario C a reduction in the CIT rate at a revenue loss of 0.25 percent of GDP from 2008 onward. The proposed reform would reduce the marginal CIT rate from an average of 39 percent to less than 30 percent, partly financed through base-broadening measures. Because the government's intentions with the CIT reform are still evolving, the experiment simulates an equivalent tax relief through a CIT rate reduction only, yielding a revenue loss of ¼ percent of GDP without offsetting base broadening. Hence, the simulated CIT rate cut is smaller than the announced statutory rate cut.

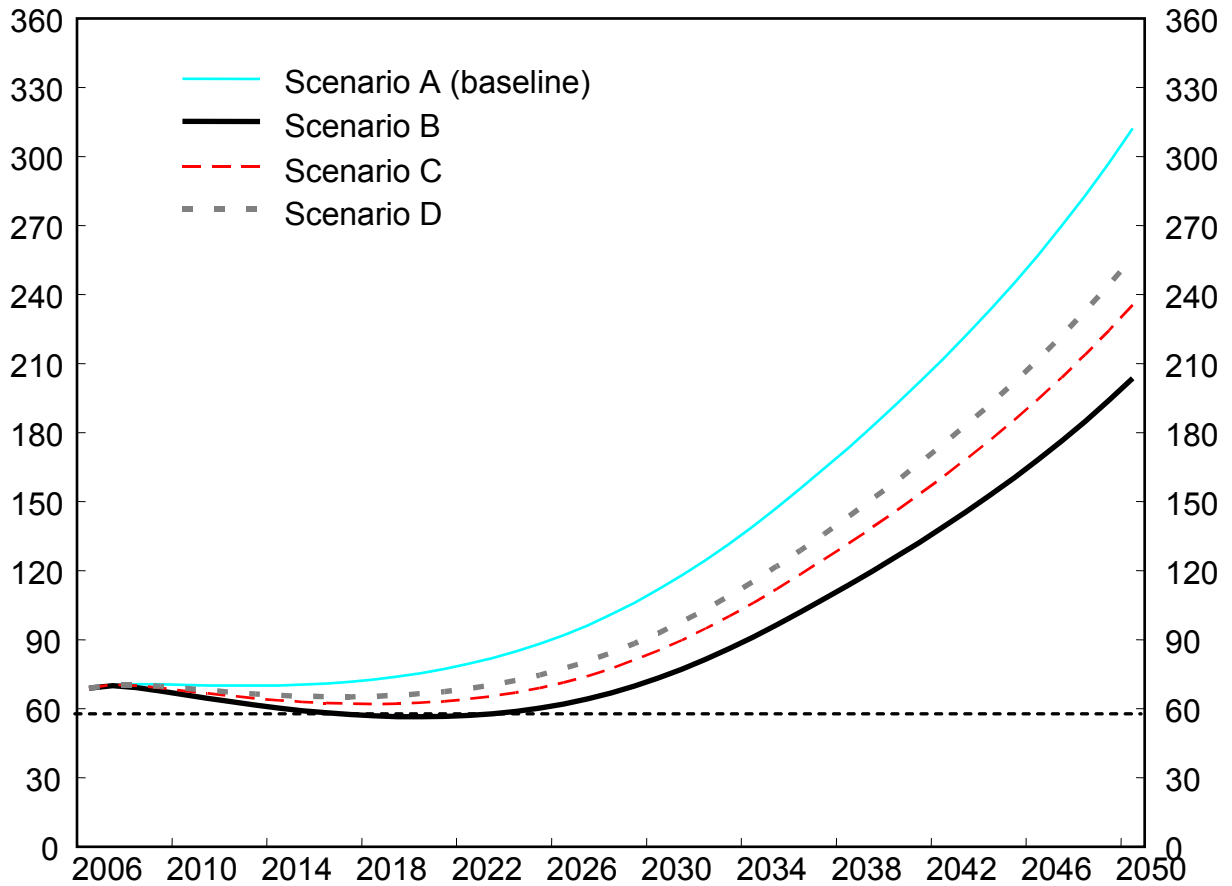
The GFM suggests that the tax measures in 2007–08 will improve the long-term debt outlook but will not be enough to secure fiscal sustainability (Figure 1). The baseline simulation shows unsustainable debt dynamics, with the debt-to-GDP ratio rising to over 300 percent of GDP in the long run. The planned (permanent) VAT hike in isolation (scenario B) could

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<sup>7</sup> The GFM imposes a fiscal reaction function that reestablishes debt sustainability only in the very long run. The simulations in this paper focus on benefits over a shorter policy horizon (until 2050).

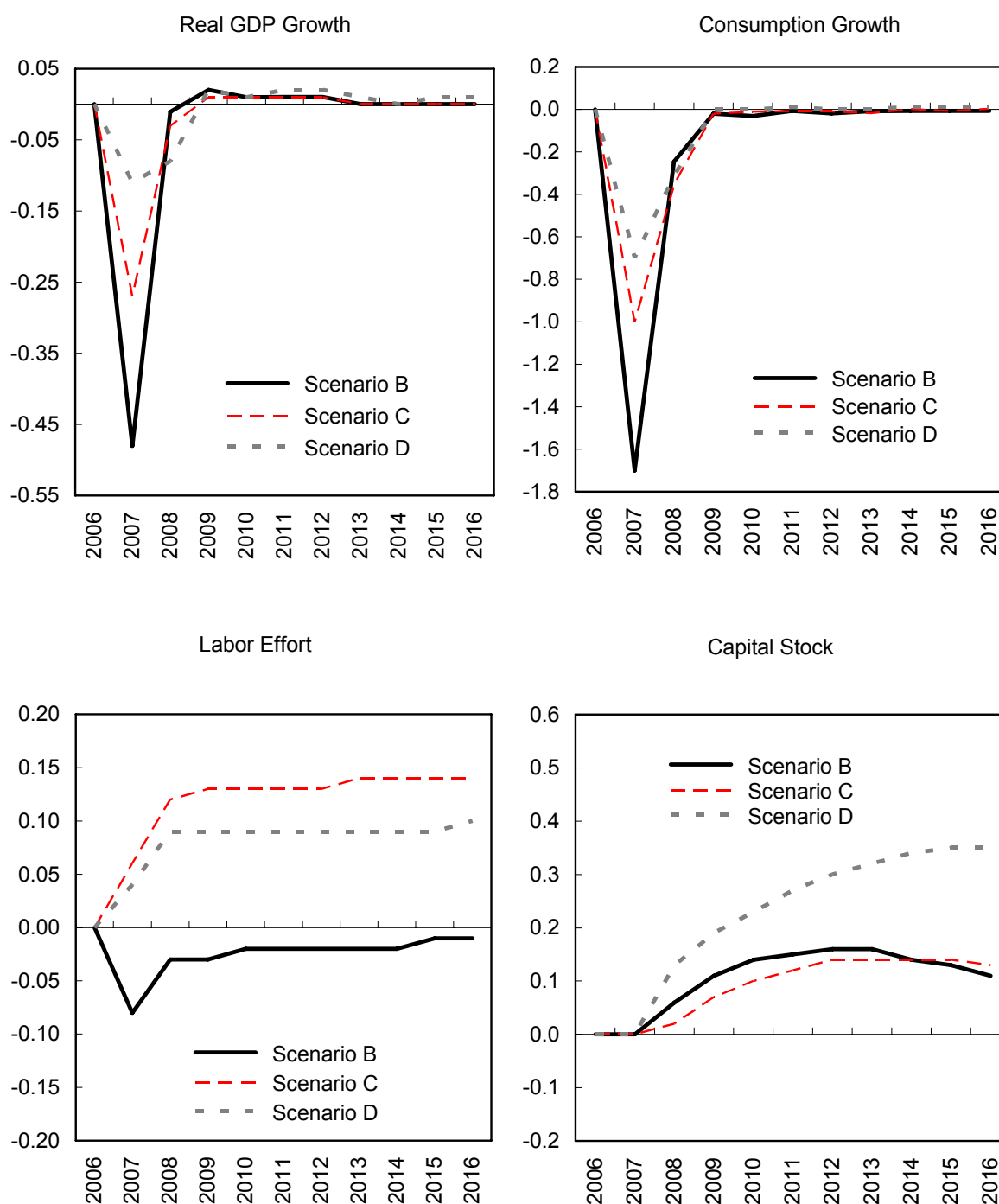
lower the debt ratio by about 100 percentage points of GDP a result of a lighter interest burden and a less distortionary tax base. The cuts in social security payroll taxes and the CIT (scenarios C and D) each offset part of the VAT revenue gains and result in debt of 230-250 percent of GDP by 2050. Hence, while the combined tax measures lower the debt buildup, the fiscal improvement would not be sufficient to stabilize the debt ratio.

Figure 1. Germany: Debt Path and Tax Reform Proposals  
(In percent of GDP)



Source: GFM simulations.

Figure 2. Germany: Economic Impact of Tax Reform Proposals 1/  
(Deviations from baseline in percentage points)



Source: GFM simulations.

