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The Global Effects of U.S. Fiscal Policy

by Kimberly Flood

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Abstract

The author examines the global impact of U.S. fiscal policy using the Bank of Canada's Global Economy Model (Lalonde and Muir 2007). In particular, she examines the global macroeconomic implications of the expiration of major tax cuts in the United States and of expected increases in U.S. entitlement program expenditures. The results of her analysis suggest that the expiration of previously enacted tax cuts in the United States will impose short-run costs on the U.S. economy. However, the rest of the world will benefit from an associated decline in the world real interest rate and from a redistribution of wealth linked to a partial reversal of global current account imbalances as U.S. government debt declines. The author's analysis of the expected increase in U.S. entitlement program expenditures, financed through debt, suggests that entitlement program expenditures will crowd out economic growth in the United States and the rest of the world.

JEL classification: H0, H2, H3
Bank classification: Fiscal policy; International topics; Regional economic developments

Résumé

À l'aide du modèle de l'économie mondiale de la Banque du Canada (Lalonde et Muir, 2007), l'auteure examine l'incidence de la politique budgétaire américaine à l'échelle internationale. Elle s'intéresse en particulier aux conséquences macroéconomiques mondiales que peuvent avoir l'expiration d'importantes réductions de taxes et d'impôts aux États-Unis ainsi que les hausses prévues des dépenses au titre des programmes américains de droits à prestations. Les résultats de son analyse donnent à penser que l'expiration de ces baisses de taxes et d'impôts imposera des coûts à court terme à l'économie américaine. Cependant, le reste du monde profitera d'une réduction du taux d'intérêt mondial réel et d'une redistribution de la richesse liée à la correction partielle des déséquilibres des balances courantes à l'échelle du globe, parce que la dette du gouvernement américain diminue. L'analyse faite par l'auteure de l'accroissement prévu des dépenses liées aux programmes de droits à prestations aux États-Unis (financé par endettement) indique que ces dépenses exerceront un effet d'éviction sur la croissance économique aux États-Unis et dans le reste du monde.

Classification JEL : H0, H2, H3
Classification de la Banque : Politique budgétaire; Questions internationales; Évolution économique régionale

1 Introduction

U.S. taxes and tax revenues could rise significantly over the next few years as major tax cuts are scheduled to be reversed. In addition, U.S. entitlement program expenditures under Social Security, Medicare, and Medicaid are expected to increase rapidly over the next two decades as the economy undergoes a demographic transition to an older population, and as health care costs continue to rise. These important changes in fiscal policy will likely have significant macroeconomic implications for the U.S. economy that may impact the rest of the world. We examine the outlook for the U.S. government sector, and the potential macroeconomic implications of current U.S. fiscal policy. In particular, we use the Bank of Canada's Global Economy Model (BoC-GEM) to explore the global macroeconomic implications of U.S. tax policy and entitlement program expenditures. The multi-region set-up of the BoC-GEM provides a useful framework to analyze the international transmission of U.S. fiscal policy shocks, since it explicitly models international linkages, permitting the analysis of direct and indirect international implications of country-specific shocks. Each expected change in U.S. fiscal policy is examined separately. Our simulations therefore provide policy-makers with a means to gauge the macroeconomic implications of each policy.

Results from our U.S. fiscal policy simulations suggest that the expiration of previously enacted tax cuts will induce short-run economic costs for the U.S. economy through a decline in real GDP. However, in the long run, the U.S. economy and the rest of the world will benefit from the increase in labour taxes and the reduction in U.S. government borrowing as real interest rates decline and world economic growth rises. In addition, an associated improvement in U.S. government debt will result in a partial unwinding of global current account imbalances. Nevertheless, the U.S. economy is facing a challenging period of rapidly rising entitlement program expenditures over the coming decades as the U.S. population ages. Simulation results suggest that, without significant changes in policy, the rise in government debt required to finance rising costs for health care and the aging of the U.S. population will crowd out economic growth in the United States and abroad. Furthermore, the increase in federal revenues associated with the expiration of previously enacted tax cuts is not nearly large enough to finance the expected increase in entitlement program spending. Of course, the economic damage associated with the expected increases in entitlement program expenditures could be avoided by adjusting policy to ensure adequate financing of the entitlement programs. This could be achieved through some combination of a decrease in program spending and an increase in program revenues. The sooner these policy adjustments are completed, the smaller will be the negative economic impact of the expected debt-financed increases in entitlement program spending.

The remainder of this paper is organized as follows. Section 2 provides background information on U.S. fiscal policy and examines the outlook for the U.S. government sector, including expected changes to U.S. tax policy and increases in entitlement program spending. Section 3 reviews the recent literature on the macroeconomic implications of fiscal policy. Section 4 provides an overview of the model we use to analyze expected changes in U.S. fiscal policy, the BoC-GEM. Section 5 describes the fiscal policy simulations and their results. Section 6 offers some conclusions.

2 Current Outlook for U.S. Fiscal Policy

Recent data on U.S. government finances show an improvement in the federal unified budget deficit. In fiscal year (FY) 2007, the budget deficit declined to 1.2 per cent of GDP from 1.9 per cent of GDP in FY 2006. As Chart 1 shows, the improvement in the budget deficit has largely been due to growth in federal revenues.[1] Official medium-term projections of the federal budget deficit from the Congressional Budget Office (CBO 2008) expect the deficit to decline gradually over the next five years until a budget surplus is obtained in FY 2012 (Chart 1).[2] The majority of the improvement in the deficit is expected to result from a continued increase in federal revenues as previously enacted tax cuts are reversed. Specifically, tax revenues are expected to rise as major tax cuts enacted under the Bush administration in 2001 and 2003 expire in 2011, and as tax relief from the Alternative Minimum Tax (AMT) expires at the end of tax year 2007.[3] A smaller portion of the expected improvement in the deficit results from a decrease in federal expenditures as defence outlays associated with the war in Iraq taper off. Moreover, federal expenditures are expected to moderate: official projections from the CBO (2005) assume that discretionary spending grows at the rate of inflation, which is lower than the projected growth rate of GDP.

1. Estimates by Swiston, Mühleisen, and Mathai (2007) suggest that 40 per cent of the recent increase in federal revenues can be explained by corporate profits growing faster than GDP, 40 per cent can be explained by capital gains, and the majority of the remaining 20 per cent can be explained by stronger income growth at the upper end of the income distribution. This stronger income growth implies higher average tax rates, given the progressive structure of the U.S. tax system.

2. These projections are required, by law, to assume that revenues and expenditures will grow as current law dictates.

3. The AMT is a secondary tax code in the United States. Individuals must compute their tax liabilities separately under the AMT tax scheme and under ordinary tax rates, and pay the higher of the two liabilities. See CBO (2007a) for a detailed explanation of the AMT, the 2001 and 2003 tax cuts, and their expected effects on federal revenues.

Despite the positive medium-term outlook for the U.S. budget deficit, the long-term outlook faces several challenges. As the population ages and health care costs continue to rise, spending on the major federal entitlement programs, including Social Security, Medicare, and Medicaid, is expected to accelerate and place increased pressure on federal spending, resulting in sustained federal budget deficits. Official CBO projections anticipate entitlement program spending to increase from 8.5 per cent of GDP in 2006 to 11 per cent of GDP by 2017, 15 per cent of GDP by 2030, and 19 per cent by 2050.[4] To put the expected increase in entitlement program expenditures into perspective, total U.S. government revenues as a share of GDP have historically averaged about 18 per cent, while expenditures have averaged around 20 per cent. Therefore, if entitlement program expenditures rise as currently expected, and government revenues and other forms of government spending remain at their historical averages, the rise must be financed through debt. We explore the implications of this in a global context.

We use simulations in the BoC-GEM model to examine the global macroeconomic implications of current U.S. fiscal policy by examining the impact of: the expiration of tax relief from the AMT, the expiration of the tax cuts enacted in 2001 and 2003, and the expected increases in entitlement program expenditures.

3 Literature Review

Previous researchers have examined the macroeconomic effects of fiscal policy. The majority of their studies focus on the role of government debt, since it plays an important role in the transmission of fiscal policy to the macroeconomy. The debate over the effect of government debt on the macroeconomy has centred on whether Ricardian equivalence holds.[5] Under the Ricardian paradigm, rational consumers are aware that current deficits imply higher future taxes and they increase their savings to fully offset an increase in the budget deficit. Thus, under Ricardian equivalence, budget deficits by themselves (i.e., holding government spending unchanged) should have no impact on the economy or on real interest rates. Agents are very forward looking and internalize the government's budget constraint into their own estimates of permanent income.[6] The majority of the academic literature rejects total Ricardian equivalence,

4. Spending on other federal entitlement programs is expected to decrease as a share of GDP going forward (CBO 2005).

5. Kormendi (1983) and Kormendi and Meguire (1986, 1990, 1995) find that Ricardian equivalence cannot be rejected; however, Feldstein (1982), Modigliani and Sterling (1986, 1990), and Feldstein and Elmendorf (1990) all reject Ricardian equivalence.