1/ Baseline includes effects of population aging on government spending. Scenario B includes increase in VAT of 3 percentage points in early 2007. Scenario C adds to scenario B a reduction in social security contributions by workers equal to 0.4 percent of GDP. Scenario D adds to scenario C a reduction in corporate income taxation equivalent to 0.25 percent of GDP.

The VAT tax hike temporarily dampens growth in 2007, but lower payroll taxation and anticipatory effects of the CIT cut in 2008 substantially reduce the magnitude of this effect (Figure 2). The model suggests that the 2007 tax relief package would reduce growth by 0.2 percent. The main channel would be a weakening of consumption of about  $\frac{3}{4}$  percentage point.<sup>8</sup> Since investment decisions of firms are forward looking and firms prefer to smooth investment over time, the CIT would also have an additional offsetting effect in 2007 of 0.1 percent. The extent to which a reduction in corporate income taxation increases growth in 2007 needs to be interpreted with caution, however. On the one hand, the benefits of CIT reform on incentives to save and invest will be considerably larger, since the announced cut in statutory CIT rates is larger than simulated.<sup>9</sup> On the other hand, it is unclear what type of base-broadening measures will be implemented to compensate for the revenue loss and, hence, what their impact on investment activity may be.

Overall, however, the reforms are likely to achieve a more efficient tax system by shifting from direct to indirect taxation. Over the long run, shifting revenue from direct taxation to less distortionary indirect taxes increases growth through higher employment and investment growth. This is relevant in an aging society where, while the direct tax base could contract, the indirect tax base is more stable.

#### IV. ACHIEVING LONG-TERM SUSTAINABILITY

Achieving fiscal sustainability requires additional efforts beyond those in the government's tax reform package. As set out in its Stability Program, the government aims to move toward structural balance over the medium term. In practical terms, this would require about a  $\frac{1}{2}$  percentage point of GDP reduction in the deficit per year during 2008-11 (some 2 percent of GDP in total). Moreover, the composition of adjustment determines the size of the short-term contraction and the long-term growth implications. The following subsections describe the theoretical implications of different tax measures and assess various strategies to achieve structural balance and the effects of a different timing and phasing of adjustment.

##### A. Comparing Tax Measures

In a model without initial wealth, wage and consumption taxation are equivalent. To illustrate this point, it follows from the two-period budget constraint that a wage tax ( $t^w$ ) affects the consumption-leisure as follows:

$$C_1 + \frac{1}{(1+r)} C_2 = (1-t^w)wL \quad .$$

In other words, lifetime consumption (C) is equal to after-tax wage income (wL). Similarly, a consumption tax affects the consumption-leisure choice in the following manner:

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<sup>8</sup> Negative consumption growth effects in 2007 could be larger than indicated in the model, as GFM does not include anticipation effects in consumption ahead of the VAT hike (no consumer durables in the model).

<sup>9</sup> The model also understates the sensitivity of investment to taxation as capital is not internationally mobile.

$$(1+t^c)C_1 + \frac{(1+t^c)}{(1+r)}C_2 = wL \rightarrow$$

$$C_1 + \frac{1}{(1+r)}C_2 = \frac{1}{(1+t^c)}wL \quad .$$

As a result, consumption ( $t^c$ ) and payroll taxation are equivalent in terms of their impact on consumption and leisure.<sup>10</sup> Taxation of both consumption and wage income reduces the cost of leisure. An equivalent analysis for an income tax results in

$$C_2 = [1 + r(1-t^y)] \times (w(1-t^y)L - C_1) \rightarrow$$

$$C_1 + \frac{1}{1+r(1-t^y)}C_2 = w(1-t^y)L \quad .$$

An income tax ( $t^y$ ) has a broader tax base than both labor income and a sales tax and includes the return to savings. As such, income taxation affects not only the consumption-leisure decision, it also affects the intertemporal choice between consumption today and in the future.

However, with initial assets, a consumption tax base becomes broader than a wage tax base. Denoting initial assets by  $A$ , the incidence of labor income and consumption taxes discussed above will change to, respectively,

$$C_1 + \frac{1}{(1+r)}C_2 = (1-t^w)wL + A$$

$$(1+t^c)C_1 + \frac{(1+t^c)}{(1+r)}C_2 = wL + A \rightarrow$$

$$C_1 + \frac{1}{(1+r)}C_2 = \frac{1}{(1+t^c)}(wL + A) \quad .$$

The wage base is smaller than the consumption tax base by the amount of initial assets in the economy. As a result, the economic distortions caused by these two types of taxes will differ. In addition, the incidence of the tax will differ as well, as consumption taxes also apply to the nonworking population with asset holdings (retirees, for example). This situation has potentially important implications for intra- and intergenerational equity, especially in an aging society such as Germany's.

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<sup>10</sup> Which is the case for  $t^c = t^w/(1-t^w)$ .

## B. Ranking Different Adjustment Strategies

Structural balance could be attained by 2011 through various combinations of expenditure and revenue measures (Table 2). The GFM can be used to analyze the effects of different consolidation methods: (i) lower government consumption; (ii) smaller government transfers; (iii) larger worker social security contributions; (iv) larger employer social security contributions; (v) higher personal income tax rates; (vi) a higher VAT; (vii) labor income tax base-broadening measures; (viii) higher corporate income tax rates, or (ix) a combination of these measures.

Calibration results from the GFM suggest that the slowdown in short-run growth from achieving structural balance varies with the type of consolidation measure. The impact on short-run growth varies between -0.1 and -0.4 percent a year between 2007 and 2011, depending on the specific measures, their distortionary effect, and the impact on domestic demand:

- **Expenditure cuts.** Reducing social security transfers has the smallest growth impact per year (-0.1 percent until 2011). This modest growth effect occurs when the benefits that are reduced are distributed in a lump-sum manner—reducing transfers that cause economic distortions (such as unemployment benefits) would imply even smaller growth losses. Part of the decline in consumption demand is absorbed by trading partners via reduced import demand. In contrast, reductions in other government consumption would lead to a larger slowing in growth, because current government spending in the model is heavily biased toward nontradables (“home bias”).
- **Revenue increases.** The negative growth impact of the different tax measures ranges from -0.1 to -0.3 percent. The VAT is less distortionary than payroll taxes because it also taxes accumulated savings (i.e., reaches a broader base) and, hence, does not solely affect the labor-leisure choice. Increasing payroll taxes on workers is more distortionary than reducing tax exemptions (base broadening) or raising social security contributions on employers because marginal tax rates on workers (but not employers) exceed the average rate. Raising corporate or personal income taxes is roughly equally distortionary in terms of output loss. That payroll taxes are less distortionary than taxation of capital is a result found in other studies as well (Baylor, 2005), and reflects generally inelastic labor supply in Germany.

If no specific strategy is proposed, rising aging-related expenditure pressures would likely result in higher direct taxation. German law stipulates that the social security accounts have to maintain balance and, as a result, under current rules growing expenditures must be met with equivalent social security contributions. While this law prevents runaway fiscal deficits and a buildup of debt, it implies higher payroll taxes as the default policy response.

Expenditure cuts and entitlement reform, in combination with broadening the base and raising indirect taxes, compares favorably to raising direct taxes. Achieving the 2 percent of GDP adjustment during 2008–11 by relying exclusively on just one of the eight adjustment

measures appears difficult, and the government likely will need to choose a combination of measures. For instance, lowering government spending—whether on goods and services or social security transfers—by 2 percentage points of GDP by 2011 implies unrealistically large cuts in discretionary spending. Similarly, further increases in VAT revenue are also limited (including through EU regulations), although further base broadening would be possible if fewer items were placed under the lower (7 percent) VAT rate. Raising direct taxation is distortionary and runs counter to the government's intentions to increase incentives for labor participation and investment. The fiscal impulse of a mixed policy package is outlined in Figure 3. It comprises lower government consumption, smaller social security transfers, reductions of payroll tax exemptions (base broadening), and a small further increase in the effective VAT.<sup>11</sup> Eliminating the structural deficit by 2011 through such a package lowers medium-run growth by about 0.2 percent per year (Figure 4).

Achieving structural balance by 2011 lowers the debt-to-GDP ratio significantly until 2030. Thereafter, debt will rise again above the Maastricht threshold of 60 percent of GDP at the height of aging pressures (Figure 5). By focusing on a limited set of feasible adjustment strategies, debt ratios range between 90 and 120 percent of GDP by 2050, depending on how the adjustment method interacts with the direct and indirect tax base—the fiscal pressures from aging imply a relative expansion of the latter. Essentially, achieving structural balance by 2011 amounts to prefunding a substantial part of aging-related liabilities; however, such achievement would not resolve the long-run financing problem in its entirety.

### **C. Effects of Different Phasing of the Adjustment**

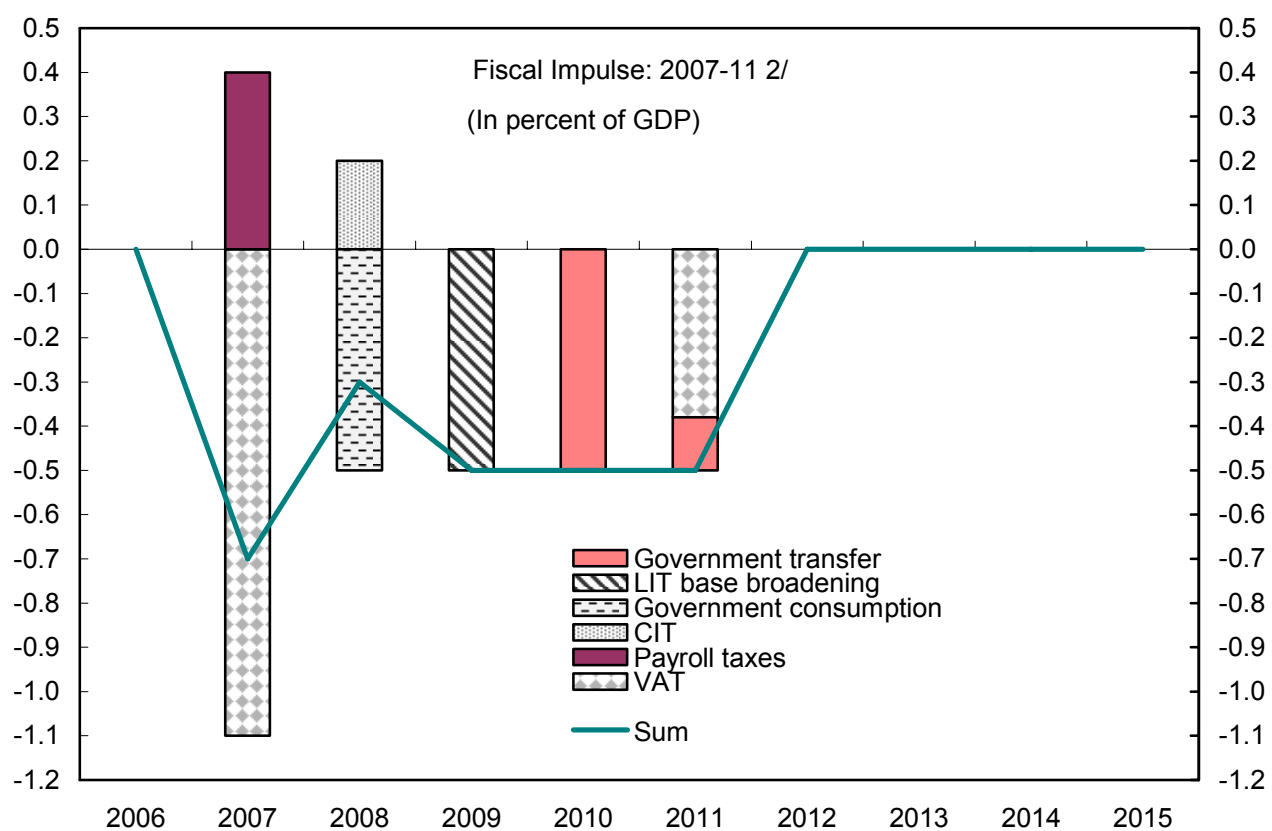
Political as well as technical reasons may prevent a front-loading of fiscal adjustment. After the significant tax increases in 2007, the political room for further adjustment on the revenue side may be limited. Furthermore, designing a package of high-quality expenditure-saving measures may require significant lead time, and implementation may need to be phased in. The GFM allows quantification of the implied economic and fiscal trade-offs among an immediate, delayed, and gradual adjustment. Two alternative scenarios to the ½ percent adjustment package are considered: (i) a more gradual ¼ percentage point adjustment, completed only by 2015, and (ii) a delayed implementation of a ½ percent adjustment until 2011–15.

Delaying adjustment or more gradualism, increases the medium- and long-term debt burden only modestly (Figure 6). As deficits remain larger under more gradual or delayed adjustment, debt dynamics will be slightly less favorable. As long as the adjustment strategy is credible and convincingly completed before aging pressures peak, the negative spiral of rising interest rates, debt, and declining investment would be manageable, even with a more gradual path of adjustment.

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<sup>11</sup> This policy package assumes a combination of the following measures in percent of GDP: in 2008, ½ percent reduction in government consumption; in 2009, ½ percent of labor income tax base broadening; in 2010, ½ percent of reduction in government transfers; and in 2011, ½ percent from a combination of cutting transfers and raising the effective VAT rate.

Figure 3. Germany: Composition of Mixed Policy Fiscal Adjustment Package 1/



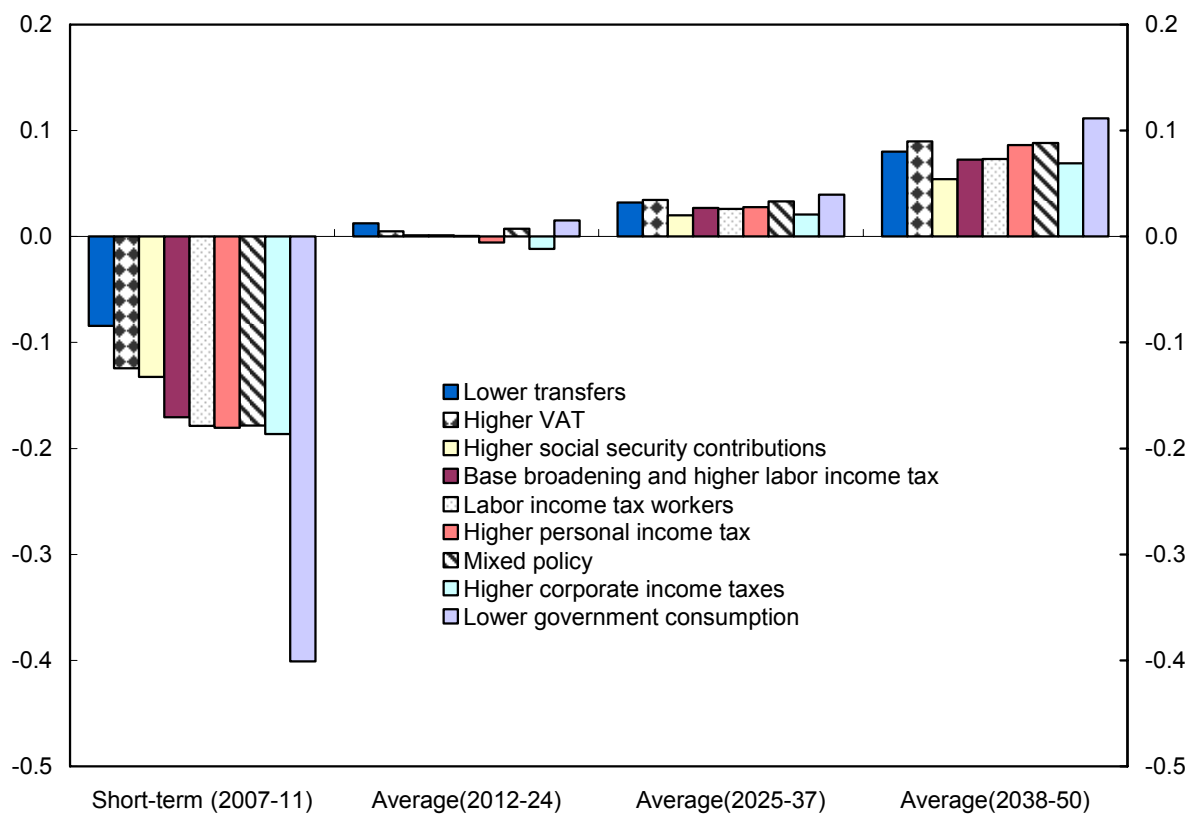
Source: GFM simulations.

1/ Adjustment package of  $\frac{1}{2}$  percent of GDP per year between 2008-11 comprising revenue and expenditure measures.

2/ Change in fiscal deficit between two years.