6. In this way, Ricardian equivalence is a synthesis of the government budget constraint and the permanent income hypothesis theories.

largely because agents are not effectively infinitely lived and because some agents are liquidity constrained. Therefore, it is important to examine the macroeconomic consequences of U.S. budget deficits and government debt, which are expected to rise rapidly under current U.S. fiscal policies.

3.1 Empirical evidence

3.1.1 Government budget deficits, debt, and private savings

The impact of an increase in the deficit-to-GDP ratio on private savings has been estimated empirically by, among others, Roubini (1988), Bosworth, Burtless, and Sabelhaus (1991), Anderson (1990), the CBO (1998), Elmendorf and Liebman (2000), and Gale and Potter (2002). The results of these studies suggest that private savings rise by about one-quarter of an increase in the budget deficit.[7]

3.1.2 Government budget deficits, expected deficits, and interest rates

The impact of budget deficits on interest rates is key to an analysis of the economic impact of fiscal deficits, since the extent to which budget policies crowd out investment depends crucially on the impact of budget deficits on interest rates. Early research incorporating deficit expectations used expectations derived from vector autoregression (VAR) analysis and found no link between expected budget deficits and interest rates (Evans 1987; Plosser 1987).[8] More recent studies have included published estimates of the budget deficit by the CBO or the Office of the Management of the Budget as proxies for market expectations of the budget deficit, and have found economically and statistically significant connections between anticipated future deficits and current long-term interest rates. Gale and Orszag (2002) summarize the literature and find that a 1 percentage point increase in the projected budget deficit-to-GDP ratio is predicted to raise long-term real interest rates by between 50 and 100 basis points.[9]

Some researchers have also examined the impact of changes in the expected debt-to-GDP ratio on interest rates. Laubach (2003) and Engen and Hubbard (2004) find that a 1 percentage point

7. As a result, these studies find evidence against Ricardian equivalence.

8. Elmendorf (1993) later criticized the use of VAR methods to capture deficit expectations based on the grounds that VAR-based measures of expectations are backward looking and may fail to incorporate information that may be widely available to market participants about future events, including the expiration of previous tax cuts.

9. For specific studies, please see Cohen and Garnier (1991), Elmendorf (1993), and Canzoneri, Cumby, and Diba (2002).

increase in the projected debt-to-GDP ratio raises future interest rates by 4 to 5 basis points and 2 to 3 basis points, respectively.[10] Results from these studies are consistent with the Bank of Canada's Model of the U.S. Economy (MUSE) (Gosselin and Lalonde 2005), in which the real interest rate rises by 3 basis points for every 1 percentage point increase in the government debt-to-GDP ratio.

In summary, the empirical literature provides evidence that expected future fiscal deficits increase current long-term interest rates. To the extent that private capital formation is sensitive to such interest rates, these findings suggest that government deficits crowd out private investment.

3.1.3 Government budget deficits and the current account

Government budget deficits may also help to explain fluctuations in current account balances. The current account balance is measured by private savings less investment less overall government budget deficits. This simple identity implies that increases in the government budget deficit may lead to larger current account deficits, which can become unsustainable in the long run. Therefore, to shrink a current account deficit, it is often recommended (by the International Monetary Fund [IMF], among others) that a fiscal deficit be reduced. However, the empirical evidence linking government budget deficits to current account deficits remains mixed. While some researchers conclude that a positive relationship exists between government spending and the current account deficit (Enders and Lee 1990; Chinn and Prasad 2000; Piersanti 2000), others find no relationship, and still others conclude that a negative relationship exists (Kim and Roubini 2004; Corsetti and Müller 2005). However, those who conclude that a negative relationship exists argue that their results do not weaken the case for fiscal adjustment: they find that government budget deficits crowd out private investment, and they assert that, by crowding out investment, a fiscal correction will strengthen the ability of the United States to generate the resources required to service external liabilities.

The results of this literature review, summarized in Table 1, suggest that budget deficits can have detrimental effects on the larger macroeconomy. Although an increase in the budget deficit is found to be partially offset by an increase in private savings, the literature suggests that budget deficits increase current real long-run interest rates and crowd out investment, thereby reducing economic growth.

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10. Laubach (2003) shows that his results are consistent with a 25 basis point increase in the long-run real interest rate for a 1 percentage point increase in the deficit-to-GDP ratio.

3.2 Model-based assessments of the U.S. fiscal position

Previous researchers have examined the macroeconomic implications of U.S. fiscal policy using large-scale models; however, their models have yet to be used to examine the global macroeconomic implications of upcoming changes to U.S. tax policy and expected increases in entitlement program spending. Instead, most of the previous studies have considered the effect of U.S. fiscal consolidation on global current account imbalances. Results from a selection of these models are summarized in Table 2.

Overall, the results of simulations of U.S. fiscal policy in large-scale macroeconomic models suggest that U.S. fiscal consolidation will reduce U.S. real GDP in the short run and increase real GDP in the long run. Furthermore, the results suggest that U.S. fiscal consolidation can assist in the resolution of global imbalances by reducing the U.S. current account deficit.[11] Therefore, most researchers conclude that an improvement in U.S. fiscal deficits should be part of a policy package to help increase savings in the United States and restore global imbalances. Near-term fiscal consolidation is generally recommended, since postponing consolidation increases the size of the fiscal adjustments required to restore current account sustainability. Finally, the results of these studies suggest that growth in the rest of the world benefits from U.S. fiscal consolidation through an increase in world savings and a reduction in real interest rates.

We simulate U.S. fiscal policy in the BoC-GEM, to develop a further understanding of the macroeconomic effects of its potential future paths. Each possible change to U.S. fiscal policy is examined separately: the expiration of AMT relief, the expiration of tax cuts enacted under the Economic Growth and Tax Relief Reconciliation Act (EGTRRA) and the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA), and the expected increase in U.S. entitlement program spending.

4 The BoC-GEM and its Calibration

4.1 The BoC-GEM

The BoC-GEM is the Bank of Canada's version of the Global Economy Model originally developed by the IMF.[12] It is a dynamic stochastic general-equilibrium model based on the optimizing representative-agent framework with consumers who maximize utility and producers

11. Models that allow the stock of net foreign liabilities to respond to permanent increases in government debt typically generate a larger current account response to a given debt reduction.

12. See Faruqee et al. (2007) for a description of the GEM, and Lalonde and Muir (2007) for a description of the BoC-GEM.

who maximize profit. The BoC-GEM is multi-region, encompassing the entire world economy in five regional blocks: Canada (CA); the United States (US); emerging Asia (AS), which includes China; commodity exporters (CX); and the remaining countries (RC), which consist primarily of Japan and the EU (since Africa is very small economically). Each of the five blocks is modelled symmetrically and consists of a continuum of firms, households, and a government sector. This section provides a brief overview of the attributes of the BoC-GEM that are pertinent to our fiscal simulations, including the consumers' optimization problem and the structure of the government sector.

In the BoC-GEM, consumers provide labour to produce goods, and they consume the final goods they help to produce. Two types of consumers exist: forward-looking consumers, who own all of the firms and the capital stock used by firms for production, and liquidity-constrained consumers, who have no access to capital markets and depend solely on their labour income to finance their consumption. Both types of households derive utility from consumption and leisure, with habit persistence present in both variables. Households in each region have access to two types of nominal bonds: a domestic (government-issued) bond denominated in domestic currency, and an international bond denominated in U.S. currency. The short-term nominal rates paid on each type of bond are controlled directly by the national governments. The U.S. currency bond is the only bond traded internationally and is in zero net supply worldwide. National households face intermediation costs when transacting in the international bond market.

The government in each region consists of a fiscal authority that collects and distributes tax revenues, and a monetary authority that provides a nominal anchor for the domestic economy. In its role as fiscal agent, the government consumes non-tradable goods, consumption goods, investment goods, and services, which it finances through taxation or borrowing. All national debt is held exclusively by domestic (forward-looking) agents. Tax revenues are received from various distortionary, lump-sum, and ad-valorem taxes, while expenditures in excess of revenues are financed through government bonds sold to domestic forward-looking agents. In the BoC-GEM, all component tax rates are controlled directly by the government, with the exception of the labour tax rate – a residual tax rate that adjusts so that the government can conform to a long-run debt-to-GDP ratio and to a size of government target set by the government. Permanent changes in the targeted level of the government debt-to-GDP ratio result in a permanent shift in the desired level of net foreign liabilities. This link is created through financial intermediation costs that are dependent on the desired holding of net foreign assets (NFA) and each region's discount rate relative to that of the United States. Therefore, if the targeted level of the debt-to-GDP ratio increases in the United States, investors in the rest of the world would require a higher

return on U.S. securities, leading to a higher share of U.S. assets in their portfolios or a reduction in net borrowing from the United States.[13] The response of the NFA position to the change in government debt is calibrated to mimic the properties of the Global Fiscal Model (GFM), the overlapping-generations model developed by the IMF.