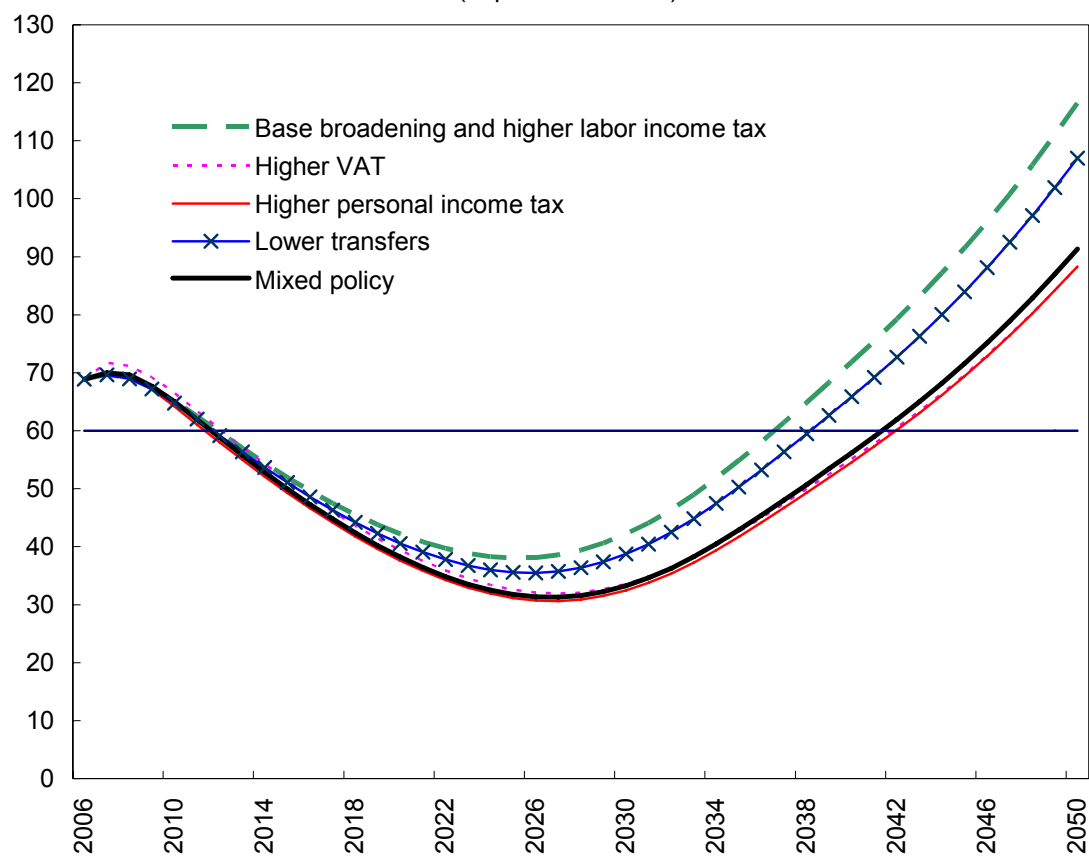
Figure 4. Germany: Growth Effects of Medium-Term Fiscal Adjustment Strategies 1/  
(Average annual deviation in real GDP growth by adjustment method)



Source: GFM simulations.

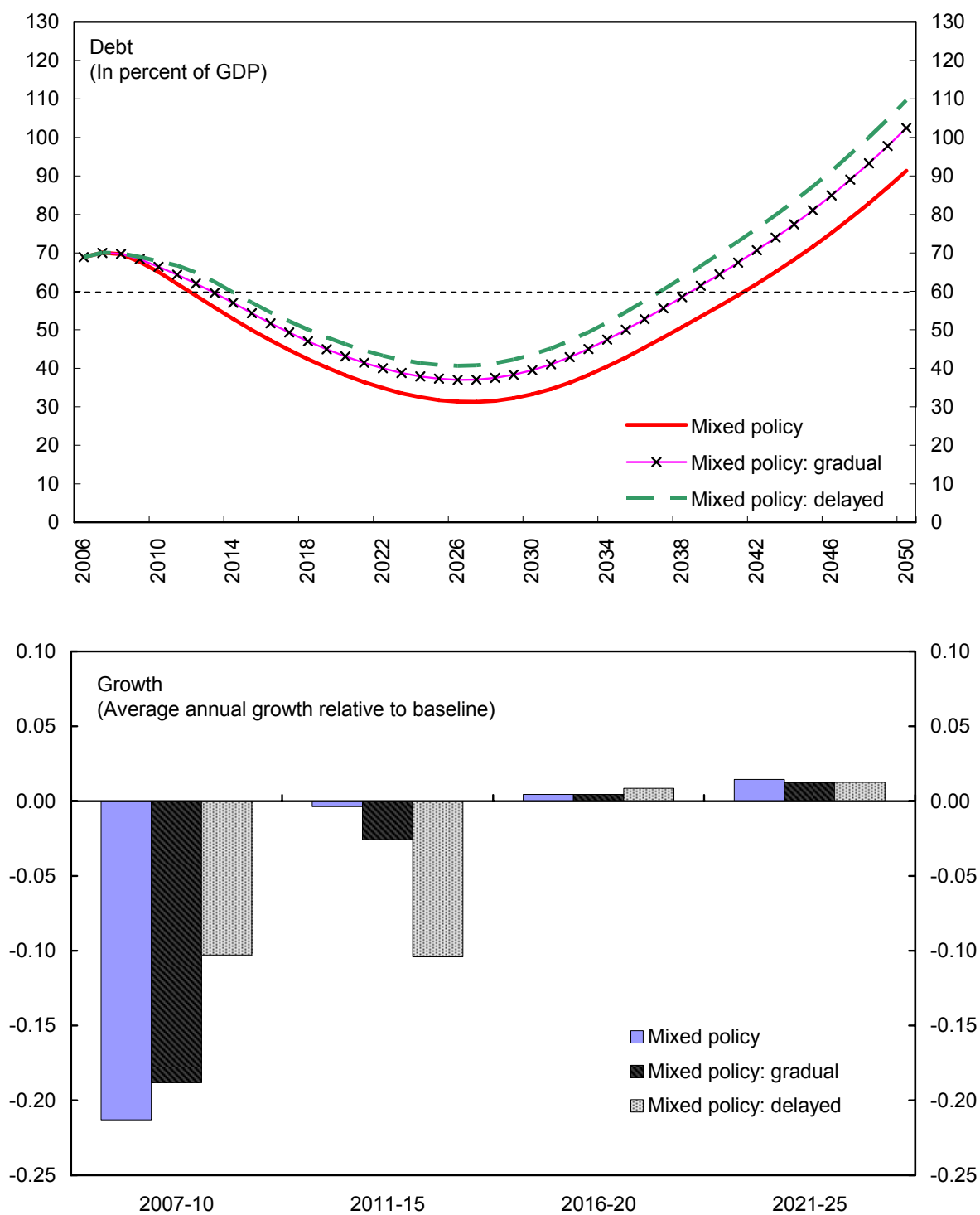
1/ Fiscal adjustment of  $\frac{1}{2}$  percent of GDP per year between 2008-11.

Figure 5. Germany: Debt Dynamics of Selected Medium-Term  
Fiscal Adjustment Strategies  
(In percent of GDP)



Source: GFM simulations.

Figure 6. Germany: Fiscal Adjustment Package: Delayed or Gradual Implementation 1/



Source: GFM simulations.

1/ Gradual adjustment is defined as a 1/4 percent of GDP fiscal adjustment for eight consecutive years between 2008-15; delayed adjustment defined as a 1/2 percent of GDP adjustment during 2011-15; mixed policy defined as package of revenue and expenditure measures with 1/2 percent of GDP adjustment during 2007-11.

Delaying or slowing fiscal adjustment shifts the negative effects on growth to the medium term. The benefits of delaying action for a few years in terms of avoiding further contractionary impulses are limited. However, postponing reform even further, beyond the medium term, would have significant negative real effects. By delaying adjustment until debt levels are accelerating together with aging pressures—e.g., beyond 2020—the government would have to engage in repeated and sizable adjustments of the fiscal balance that would lead to large output losses. This implies that the long-run aging problem needs to be substantially anticipated and resolved in the next decade before drastic measures will become necessary to secure solvency of the welfare state.

## V. SPILLOVER EFFECTS

As Germany is an open economy and well integrated with international capital markets, spillover effects of its policies are of interest. In the GFM, spillover effects occur through trade and financial channels. Because Germany's fiscal policies in isolation<sup>12</sup> have only a small effect on the global pool of savings and investment, financial spillover effects in real interest rates will be relatively modest. Spillover effects through trade channels could be more substantial, although any change in import demand will also affect international relative prices.

The planned tax policy measures for 2007–08 have limited spillover effects for trading partners (Figure 7). Germany's current account surplus will improve further as a result of increasing the VAT. However, the effects on partner countries'—accession countries, eurozone partners, and the rest of the world—growth and current account balances are modest because the VAT increase will have only temporary and small effects on German consumption and import demand. Furthermore, as Germany is well integrated with international capital markets, there is an offsetting—albeit small—effect on partner country growth through lower real interest rates. These spillover effects are even smaller when the increase in the VAT is combined with lower labor income taxes and CITs, as foreseen in the government's plans to reduce the impact on German consumption.