In its role as the monetary authority, the government defines an objective for its monetary policy and uses the short-term nominal interest rate as its instrument. With the exception of AS, which is assumed to follow a nominal exchange rate peg relative to the U.S. dollar, all countries are assumed to target inflation (either headline or core) as their monetary policy objective. In the remaining regions, the exchange rates are assumed to adhere to a hybrid uncovered interest rate parity (UIRP) condition adjusted for risk through financial intermediation costs on the internationally traded bond. The BoC-GEM incorporates several non-Ricardian features, including liquidity-constrained consumers, an explicit link between the level of debt the fiscal agent holds and the level of NFA, and distortionary taxation, to allow for a detailed consideration of fiscal policy issues.

4.2 Model calibration

This section provides an overview of the model calibration related to our fiscal policy simulations.[14] Specifically, the calibration of key consumer behaviour parameters, the government sector, and international linkages are discussed, paying particular attention to the calibration of the U.S. variables.

In the BoC-GEM, key steady-state parameters for our fiscal policy simulations are associated with the shares of liquidity-constrained consumers and forward-looking consumers. In the United States, the share of liquidity-constrained consumers is calibrated to 15 per cent. Their presence, combined with the link between government debt and NFA, allows the model to stimulate the impact of a shock to government debt on output.

As the fiscal authority, the government of each region is assumed to target an explicit level of government debt, which is calibrated to 50 per cent of GDP in the long run for the United States. In the BoC-GEM, the government adjusts to the target level of debt through changes in the labour tax rate (τ_t), which is a smoothed function of past (τ_{t-1}) and expected future tax rates

13. If the target debt increased in another country at the same time, the U.S. premium would fall somewhat.

14. For further information on the calibration of the BoC-GEM, please see Lalonde and Muir (2007).

($E_t\tau_{t+1}$), adjusted upward when the current debt-to-GDP ratio (B_t/GDP_t) is different from the average of its current target ($B_{TAR,t}$) and its past observed level (B_{t-1}/GDP_{t-1}):

$$\tau_t = (\tau_{t-1} + \tau_t + E_t\,\tau_{t+1}) / 3 + \varnothing_{T1}\,((B_t/GDP_t) - \varnothing_{T2}\,B_{TAR,t} - (1 - \varnothing_{T2})\,(B_{t-1}/GDP_{t-1})). \qquad (1)$$

For our U.S. fiscal policy simulations, the smoothing parameter ($\varnothing_{T1}$) is calibrated to 0.0025 in the United States and the weight in the government debt-to-GDP ratio gap on the debt-to-GDP target ($\varnothing_{T2}$) is calibrated to 0.1 to allow us to generate a persistent shock to the labour income tax rate.[15] Net foreign assets are also calibrated to achieve a long-run steady-state value as a percentage of GDP.[16] In steady state, the U.S. maintains a negative NFA-to-GDP ratio of 50 per cent. Owing to its negative NFA position, the U.S. must generate a small trade surplus in the long run. In the BoC-GEM, the NFA-to-GDP ratio is assumed to converge to its desired level within 15 to 20 years following a shock.[17]

Given the link between government debt and NFA in the BoC-GEM, each country's initial NFA position will be an important determinant of the spillover effects of the U.S. fiscal policy shocks on the rest of the world. Table 3 provides further details on the steady-state government debt and NFA-to-GDP ratios for each region and each region's share of the world GDP. In the BoC-GEM, Canada, the commodity exporter, emerging Asia, and the remaining countries are assumed to absorb, respectively, 0.0, 17, 28, and 55 per cent of any adjustment in the U.S. NFA position. The calibration of these shares is based on recent trends in the stock of U.S. government debt held by each region, and on recent trends in flows of global holdings of U.S. government debt. Asia and the commodity exporter absorb more than their GDP weight in the world, which reflects the fact that these regions have recently been the driving force behind flows in U.S. government debt. The low weight in Canada also reflects the fact that recent flows into U.S. government debt have been driven by emerging Asia and the commodity exporters. The consequence of this calibration is that Canada will not benefit as much from a U.S. fiscal consolidation.

15. In all other regions, the smoothing parameter is calibrated to 0.005 and the weight in the government debt-to-GDP ratio gap on the debt-to-GDP target is unity.

16. Net foreign assets are measured as aggregate holdings of the internationally traded bond.

17. No empirical estimates are available on which to base the assumptions underlying this adjustment speed; therefore, it is chosen as a compromise between faster adjustment, which would result in strong deviations of the U.S.-dollar exchange rate from the UIRP condition, and slower adjustment, which would eliminate the stock-flow dynamics between the current account and the NFA position.

The calibration of international linkages in the BoC-GEM is important when examining the spillover effects of the U.S. fiscal policy shocks on other regions. Trade linkages in the BoC-GEM are calibrated based on current trends in trading observed in the COMTRADE database of the United Nations. The calibration of all bilateral trade flows in tradable goods between the regions in the BoC-GEM is illustrated in Chart 2. Table 4 shows the relative size of each region's trade flows; the trade flows in the United States are large relative to those in other regions, suggesting that changes in U.S. trade patterns may have large impacts on the rest of the world. In particular, the largest trading partners with the United States are Canada, emerging Asia, and the commodity exporter block. Furthermore, U.S. shocks transmitted through trade linkages may have particularly large implications for Canada, since trade accounts for a large proportion of the Canadian economy and the majority of Canada's trade occurs with the United States. In the other three regional blocks, trade accounts for a smaller, though still significant, share of GDP, with the United States accounting for an average of 38 per cent of each region's total trade flows. The large share of international trade flows attributed to the United States suggests that trade linkages will likely play a key role in transmitting the U.S. fiscal policy shocks to the rest of the world.

5 U.S. Fiscal Policy Simulations and Results

In this section, we examine separately the impact that the expiration of tax relief from the AMT, the expiration of the tax cuts enacted in 2001 and 2003, and expected increases in U.S. entitlement program expenditures would have on the U.S. economy and the rest of the world.

Given that the U.S. economy accounts for a large share of global output, and is a key player in world trade, shocks to U.S. fiscal policy will have spillover effects on the rest of the world. In the BoC-GEM, there are four main channels through which spillovers could occur:

(i) Trade Flows – A change in U.S. consumption or investment due to a change in U.S. fiscal policy would change import demand in the United States.

(ii) Exchange Rates – A change in U.S. fiscal policy would result in exchange rate movements with implications for global trade flows.

(iii) Savings and Investment Flows – A change in U.S. savings would affect demand in the United States, and would induce a wealth effect in the rest of the world through, in part, NFA.

(iv) Real Interest Rates – A change in U.S. fiscal policy would affect the world real interest rate.

Therefore, the overall impact of a shock to U.S. fiscal policy on a particular region would depend on each region's exposure to trade with the United States, its initial NFA position, its exchange rate movement vis-à-vis the U.S. dollar following a shock, and the new equilibrium world real interest rate.

Although our simulations of U.S. fiscal policy are useful for evaluating the global macroeconomic effects of changes in U.S. fiscal policy, four caveats should be noted. First, tax policy is subject to uncertainties, and several proposed changes to tax policy are not analyzed. Second, we examine each expected U.S. tax policy change separately and do not consider a combined scenario.[18] Third, we limit our analysis of the expected increase in entitlement spending to the United States, whereas age- and health-related spending is expected to increase globally. Fourth, simulations that involve large increases in government debt (including those of the increase in U.S. entitlement program spending) may be unrealistic: some researchers have found evidence that the U.S. government has historically taken corrective action when faced with an increasing debt-to-GDP ratio (Bohn 1998, 2005; Hamilton and Flavin 1986; Trehan and Walsh 1988, 1991). Nevertheless, current fiscal policies have been deemed unsustainable by several researchers (for example, Gale and Orszag 2004; Cardarelli and Towe 2004); therefore, it is important to analyze the macroeconomic effects of changes to U.S. fiscal policy.

5.1 U.S. tax policy simulations

In this section, we simulate two expected U.S. tax policy changes and their global macroeconomic implications: (i) the expiration of tax relief from the AMT, and (ii) the expiration of the tax cuts enacted in 2001 and 2003. We then discuss the dynamics of the global economy following each tax shock.

5.1.1 Expiration of tax relief from the AMT

Tax relief from the AMT expires at the end of tax year 2007. If this relief is not extended, AMT tax liabilities are expected to increase significantly. In 2009, when the largest impact of the AMT is felt, the expiration of AMT tax relief could boost tax receipts relative to GDP by about 0.5 percentage points (CBO 2007a).[19]

18. Results in the BoC-GEM model are linear around the steady state; therefore, the results of the two tax scenarios can be summed together to obtain a combined scenario.

19. The expiration of relief from the AMT would then continue to increase tax receipts for the indefinite future as the income for a greater number of people rises with inflation and surpasses the AMT exemption amounts that

The shock that is implemented in the BoC-GEM is a temporary but persistent increase in tax revenues of 0.5 per cent of GDP, achieved through an increase in the labour income tax rate. To generate an immediate and persistent increase in the tax rate on labour income, we combine a positive short-run shock to the labour income tax rate with a negative shock to the target level of the U.S. government debt-to-GDP ratio.[20] We believe that a temporary but persistent shock to the labour income tax rate allows us to replicate the initial expiration of tax relief from the AMT, given that government revenues in the United States have been stationary around their historical average.[21] To obtain the increase in tax receipts, we induce a fall in the long-run government debt-to-GDP ratio of 4.7 percentage points, which translates into a reduction in the long-run deficit-to-GDP ratio of about 0.2 percentage points. The magnitude of the shock introduced to labour income taxes is consistent with estimates of the size of the tax increase set to occur in 2009 due to the expiration of relief from the AMT. In practice, taxes paid under the AMT will continue to increase after the initial expiration of AMT relief; however, we limit our analysis to the initial shock.

After a shock to U.S. fiscal policy, the world real interest rate will adjust to re-equilibrate world savings and investment, given the large share of global output accounted for by the United States. In the BoC-GEM model, the world real interest rate does not respond endogenously to a shock to government debt; therefore, we shock the world real interest rate to generate a reasonable interest rate response. Specifically, the world real interest rate is reduced by 3 basis points for every 1 percentage point decrease in the long-run government debt-to-GDP ratio. This reduction is consistent with empirical estimates from reduced-form models (Laubach 2003; Engen and Hubbard 2004), and consistent with the real interest rate response observed in the Bank of Canada's MUSE (Gosselin and Lalonde 2005). Furthermore, the fact that it is the world real interest rate that is affected after a shock to U.S. government debt is consistent with the GFM, in which interest rates are equalized internationally in the long run. In our simulation, the increase in the labour income tax rate results in a fall of 4.7 percentage points in the debt-to-GDP ratio, and so we calibrate a fall of 14 basis points in the world real interest rate in the long run.

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are not indexed for inflation. The current relief package temporarily increased the AMT exemption amounts to prevent additional people from becoming subject to the AMT.

20. The direct shock to the labour income tax rate allows us to generate an immediate increase in that rate, while the shock to the government debt-to-GDP ratio allows for persistency in the shock to the labour income tax rate.

21. This would imply that the U.S. government will eventually modify the tax code so that tax revenues remain close to their historical average share of GDP.

The decline in the world real interest rate is achieved by calibrating an equivalent shock in the real interest rate across each region. In the BoC-GEM, a real interest rate shock in a given region is achieved through a shock to the rate of time preference. This is consistent with Laubach and Williams (2003), who find that both the growth rate of potential GDP and a shift in the rate of time preference can permanently affect the equilibrium interest rate without having a permanent effect on the growth rate of the economy. In the BoC-GEM model, a positive shock to the rate of time preference causes a reduction in the real interest rate by changing the supply and demand of savings. In particular, the increase in the rate of time preference causes people to become more patient in their consumption decisions, so that they increase their savings today and increase their consumption in the future. This global shift in savings behaviour causes a permanent reduction in the world real interest rate.

5.1.2 Expiration of tax cuts enacted in 2001 and 2003

The EGTRRA and the JGTRRA enacted major tax cuts in the United States in, respectively, 2001 and 2003.[22] These tax cuts were implemented with sunset clauses and expire on 1 January 2011. Their expiration is expected to raise projected tax revenues sharply in 2011 and 2012, boosting tax receipts by around 1.2 percentage points of GDP once all of the provisions have expired (CBO 2007a). However, the CBO (2007a) expects that total tax revenues will rise by approximately 1.5 percentage points of GDP over 2010–12, and that the remainder of the expected tax receipt increase will accrue due to the effect of inflation on the unindexed provisions of the tax code. We consider a shock of the magnitude of the total tax revenue increase expected over 2010–12. The shock is similar to the shock to labour taxes associated with the expiration of tax relief from the AMT; however, the size of the shock is tripled. Specifically, tax receipts as a share of GDP rise by 1.5 percentage points owing to an increase in labour income taxes, resulting in a 14.0 percentage point reduction in the steady-state level of government debt-to-GDP ratio and a 0.6 percentage point reduction in the U.S. deficit-to-GDP ratio.[23] The world real interest rate decreases by 42 basis points in response to the increase in labour taxes.

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22. These tax cuts were amended under the 2004 Working Families Tax Relief Act (WFTRA) and the 2006 Tax Increase Prevention and Reconciliation Act (TIPRA). All amendments of tax cuts are included in the revenue analysis.

23. Although some of the tax increases in 2011 and 2012 are due to dividends and capital gains taxes reverting to higher levels, the share of the tax increase allocated to these types of taxes is small (approximately 5 per cent); therefore, we assume that all of the tax increase occurs through an increase in labour taxes.

The effect of shocks in the BoC-GEM is linear around the steady state; therefore, the effect of the expiration of the 2001 and 2003 tax cuts on real variables in the BoC-GEM will be triple that of the expiration of tax relief from the AMT. For this reason, we present results for only the shock to labour income taxes associated with the expiration of the 2001 and 2003 tax cuts (Table 5 and Charts 3 and 4).

5.1.3 Dynamics of the global macroeconomy after an increase in U.S. taxes

On average, U.S. real GDP falls over the first five years following a labour income tax increase and a corresponding fall in the world real interest rate (see Chart 3).[24] The primary cause of the initial fall in GDP is a fall in consumption as labour effort declines in response to the increase in the labour income tax rate.[25] However, the overall decline in U.S. real GDP is minimal, since the decline in the world real interest rate induces a permanent decrease in the level of the rental price of capital and a corresponding increase in investment and capital stock. As a result, labour productivity and potential GDP rise permanently. In the long run, the tax increase benefits the U.S. economy. As the labour income tax rate returns to control, labour effort increases and consumption rises.[26] Furthermore, as labour productivity rises, the average real wage increases and provides an additional boost to consumption. Real GDP is higher in the long run, mainly as a result of higher investment and consumption. Overall, the impact on U.S. inflation is negligible.

The increase in the U.S. labour income tax rate is transmitted globally through its impact on the U.S. NFA position, the U.S. current account balance, U.S. trade, the U.S. real effective exchange rate, and the world real interest rate. The short-run reduction in consumption causes a fall in U.S. import demand and a corresponding improvement in the trade balance. The trade balance also benefits from an increase in exports as global demand for U.S. investment goods responds positively to the fall in the world real interest rate. Nevertheless, the trade balance deteriorates in the long run as the increase in consumption stimulates import demand. Despite the slight trade balance deterioration, the current account balance improves in the long run because of a decrease

24. We treat the expiration of relief from the AMT and the expiration of the 2001 and 2003 tax cuts as unexpected shocks to the tax code. As such, the results of these simulations may not capture preventative actions that rational agents may take prior to the expiration of the tax cuts. However, we believe that this treatment is reasonable given that U.S. policy discussions have centred on the extension of these tax cuts.

25. This response highlights the non-Ricardian features of the BoC-GEM, since consumption falls despite the temporary (but persistent) nature of the labour tax increase.

26. This is due to the temporary, but persistent, tax increase. In the BoC-GEM framework, a permanent increase in the labour income tax rate is not possible because it is the tax rate through which the government adjusts to its long-run debt-to-GDP target.

in interest payments and a fall in net foreign liabilities.[27] In the short run, as real GDP falls slightly, the U.S. dollar depreciates; however, in the long run, the U.S. dollar appreciates as the U.S. economy expands relative to control. Despite the long-run appreciation of the U.S. dollar, the real U.S.-dollar world prices of oil and commodities rise, owing to higher global output and demand for commodities. Given the steeper supply curve in the oil market and the fact that the United States accounts for a smaller portion of world commodities consumption relative to its share of world oil consumption, the rise in the price of oil is larger than the increase in commodity prices.

The rest of the world benefits from the increase in the labour income taxes and the fall in the world real interest rate (Chart 4). In emerging Asia, real GDP is higher in the long run, mainly owing to investment, which is boosted by the decline in the world real interest rate. Consumption in emerging Asia falls as its net foreign assets in the U.S. fall, and as it earns less on its U.S. assets owing to the decline in the world real interest rate. The trade balance in emerging Asia deteriorates in the short run as a result of a drop in U.S. demand for foreign consumption goods that reduces emerging Asia's exports to the United States. Nevertheless, the trade balance improves in the long run as the real effective exchange rate depreciates and induces a positive price substitution effect that reduces the price of emerging Asia's exports and increases their exports. Finally, given the large share of NFA holdings in emerging Asia, roughly half of the improvement in the U.S. current account balance comes from a slight deterioration in emerging Asia's current account surplus and NFA holdings.