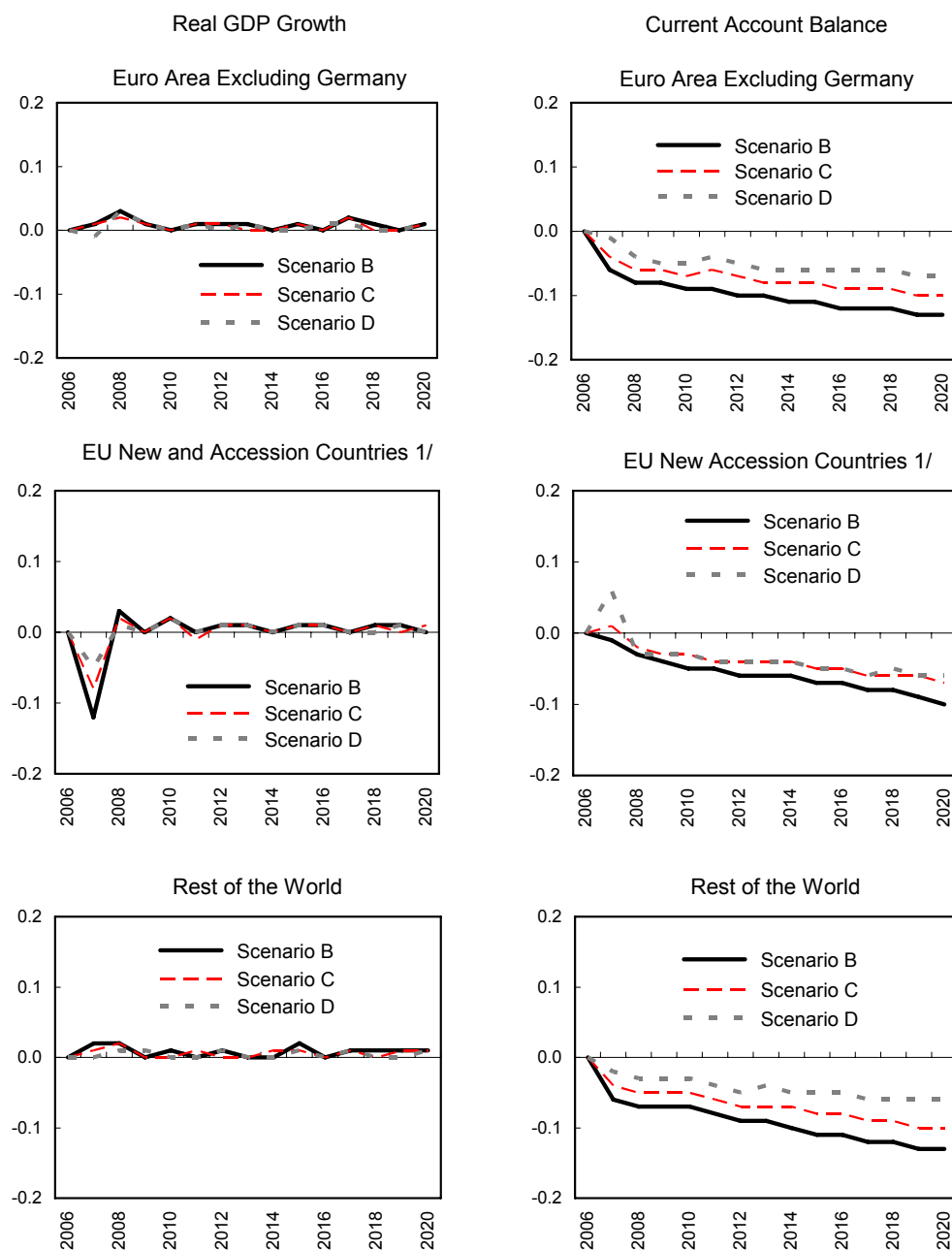
Additional adjustment to achieve structural balance has limited supplemental spillover effects on other economic regions (Figure 8). Germany's current account position will improve somewhat further because of the greater overall adjustment effort.<sup>13</sup>

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<sup>12</sup> Abstracting from the fact that other countries also face aging problems, fiscal difficulties are set to be compounded on a global scale.

<sup>13</sup> Again, this assumes that Germany is tackling aging pressures in isolation. In reality, other countries may also be expected to reduce aging costs. To the extent that this induces global fiscal adjustment, global growth could slow, and the external current account of countries could swing either way, depending on their relative adjustment effort. At the same time, interest rates in Germany and other countries would be expected to decline by more.

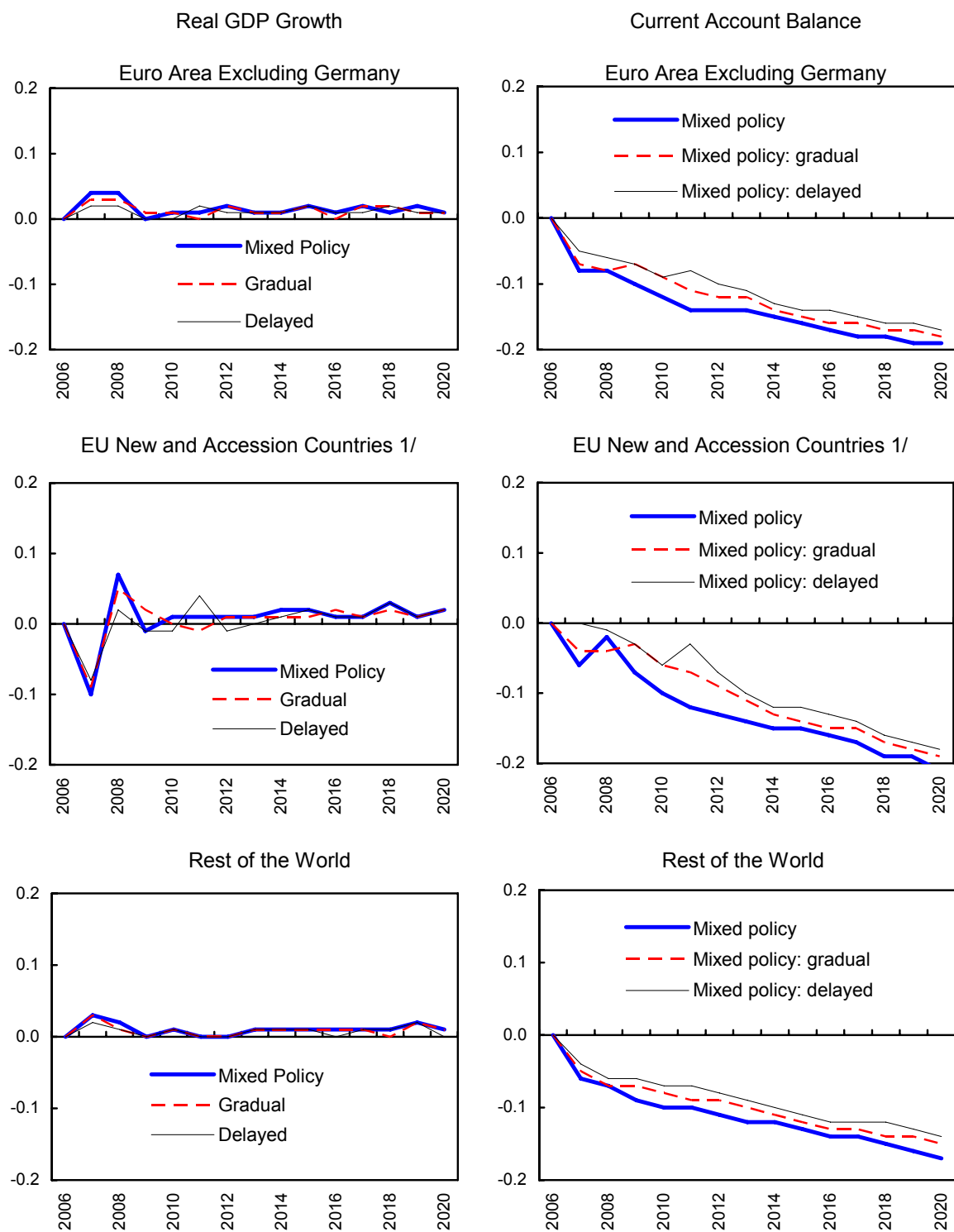
Figure 7. Germany: Spillover Effects of Tax Reform Proposals  
(Difference from baseline in percentage points)



Source: GFM simulations.

1/ 10 new EU member states and Bulgaria, Croatia, and Romania.

Figure 8. Germany: Spillover Effects of Medium-Term Adjustment  
(Difference from baseline in percentage points)



Source: GFM simulations.

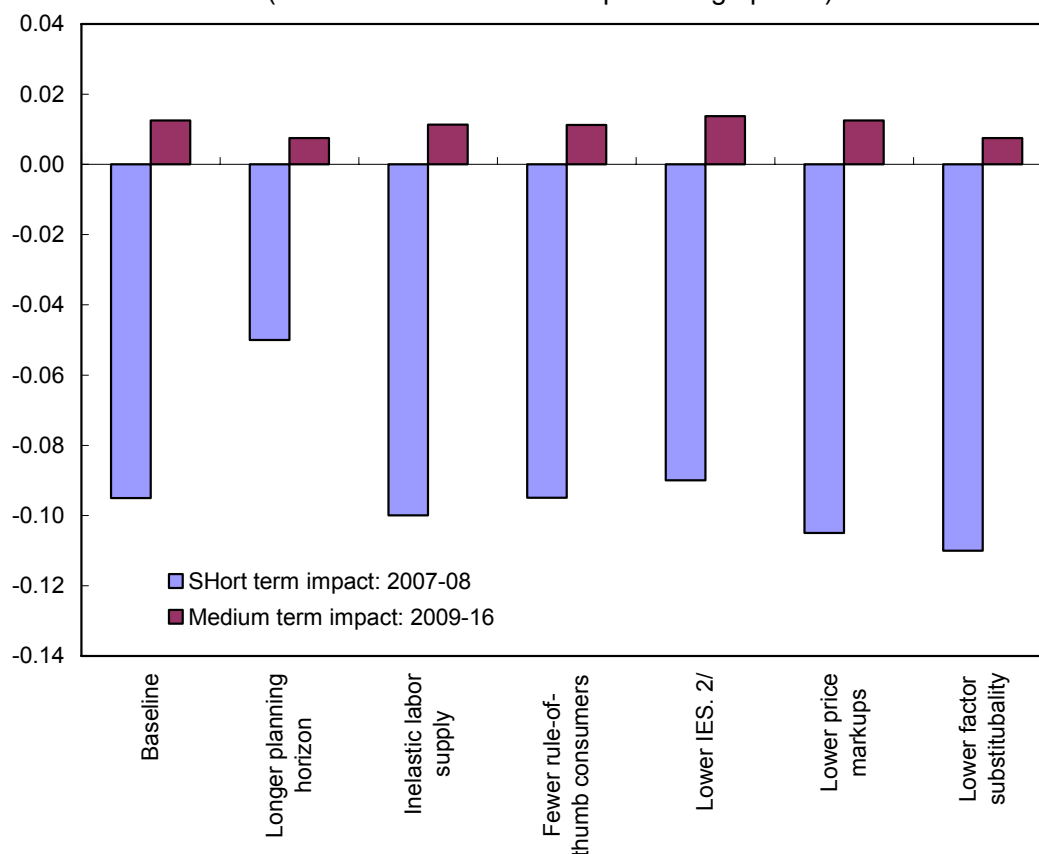
1/ 10 new EU member states and Bulgaria, Croatia, and Romania.

## VI. SENSITIVITY ANALYSIS

Sensitivity analysis indicates that the results outlined above are robust to changes in the behavioral assumptions and structural parameters of the model:

- The relative impact of fiscal consolidation on economic growth does not vary much with different model parameters (Figure 9). The largest change in the results can be observed for a parameterization extending the planning horizon. Although more forward looking behavior would limit the crowding-out effects of government debt, it would also reduce the impact on consumption of increasing the VAT. Less elastic labor supply would reduce the benefit of cutting payroll taxes, while higher price markups reduce the benefit of cutting CITs, as more of the tax burden would fall on monopolistic rents rather than the return to capital.

Figure 9. Germany: Sensitivity Analysis: Effects of Coalition Agreement on German Real GDP Growth 1/  
(Deviation from baseline in percentage points)

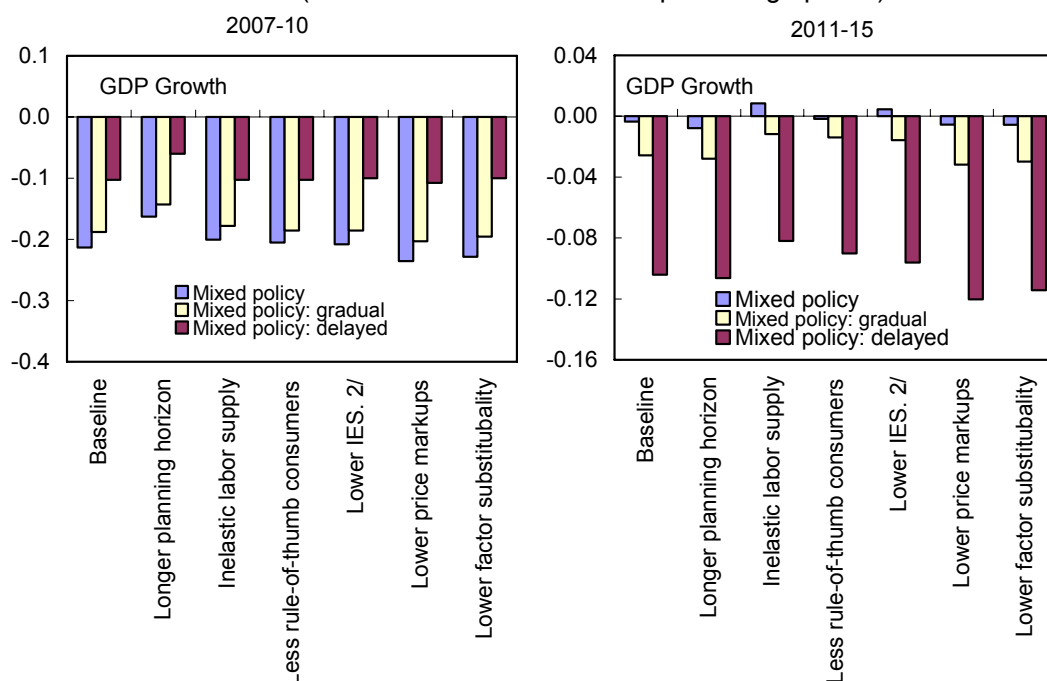


Source: GFM simulations.

1/ Alternative simulations consider a longer planning horizon (100 versus 25 years in the baseline); less elastic labor supply (absolute elasticity of labor supply equal to -0.01 rather than -0.08 in the baseline); a smaller share of rule-of-thumb consumers (20 percent of consumers compared with 40 percent in the baseline); lower price markups (a reduction of 25 percent relative to the baseline); a lower intertemporal elasticity of substitution (from 1/3 to 1/4); and less substitutability between capital and labor (0.60 rather than 0.75 in the baseline; with a value of unity indicating the Cobb-Douglas case). 2/ Intertemporal elasticity of substitution.

- The impact of the timing and pace of consolidation depend on the planning horizon of consumers and their sensitivity to changes in interest rates (Figure 10). Implementing the adjustment to achieve structural balance is less costly if consumers are more forward looking, but overall the results are robust to changes in modeling assumptions.

Figure 10. Germany Sensitivity Analysis:  
Effects of Mixed Policy, Gradual, and Delayed Adjustment on Real GDP Growth 1/  
(Deviation from scenario D in percentage points)



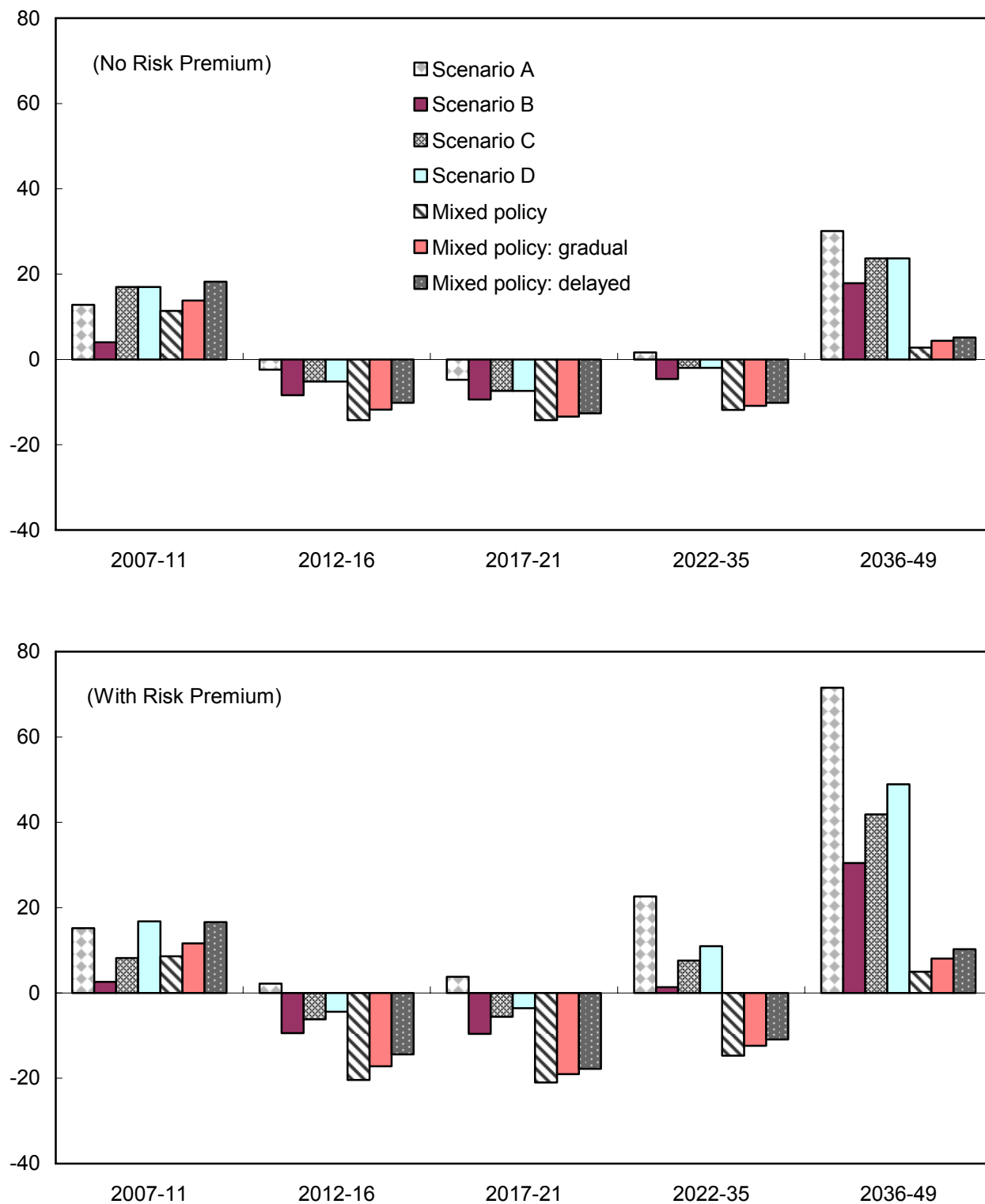
Source: GFM simulations.