In Europe and Japan, real GDP rises by less than in emerging Asia, due mainly to a smaller increase in investment following the shock. The positive impact on real GDP from the increase in investment is partially offset by a short-run fall in consumption, and by a deterioration in the trade balance. However, the deterioration in the trade balance is smaller than in emerging Asia, which reflects the fact that emerging Asia has recently been a larger net accumulator of U.S. debt and must bear a relatively larger share of the adjustment in the U.S. current account balance.

In the commodity exporter block, the long-run responses in real GDP, investment, and consumption are similar to those observed in Europe and Japan; however, the commodity exporter block experiences an appreciation in its real effective exchange rate, which is largely attributable to an increase in domestic currency earnings from commodities and oil. Partially

27. The fact that an increase in the government surplus induces an improvement in the current account balance reflects the twin-deficits hypothesis.

owing to the currency appreciation, which makes its exports more expensive, the trade balance in the commodity exporter block deteriorates. Furthermore, the current account balance deteriorates in the long run, reflecting the partial rebalancing of global current account positions.

In Canada, the long-run responses in real GDP and investment are also similar to those observed in the other regions of the world. Despite an initial decline, Canada experiences a long-run increase in consumption due to a positive wealth effect associated with the increases in the real U.S.-dollar prices of oil and commodities and with the increase in investment that boosts labour productivity, average real wages, and consumption. Moreover, the Canadian trade balance declines in the short run due to a drop in demand for its exports from the United States; however, it is largely unchanged in the long run. As a result, the Canadian current account balance is also roughly unchanged in the long run.

We conduct a sensitivity analysis around our base-case simulations of the expiration of tax relief from the AMT and the expiration of the 2001 and 2003 tax cuts.[28] First, we resimulate the labour tax shock but assume that the increase in the labour tax rate resulted in a fall in the U.S., rather than the world, real interest rate. We conduct this sensitivity analysis since, in the case of limited financial integration, it may be the case that a change in the U.S. government debt-to-GDP ratio would affect only the U.S. real interest rate. In this case, we find that the impact on domestic U.S. variables is essentially unchanged from the base-case scenario, with a similar long-run response of real GDP. Furthermore, the long-run improvement in the U.S. current account-to-GDP ratio and the NFA position is similar to the base-case scenario. However, in contrast to the base-case scenario, the U.S. real effective exchange rate depreciates in response to the increase in the labour income tax rate as the differential falls between the U.S. real interest rate and real interest rates in the remaining regions.

When we assume that the U.S. fiscal consolidation affects only the U.S. real interest rate, the rest of the world benefits less from the U.S. fiscal consolidation. The smaller positive output response in the rest of the world is associated mainly with smaller global increases in investment, which is consistent with the higher level of real interest rates in each region relative to the base-case scenario.[29] The exchange rate responses in the rest of the world also differ from the base-case scenario. Each region observes an appreciation in their real effective and real bilateral

28. Impulse-response functions are available from the author.

29. Nevertheless, investment in each region increases relative to control in the long run as each region benefits from an appreciation in its real effective exchange rate, which lowers the price of imported investment goods, making investment more attractive.

exchange rate with the U.S. dollar as their real interest rates rise relative to the U.S. real interest rate. As in the base-case scenario, the current account-to-GDP ratio in emerging Asia and the commodity exporter blocks deteriorates by more than in Canada, Europe, and Japan, which reflects the fact that these regions have accumulated large reserves of U.S. debt and will play an important role in the unwinding of that debt.

To verify the sensitivity of our results to our assumptions regarding the impact of U.S. tax policy on real interest rates, we resimulate the labour tax shock, omitting any shock to real interest rates.[30,31] In this case, the short-run costs to the U.S. economy from the fiscal consolidation are greater and persist for a longer period of time; however, output is roughly unchanged in the long run. The main reason real GDP is weaker in this scenario compared to the base-case scenario is that, in the absence of a fall in the world real interest rate, investment falls in response to an increase in labour income taxes. As a result, the short-run depreciation of the U.S. dollar is larger than in the base-case scenario. Nevertheless, the long-run improvement in the current account is similar to that observed in the base-case scenario. Overall, the impact on the rest of the world from the expiration of tax relief from the AMT is very small. Real GDP in each region is, on average, roughly unchanged, since increases in investment and consumption are offset by a fall in the trade balance. In Canada, the dynamics of the economy following the shock differ from those in the other regions. In Canada, the trade balance increases slightly in the short run as a small depreciation of the Canadian dollar reduces the price of Canadian goods, causing Canadian exports to increase (the price substitution effect). However, this positive effect is almost completely offset by a reduction in U.S. demand for foreign consumption and investment goods that reduces Canadian exports to the United States (the income effect). Consumption and investment both fall over the medium term, reflecting, in part, the depreciation of the Canadian

30. The results of this simulation are comparable to those obtained in Lalonde and Muir (2007). The main difference is that, in our work, the labour tax rate increase occurs more rapidly than in Lalonde and Muir (2007).

31. Other types of sensitivity analysis could also be performed. For example, we could examine the planning horizon of consumers and the sensitivity of consumption to changes in the interest rate. In general, consumers with a shorter planning horizon would decrease their consumption by more in response to the temporary, but persistent, increase in the labour tax rate; therefore, national savings would increase by a larger amount, real GDP would decline by more in the short run, and the improvement in the NFA position would be larger. Moreover, a lower intertemporal elasticity of consumption would imply that consumption is less responsive to real interest rate movements, and that the long-run increase in consumption would be smaller than we observe.

dollar, which increases the price of imported investment goods, causing a reduction in investment and labour productivity, which, in turn, reduces consumption.

Overall, although the expiration of relief from the AMT and the expiration of the 2001 and 2003 tax cuts pose short-run costs for the U.S. economy, the results of these simulations suggest that the long-run output gains outweigh the short-run costs. In the long run, fiscal consolidation benefits the United States and the rest of the world as real GDP increases relative to the steady state. Furthermore, the initial expiration of relief from the AMT and the expiration of the 2001 and 2003 tax cuts can reduce the current account deficit-to-GDP ratio by 0.2 and 0.7 percentage points, respectively. However, the overall reduction in the U.S. current account imbalance is minimal compared with the current size of the U.S. current account deficit (approximately 5.7 percentage points of GDP). Therefore, the expiration of the tax cuts alone would be unable to fully resolve global current account imbalances, suggesting that U.S. fiscal consolidation should be only part of a package of measures aimed at reducing U.S. external liabilities. Erceg, Guerrieri, and Gust (2005a) find a smaller response to the current account balance due to the exclusion of a link between government debt and the net foreign liabilities in their model; however, our results are comparable to Kumhof, Laxton, and Muir (2005), who include this link in the IMF's version of the GEM. Finally, the simulation results suggest that the expiration of relief from the AMT or the expiration of the 2001 and 2003 tax cuts will not provide enough of an increase in federal revenues to ensure adequate financing of the expected increases in U.S. entitlement expenditures.[32] Combined, the expiration of these tax cuts would provide the government with about one-third of the additional revenues needed to finance the increase in entitlement expenditures expected over the next 25 years.

5.2 U.S. entitlement program expenditure simulations

5.2.1 Expected increases in U.S. entitlement program spending

U.S. entitlement program spending is projected to increase over the next few decades as an aging population and rising costs of medical care increase expenditures for Social Security, Medicare, and Medicaid. For Social Security, the demographic transition to an older population poses the largest financing challenge. Over the next three decades, the older population (65 and above) receiving Social Security benefits is expected to double (CBO 2007b). As a result, the older population is projected to be more than one-third the size of the younger age group (20–64),

32. Had we simulated a permanent increase in labour taxes, or a shock that considered the impact of the increase in AMT tax liabilities over time, and not the initial impact, the tax policy changes would be capable of financing a greater proportion of the expected increases in entitlement program spending.

compared with one-fifth today. Consequently, absent any policy action, Social Security expenditures are expected to rise from around 4.3 per cent of GDP today to 6.1 per cent of GDP by 2030, and to 6.4 per cent of GDP by 2050.[33,34]

The financing challenge facing Medicare and Medicaid is much larger than that facing Social Security: in addition to the expenditure pressures associated with the aging of the population, Medicare and Medicaid expenditures as a share of GDP are expected to continue to rise rapidly, since health care costs per beneficiary are expected to continue to increase faster than per capita GDP. Expenditures on Medicare and Medicaid are expected to escalate from 4.2 per cent of GDP in 2006 to 7.5 per cent by 2030 if health care costs per enrollee grow 1 percentage point faster than real GDP per capita.[35]

Rising entitlement program expenditures clearly play an important role for the sustainability of U.S. fiscal policy. The expected increases in health care costs are the largest contributor to the long-run spending challenges facing the U.S. government. Unfortunately, no significant health care policy changes have yet been legislated that are expected to significantly alter the path of health care costs. If these costs do rise, as expected, even if the tax cuts and relief from the AMT are not extended, long-run fiscal projections indicate a rapid escalation in government expenditures and debt. Specifically, the combined increases in government spending on Social Security, Medicare, and Medicaid would escalate rapidly, from 20.3 per cent of GDP in 2007 to 27.1 per cent of GDP in 2030. Assuming that federal revenues remain at their historical average share of GDP (18.3 per cent), federal government debt would rise from 39.2 per cent of GDP to 96.9 per cent of GDP by 2030.