1/ Alternative simulations consider a longer planning horizon (100 versus 25 years in the baseline); less elastic labor supply (absolute elasticity of labor supply equal to -0.01 versus -0.08 in the baseline); fewer rule-of-thumb consumers (20 percent of consumers compared with 40 percent in the baseline); a lower intertemporal elasticity of substitution (from 1/3 to 1/4); lower price markups (a reduction of 25 percent relative to the baseline), and less substitutability between capital and labor (0.60 versus 0.75 in the baseline; with a value of unity indicating the Cobb-Douglas case). 2/ Intertemporal elasticity of substitution.

- If Germany is less well integrated in international capital markets, the debt-GDP ratio will increase faster. With perfectly integrated capital markets, the real interest rate increase by only 20–30 basis points under the government's proposals by 2050 (Figure 11). Introducing imperfectly integrated capital markets—by specifying a risk premium in relation to the change in the ratio of the current account deficit to GDP—amplifies the increase in the real interest rate in the long term to between 40 and 70 basis points. Government debt increases more quickly because interest payments rise more quickly, unless structural balance is achieved (Figure 12). The short-term costs of fiscal adjustment are also smaller, since interest rates decline more (Figure 13). These long-term beneficial effects of fiscal adjustment would be larger if the interest rate were to be even more sensitive to the debt profile.

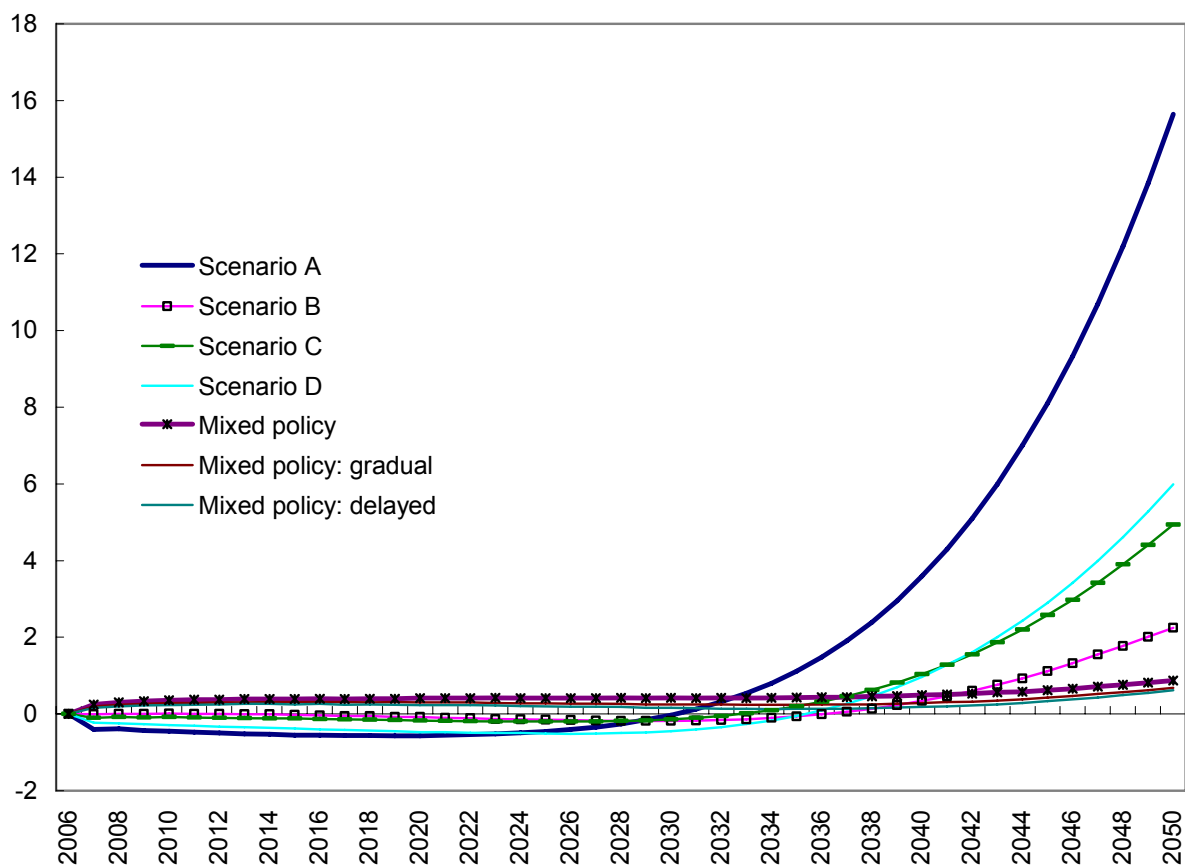


Figure 11. Germany: Sensitivity Analysis: Effect on Real Interest Rate  
(Deviation from 2006 projection in basis points)



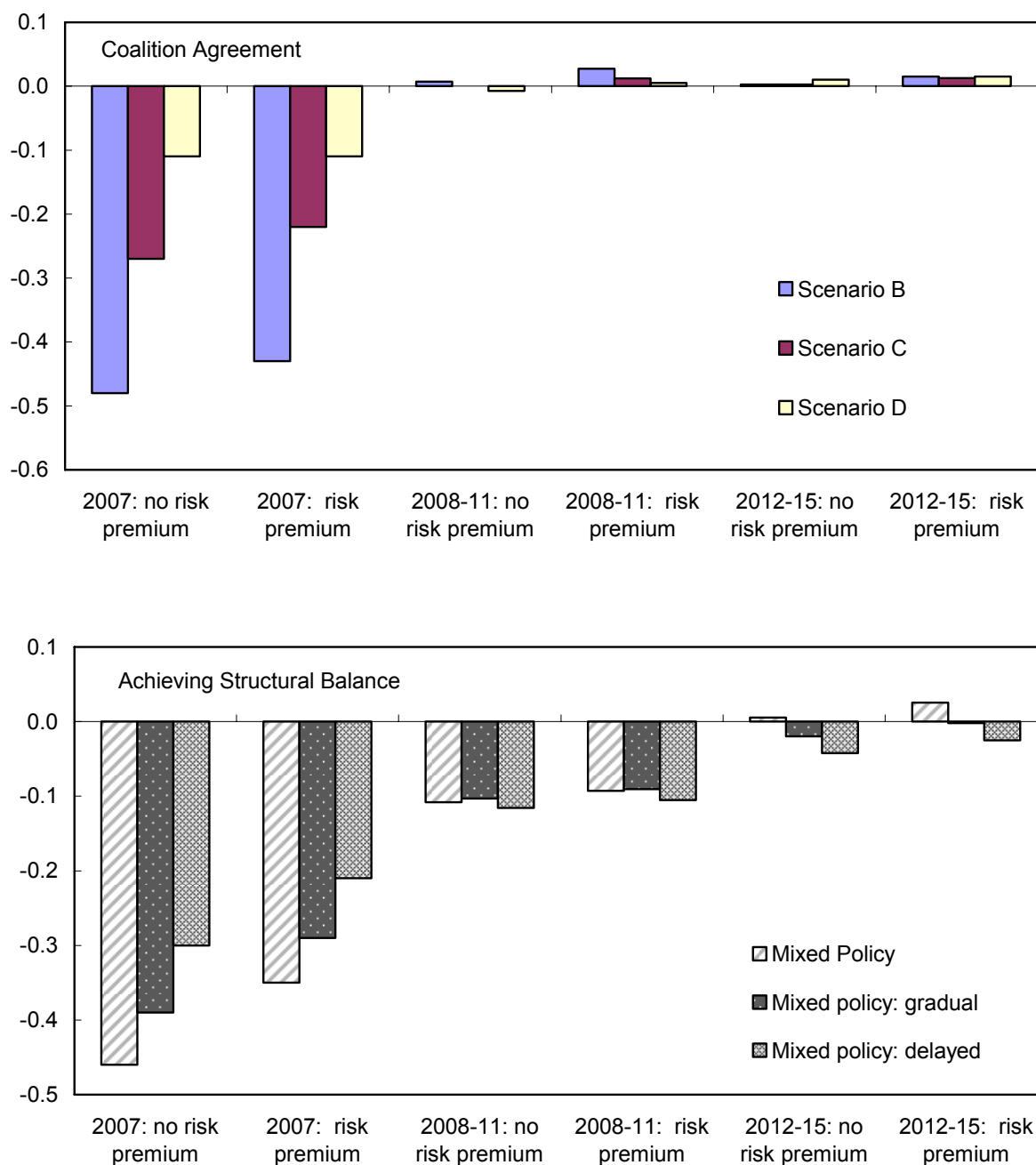
Source: GFM simulations.