In this section, we consider the impact of rising U.S. entitlement spending on the global macroeconomy. Although it can be argued that rising age- and health-related expenditures are a

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33. Although Social Security is financed through a trust fund, it has an impact on government finances. The trust fund operates more like an accounting tool used to keep track of Social Security revenues and expenditures; however, actual revenues and expenditures are paid in and out of general government funds. In recent years, Social Security has received revenues in excess of expenditures, which has resulted in a smaller budget deficit for the United States. In the future, it is expected that Social Security will need to draw down its trust fund in order to pay benefits, and the draw down of trust fund assets will result in a larger budget deficit.

34. Regardless of how Social Security is reformed, retirees, current workers, or the government will bear the cost of retirement under current CBO projections of Social Security spending.

35. This outlook is quite sensitive to the projected rise in health care costs. For example, if health care costs grow at a lower rate, of 2.5 percentage points faster than growth in real GDP, then expenditures on Medicare and Medicaid will reach 9.4 per cent of GDP by 2030. Since 1990, health care costs per capita have risen 1.9 percentage points faster than growth in real GDP per capita.

global phenomenon, we limit our analysis to the global macroeconomic impacts of rising U.S. entitlement program expenditures. In particular, we assume that federal revenues remain at their historical average share of GDP, while spending rises to 27.1 per cent of GDP by 2030, causing government debt to increase to 96.9 percentage points of GDP. Therefore, we simulate an increase in federal government debt as a share of GDP by 60 percentage points that evolves over approximately 20 to 25 years (Table 6 and Charts 5 and 6). This reflects the expected increase in transfer payments for the major federal entitlement programs. To obtain an accurate response in the world real interest rate to the increase in U.S. federal age- and health-related spending, we calibrate the response of the world real interest rate such that it increases by 180 basis points (3 basis points for every 1 percentage point increase in the government debt-to-GDP ratio).[36]

In the short run, the increase in entitlement spending and the increase in the world real interest rate induce a small increase in U.S. real GDP (by an average of 0.3 per cent over the first year following the shock). The initial increase in real GDP is attributable to an increase in disposable income as transfers to households rise, providing a boost to consumption expenditures. However, in the long run, the increase in government debt and the associated increase in the real interest rate crowd out consumption and investment, causing real GDP growth to fall by about 6 per cent relative to the steady state. Consumption is crowded out in the long run because at some point the aggregate tax rate must rise to pay for the increase in transfer payments.

The long-run decline in real GDP relative to control occurs despite the fact that the trade balance increases in the long run owing to a reduction in demand for imported consumption and investment goods. Moreover, the improvement in the trade balance occurs regardless of a reduction in exports as economic growth abroad declines. Because the increase in government debt is partly financed abroad, the NFA-to-GDP ratio decreases by about 30 percentage points relative to steady state in the long run, causing a depreciation of the real effective exchange rate and helping to improve the trade balance. The current account-to-GDP ratio increases by an average of 1.0 percentage point over the first 10 years following the shock, and by about 2.8 percentage points in the long run as net foreign liabilities rise: the increase in net foreign liabilities and in the world real interest rate result in an increase in interest payments. In the long run, the real U.S.-dollar prices of oil and commodities fall as global consumption falls. The decline in the price of oil is larger than that observed in the price of commodities, since there is a faster adjustment in commodities demand following the shock, and since the United States

36. Owing to the increase in government debt, the U.S. deficit-to-GDP ratio worsens by about 2.6 percentage points.

accounts for a smaller share of world commodities consumption relative to its share of world oil consumption.

The increase in U.S. entitlement program expenditures and the corresponding increase in the world real interest rate crowd out economic activity abroad (Chart 6). In emerging Asia, real GDP is about 10 per cent lower in the long run relative to control, mainly owing to lower investment and consumption. Although the trade balance improves in the short run, it deteriorates in the long run as the real effective exchange rate appreciates, making exports from emerging Asia more expensive relative to exports from other regions in the world. Despite the long-run deterioration in the trade balance, the current account surplus increases by about 1.5 percentage points of GDP as emerging Asia finances a large portion of the accumulation of government debt in the United States through an increase in net foreign assets, and as the interest income on those assets rises with the increase in the world real interest rate.

Economic growth in Europe and Japan, the commodity exporter, and Canada suffers less than in emerging Asia following the increase in entitlement program expenditures and the increase in the world real interest rate. In the long run, real GDP growth is, on average, 5 per cent lower, since investment drops dramatically in response to the increase in the world real interest rate. Consumption growth is also crowded out in the long run in each region. In Europe and Japan, the exchange rate appreciates by about 4 per cent in the long run, contributing to a long-run deterioration of the trade balance. Compared with emerging Asia, Europe and Japan finance a smaller share of the increase in U.S. government debt through an increase in net foreign assets. This is reflected in an improvement in the current account balance in Europe and Japan of about 1 percentage point of GDP in the long run. The current account balance also improves as the increase in the world real interest rate results in an increase in interest income.

In contrast to the appreciation observed in Europe, Japan, and emerging Asia, the commodity exporter experiences a medium-term depreciation of its real effective exchange rate. The depreciation can be attributed to the medium-term decline observed in the real U.S.-dollar prices of oil and commodities as global growth falters. Owing to a positive price substitution effect brought about by the depreciation of its real effective exchange rate, the commodity exporter experiences a smaller long-run decline in its trade balance compared with other regions. Nevertheless, the commodity exporter finances a large portion of the expansion of the U.S. current account deficit through an accumulation of U.S. assets. In the long run, the commodity exporter’s current account improves by about 1.4 percentage points of GDP as net foreign assets, and the interest paid on those assets, increase.

In Canada, the real effective exchange rate appreciates by an average of 0.5 per cent over the first five years following the increase in U.S. entitlement program expenditures. However, in the long run, Canada's real effective exchange rate is roughly unchanged. Despite the short-run appreciation of the Canadian dollar, the Canadian trade balance improves in the short run as U.S. consumption and investment increase the demand for U.S. imports from Canada. Owing to the large share of Canadian trade completed with the United States, this causes a short-run improvement in the current account-to-GDP ratio. In the long run, Canada does not finance the deterioration of U.S. net foreign assets and it does not benefit from an increase in interest income; therefore, the current account is unchanged.

The effect of the increase in entitlement expenditures on the United States would be slightly different if we had considered a global shock to age- and health-related spending. In general, the effect of a global shock to entitlement program expenditures on domestic U.S. variables, including real GDP, consumption, investment, inflation, and interest rates, would be roughly unchanged from this base-case scenario. However, depending on the relative size of the expected increase in entitlement program expenditures in each region, the effects on the U.S. real effective exchange rate, NFA, and current account ratios would differ, as would the effects on each of the other four regions considered in the BoC-GEM. We leave the analysis of a shock of this type to future research.

Although we do not consider the case of a global shock to entitlement program expenditures, we do conduct a sensitivity analysis around several other simulations. In particular, we examine the case where the increase in entitlement program spending results in an increase in the U.S. real interest rate, in contrast to the world real interest rate.[37] In this case, the macroeconomic implications for the U.S. economy resemble those in the base-case scenario, with similar implications for consumption, investment, real GDP, net foreign assets, and the current account balance. However, in this case, the real effective exchange rate appreciates in the medium term due to the higher real interest rate in the U.S. economy relative to the rest of the world. Globally, real GDP improves relative to the base-case scenario and each region experiences depreciation in its real effective exchange rate as their real interest rates decline relative to the U.S. real interest rate. The smaller negative impact on real GDP globally is associated mainly with smaller global decreases in investment, which reflects the lower level of real interest rates in each region compared with the base-case scenario. As in the base-case scenario, emerging Asia and the

37. Complete results of the sensitivity analysis are available from the author.

commodity exporter experience the largest increases in their current account balances, since they redirect funds towards financing the increase in U.S. transfer payments and government debt.