Figure 12. Germany: Debt Ratio with Imperfect Capital Market Integration  
(Difference in debt relative to no-risk premium in percent of GDP)



Source: GFM simulations.

Figure 13. Germany: GDP Growth Effects of Varying Risk Premium  
(Deviation from baseline in percentage points)

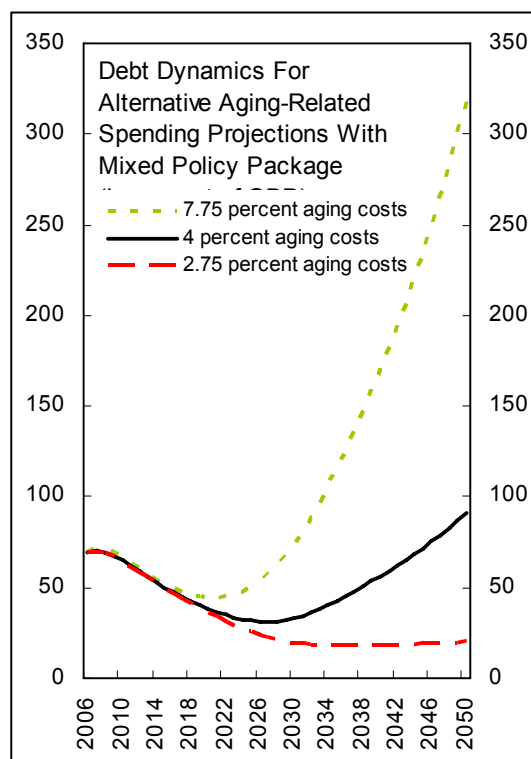


Source: GFM simulations.

The debt profile is highly sensitive to alternative assumptions about the cost of an aging population. Estimates for aging-related spending pressures range from  $2\frac{3}{4}$  percent of GDP to  $7\frac{3}{4}$  percent. The debt dynamics after 2025 are highly sensitive to the size of these costs, implying that, to help guide policies, the authorities should convene a group of independent experts to estimate aging costs, as is done for the preparation of joint tax estimates.

## VII. CONCLUSIONS

The government's planned tax policy measures for 2007–08 significantly improve the debt outlook and will achieve a more efficient tax system but do not secure fiscal sustainability. The GFM simulations suggest that the government's tax reforms increase labor demand and incentives to save and invest by moving from direct to indirect taxation. As the reforms lower the deficit path, the outlook for debt improves by about 60 percentage points of GDP but not yet to the point of long-run sustainability.



Fiscal adjustment necessarily leads to some sacrifice in growth and consumption in 2007 to address aging-related spending pressures. Real GDP growth, following the increase in the VAT rate, is estimated to slow by about  $\frac{1}{2}$  percentage point upon implementation, with a small effect on growth afterward. The proposed reduction in payroll taxes in 2007 would cut this impact on growth by half, while the planned reduction in corporate income taxation appears to be broadly neutral with respect to growth.

Beyond the tax reforms in 2007–08, achieving structural balance over the medium term would further significantly improve the debt dynamics and set aside resources for aging-related liabilities. Model simulations suggest that a  $\frac{1}{2}$  percent of GDP adjustment each year in the structural balance during 2008–11 would further significantly reduce government debt over the medium term. However, from 2030 onward, debt would start to increase again, and the debt-to-GDP ratio would rise to around 100 percent by 2050. Achieving structural balance by 2011, therefore, is no panacea.

Expenditure cuts and entitlement reform, in combination with measures to broaden the tax base and raising indirect taxes, compare favorably to raising direct taxes. Achieving structural balance by increasing payroll taxation—whether on workers or through social security contributions by employers—or by taxing corporate or personal income implies the largest efficiency losses. At the same time, relying on cuts in government spending or social security transfers alone would require large cuts that may be politically difficult. Eliminating

the structural deficit by 2011 through such a mix of expenditure and revenue measures lowers growth by about 0.2 percent per year.

Debt would be higher and adverse growth effects would occur later if achieving structural balance is delayed or occurs more gradually over time. Delaying adjustment to the 2011–15 period or phasing in adjustment more gradually to beyond 2011 would increase the debt ratio by 10 and 20 percent of GDP in the long run, respectively; meanwhile, adverse growth effects are broadly the same in magnitude although occurring later. Postponing reform to the longer run, however, (say, waiting until 2020) would have significant adverse growth effects, as the government would be forced eventually to apply much larger and, hence, more distortionary adjustment measures.

International spillover effects on growth and current account imbalances are moderate. Under the assumption that Germany is well integrated with international capital markets, the government's reforms will have only a moderate impact on international saving-investment balances. As consumption declines in Germany in 2007 following the higher VAT rate, demand for imports falls. At the same time, by strengthening government saving, the international financing environment would improve somewhat (less crowding out of saving). Over the longer run, less pressure from government debt supports more private sector investment and growth.

These results are robust to alternative assumptions about the structure of the economy and the sensitivity of consumers and producers to changes in tax and expenditure policy. However, the debt profile is highly sensitive to alternative estimates of the cost of an aging population. The simulations indicated moderate effects of reducing the elasticity of labor supply to after-tax real wage, lengthening the planning horizon of consumers, reducing the share of consumers excluded from financial markets, reducing the sensitivity of consumers to changes in the real interest rate, reducing price markups, or lowering the substitutability between capital and labor. The introduction of country-specific risk premiums makes consolidation less costly and reduces the direct output costs of achieving structural balance, but worsens the debt dynamics because of higher debt-servicing costs.

Table 1. Germany: Key Macroeconomic Variables in the Initial Steady State

National expenditure accounts at market prices (In percent of GDP)				
Expenditure ratios		Factor Incomes		
Private consumption	63.2	Capital		43.6
Government consumption	18.3	Labor		56.4
Investment	18.5	Government		
Exports	31.3	Debt		68.9
Tax rates and revenue				
Payroll taxes (worker and employer)		On personal income		
Effective tax rate	49.6	Effective tax rate		9.0
In percent of GDP	17.6	In percent of GDP		8.9
On corporate income		On consumption		
Effective tax rate	29.0	Effective tax rate		10.1
In percent of GDP	7.8	In percent of GDP		6.2
Trade flow matrix				
	Germany	Euro area 1/	EU new 2/	Rest of the world
GDP share (in percent of global output)	6.8	15.9	1.7	75.6
Total exports to:	31.3	19.8	36.8	4.2
Germany		6.2	14.5	1.2
Euro area 1/	13.2		13.3	2.7
EU new 2/	2.6	1.3		0.3
Rest of the World	15.5	12.2	8.9	

Source: IMF staff estimates.

1/ Euro area without Germany.

2/ 10 new EU member states and Bulgaria, Croatia, and Romania.

Table 2. Germany: Eight Illustrative Adjustment Strategies: 2006-11 1/

(In percent unless otherwise indicated)

	2006	2007	2011
VAT			
Statutory rate	16	19	24.5
Effective tax rate	10.1	12	15.5
Revenue, (in percent of GDP)	6.2	7.3	9.3
Labor income tax workers			
Effective tax rate	26.8	25.6	31.6
Revenue, (in percent of GDP)	8.8	8.4	10.4
Base broadening and higher labor income tax workers			
Base broadening			
Effective exemption rate 2/	15.0	15.0	1.5
Labor income tax			
Effective tax rate	26.8	25.6	27.3
Overall revenue effect, (in percent of GDP)	8.8	8.4	10.4
Labor income tax employers			
Effective tax rate	22.8	22.8	29.4
Revenue, (in percent of GDP)	8.8	8.8	10.8
Personal income tax			
Effective tax rate	9.0	9.0	11.0
Revenue, (in percent of GDP)	8.9	8.9	10.9
Corporate income tax			
Effective tax rate	29.0	29.0	34.9
Revenue, (in percent of GDP)	7.8	7.8	9.8
Social security transfers			
In the absence of fiscal adjustment (aging effect) 3/			
Spending, (in percent of GDP)	19.6	20.5	19.4
With fiscal adjustment			
Spending, (in percent of GDP)	19.6	20.5	17.4
Government consumption			
Spending, (in percent of GDP)	18.6	18.6	18.6

Source: IMF staff estimates.

1/ Adjustment of 1/2 percent of GDP during 2007-11 in addition to the coalition agreement.

2/ Fraction of average labor income that is tax exempt.

3/ Aging costs are projected to decline during 2007-11.

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