We also examine the case where the increase in U.S. entitlement expenditures and the associated increase in the government debt-to-GDP ratio have no impact on either the world real interest rate or the U.S. real interest rate.[38] In this case, there are large positive benefits to the U.S. economy in the short run. On average, real GDP is about 1.3 per cent higher over the first 10 years following the shock. Disposable income responds positively to the increase in the transfer payments to households, boosting consumption and investment relative to steady state. However, as the labour income tax rate increases in the long run to maintain the government debt-to-GDP ratio at its new steady-state level, consumption falls by about 1.0 per cent. As a result, investment also declines in the long run (by about 0.25 per cent) and real GDP is about 0.5 per cent lower in the long run. Essentially, the increase in government debt involves a trade-off between growth today and in the future, since higher transfer payments today imply higher taxes in the future to meet the interest payment obligations on the debt. Furthermore, the increase in entitlement program spending results in a deterioration of the current account-to-GDP ratio by about 1.1 percentage points in the medium term and by about 0.6 percentage points in the long run. As a result, the NFA-to-GDP ratio deteriorates by about 30 per cent in the long run. These factors induce an appreciation of the U.S. real effective exchange rate in the short run and a depreciation in the long run. Globally, output is crowded out by the U.S. fiscal expansion, owing, in part, to large global declines in consumption and investment as funds are redirected towards paying for the increase in U.S. government debt. However, growth in Canada actually benefits from the increase in U.S. entitlement program expenditures, since Canadian exports to the United States respond positively to the increase in U.S. demand over the medium term. The Canadian exchange rate appreciates, which decreases the price of imported investment goods and induces an increase in investment. The majority of the increase in the U.S. current account deficit is financed by emerging Asia and the commodity exporter; Europe and Japan finance a smaller portion, while almost none of the increase in the U.S. deficit is financed by Canada.

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38. We could also conduct a sensitivity analysis around several other simulations, including the interest sensitivity of consumption, the share of liquidity-constrained consumers in the economy, and the planning horizon of consumers. In this case, if the interest sensitivity of consumers was higher than calibrated in the base-case simulation, consumption would be more responsive to movements in the real interest rate and it would decrease by more than observed in the base-case simulation. Furthermore, a larger share of liquidity-constrained consumers would increase the initial upwards adjustment in consumption and the positive short-run impact on real GDP.

Overall, the results of these simulations suggest that the expected increase in U.S. entitlement program expenditures, financed through debt, will crowd out economic growth in the United States and abroad. In the United States, real GDP benefits in the short run as entitlement expenditures rise; however, real GDP is significantly weaker in the long term. Of course, the U.S. government may react to the current outlook for U.S. entitlement expenditures by reducing program outlays or increasing taxes to pay for the increased expenditures. Simulation results suggest that tax receipts as a share of GDP would have to rise by 6 percentage points, or three times the combined impact of the expiration of the tax relief from the AMT and the 2001 and 2003 tax cuts, to pay for the expected increase in entitlement program expenditures.

6 Conclusion

The results of our U.S. fiscal policy simulations show that the expiration of the tax relief from the AMT and the expiration of the tax cuts enacted in 2001 and 2003 can impose short-run economic costs to the U.S. economy. However, in the long run, aggregate demand in the United States and the rest of the world benefits from the expiration of AMT relief and the 2001 and 2003 tax cuts, owing mainly to a corresponding fall in the world real interest rate. Furthermore, the simulations highlight the potentially important role that U.S. fiscal policy adjustment can play in the unwinding of global current account imbalances. In particular, the increase in taxes associated with the expiration of relief from the AMT relief and the expiration of the 2001 and 2003 tax cuts can result in an improvement in the U.S. current account deficit. Nevertheless, this improvement is small compared with the size of the adjustment required to reverse global current account imbalances: U.S. fiscal policy is only one factor behind such imbalances, and will therefore be only part of a successful adjustment package.[39]

The results of our study suggest that the initial expiration of relief from the AMT will:

- reduce the level of U.S. real GDP by 0.1 per cent, on average, over the first five years following the expiration of AMT relief, and increase real GDP by about 0.5 per cent in the long run
- improve the U.S. current account-to-GDP ratio by about 0.2 percentage points in the long run
- increase the level of Canadian real GDP by about 0.5 per cent in the long run

39. For example, high savings rates elsewhere have also contributed to current global current account imbalances.

The results of our study also suggest that the expiration of the 2001 and 2003 tax cuts will:

- reduce the level of U.S. real GDP by an average of 0.2 per cent over the first five years following the shock, and increase real GDP by about 1.5 per cent in the long run
- improve the U.S. current account-to-GDP ratio by 0.7 percentage points in the long run
- increase the level of Canadian real GDP by about 1.5 per cent in the long run

Our results also demonstrate the important economic costs associated with debt-financed increases in U.S. entitlement program expenditures as the population undergoes a demographic transition to an older population, and as health care costs continue to escalate: economic growth in the United States and the rest of the world is crowded out. The results highlight the importance of restructuring entitlement programs to ensure adequate debt-neutral financing going forward. This challenge is not unique to the United States and will be faced by many other nations over the coming decades, since the aging of the population and rising health care costs are global phenomena. The results of our study suggest that, ceteris paribus, the expected increase in U.S. entitlement program expenditures will:

- reduce the level of U.S. real GDP by about 6 per cent in the long run
- increase the U.S. current account-to-GDP ratio by about 2.8 percentage points in the long run
- reduce the level of Canadian real GDP by about 5 per cent in the long run

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Table 1
Responses to a 1 Percentage Point Increase in the Deficit-to-GDP Ratio

Private savings	• increase by between 0.2 and 0.65 percentage points
Current real long-run interest rates	• increase by between 50 and 100 basis points
Current account	• no clear consensus

Table 2
Model-Based Assessments of the U.S. Fiscal Position

Model	Non-Ricardian model attributes	Simulation and key findings
Erceg, Guerrieri, and Gust (2005a, 2005b) SIGMA	• Liquidity-constrained consumers	• Permanent 1 percentage point of GDP increase in the fiscal deficit • The trade deficit-to-GDP ratio increases by 0.2 percentage points
Faruqee et al. (2007) IMF Global Economy Model (GEM)	• Liquidity-constrained consumers • An explicit link between government debt and NFA • Distortionary taxation	• Permanent 60 percentage point of GDP reduction in government debt • The CA[1] deficit-to-GDP ratio improves by 1.75 percentage points in the long run
Lalonde and Muir (2007) Bank of Canada's Global Economy Model (BoC-GEM)	• Liquidity-constrained consumers • An explicit link between government debt and NFA • Distortionary taxation	• Permanent 20 percentage point of GDP reduction in government debt • The CA deficit-to-GDP ratio improves by 0.5 percentage points in the long run
Kumhof, Laxton, and Muir (2005) IMF Global Fiscal Model (GFM)	• Overlapping generations • Liquidity-constrained consumers • Distortionary taxation	• Permanent 40 percentage point of GDP reduction in government debt • The CA deficit-to-GDP ratio improves by 0.8 percentage points in the long run • The long-run world real interest rate falls by 80 basis points • Real GDP increases by about 4 per cent in the long run
Kumhof and Laxton (2007)	• Overlapping generations • Liquidity-constrained consumers • Distortionary taxation	• Permanent 14.7 percentage point of GDP reduction in government debt • The CA deficit-to-GDP ratio increases by 0.3 percentage points in the long run • The long-run world real interest rate increases by 40 basis points

1. CA = Canada

Table 3
Steady-State National Accounts
(Per cent of domestic GDP)

	CA	US	CX	AS	RC
Government debt	25.0	50.0	15.0	24.0	67.0
Net foreign asset	-7.5	-50.0	21.4	35.0	20.0
Share of world GDP (per cent)	2.4	30.1	9.3	10.6	47.7

Note: CA = Canada, US = United States, CX = commodity exporters, AS = emerging Asia, RC = remaining countries

Table 4
Trade Flows in the BoC-GEM

	CA	US	CX	AS	RC
Total trade flows relative to world GDP	1.8	8.4	4.4	5.6	8.5
Total trade flows relative to region's GDP	73.3	27.8	47.7	52.5	17.9
Imports from the U.S. (per cent of total)	60.9	NA	41.7	27.5	47.2
Exports to the U.S. (per cent of total)	80.1	NA	35.7	42.1	36.7
Total trade flows with the U.S. (per cent of total)	69.4	NA	39.1	32.7	42.1

Note: Total trade flows are calculated as the sum of imports and exports.

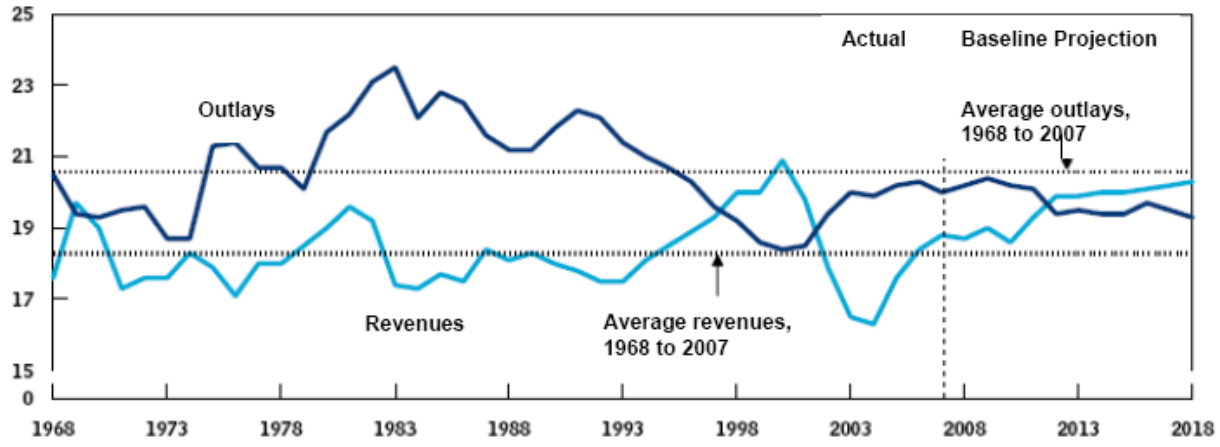
Table 5
The Expiration of the 2001 and 2003 Tax Cuts and a Fall in the World Real Interest Rate (deviations from control)

Variable	5-year average	10-year average	Steady state
United States			
Real GDP (per cent)	-0.20	-0.05	1.53
Consumption (per cent)	-1.31	-1.26	1.39
Investment (per cent)	2.06	2.51	3.70
Real effective exchange rate (per cent)	0.09	-0.05	-1.20
Trade balance/GDP (percentage points)	0.20	0.19	-0.29
Net foreign assets/GDP (percentage points)	0.61	1.58	7.45
Current account/GDP (percentage points)	0.35	0.38	0.71
Canada			
Real GDP (per cent)	-0.08	0.21	1.50
Consumption (per cent)	-0.95	-0.84	0.84
Investment (per cent)	2.00	2.55	3.61
Real effective exchange rate (per cent)	0.30	0.23	-0.02
Trade balance/GDP (percentage points)	-0.07	-0.02	-0.02
Net foreign assets/GDP (percentage points)	-0.21	-0.16	-0.09
Current account/GDP (percentage points)	-0.06	-0.01	-0.33
Commodity Exporter			
Real GDP (per cent)	-0.02	0.43	1.13
Consumption (per cent)	-0.38	-0.16	0.32
Investment (per cent)	2.46	3.35	3.53
Real effective exchange rate (per cent)	-0.03	-0.13	0.21
Trade balance/GDP (percentage points)	-0.27	-0.14	0.14
Net foreign assets/GDP (percentage points)	-0.91	-1.54	-3.72
Current account/GDP (percentage points)	-0.37	-0.28	-0.34
Emerging Asia			
Real GDP (per cent)	0.54	0.88	2.67
Consumption (per cent)	-1.51	-1.61	0.35
Investment (per cent)	4.35	5.20	5.59
Real effective exchange rate (per cent)	-0.09	0.02	0.54
Trade balance/GDP (percentage points)	-0.31	-0.27	0.21
Net foreign assets/GDP (percentage points)	-1.06	-2.19	-5.56
Current account/GDP (percentage points)	-0.44	-0.47	-0.39
Remaining Countries			
Real GDP (per cent)	0.17	0.46	1.29
Consumption (per cent)	-0.66	-0.55	0.36
Investment (per cent)	2.42	3.43	3.65
Real effective exchange rate (per cent)	-0.07	0.03	0.78
Trade balance/GDP (percentage points)	0.00	0.03	0.11
Net foreign assets/GDP (percentage points)	-0.14	-0.38	-2.34
Current account/GDP (percentage points)	-0.06	-0.09	-0.26

Table 6
An Increase in U.S. Entitlement Expenditures and an Increase in the World Real Interest Rate
(deviations from control)

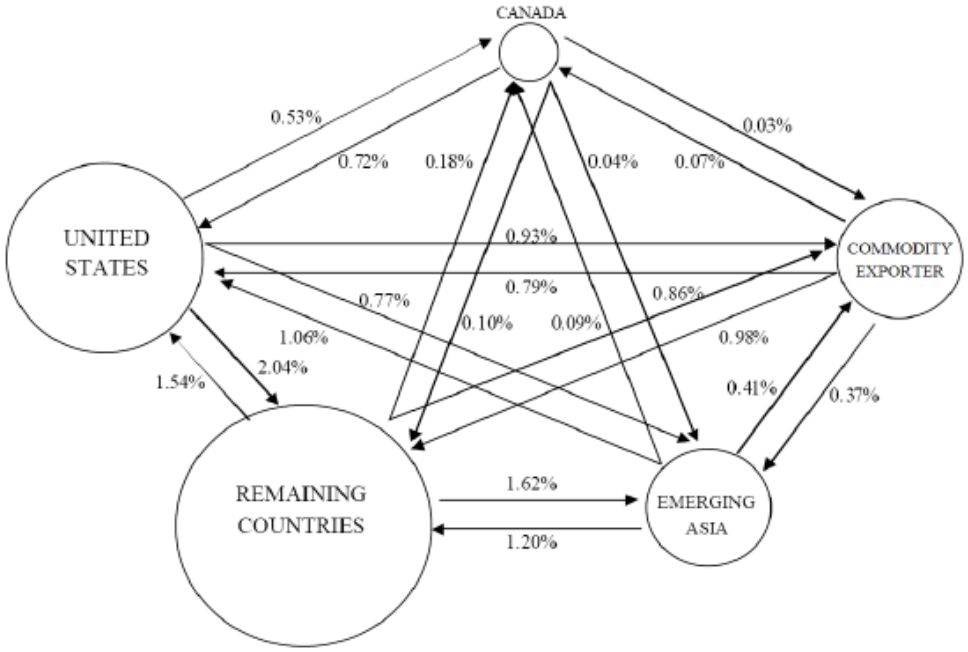
Variable	5-year average	10-year average	Steady state
United States			
Real GDP (per cent)	-0.56	-1.25	-5.92
Consumption (per cent)	2.56	2.31	-5.46
Investment (per cent)	-10.98	-13.13	-12.61
Real effective exchange rate (per cent)	1.64	1.95	4.55
Trade balance/GDP (percentage points)	0.12	0.17	0.99
Net foreign assets/GDP (percentage points)	-1.30	-2.85	-24.39
Current account/GDP (percentage points)	-0.52	-0.52	24.58
Canada			
Real GDP (per cent)	-0.08	-1.34	-5.83
Consumption (per cent)	3.22	2.69	-3.39
Investment (per cent)	-8.94	-11.31	-13.36
Real effective exchange rate (per cent)	0.03	0.01	0.15
Trade balance/GDP (percentage points)	0.39	0.16	0.10
Net foreign assets/GDP (percentage points)	1.14	1.13	-1.23
Current account/GDP (percentage points)	0.35	0.13	-4.98
Commodity Exporter			
Real GDP (per cent)	0.27	-1.38	-4.52
Consumption (per cent)	2.40	1.56	-1.38
Investment (per cent)	-9.15	-11.84	-14.34
Real effective exchange rate (per cent)	-0.88	-0.25	-0.44
Trade balance/GDP (percentage points)	0.55	0.05	-0.44
Net foreign assets/GDP (percentage points)	2.01	3.13	12.57
Current account/GDP (percentage points)	0.88	0.42	-11.98
Emerging Asia			
Real GDP (per cent)	-0.20	-1.41	-10.20
Consumption (per cent)	8.93	9.14	-1.78
Investment (per cent)	-12.06	-15.36	-21.51
Real effective exchange rate (per cent)	0.59	0.13	-2.51
Trade balance/GDP (percentage points)	-0.12	-0.03	-0.59
Net foreign assets/GDP (percentage points)	0.20	1.64	20.28
Current account/GDP (percentage points)	0.29	0.43	-11.89
Remaining Countries			
Real GDP (per cent)	-0.30	-1.33	-5.12
Consumption (per cent)	3.41	3.00	-1.55
Investment (per cent)	-9.16	-12.50	-14.52
Real effective exchange rate (per cent)	-1.81	-1.94	-2.54
Trade balance/GDP (percentage points)	-0.16	-0.11	-0.38
Net foreign assets/GDP (percentage points)	-0.39	0.13	7.15
Current account/GDP (percentage points)	0.04	0.12	-10.41

Chart 1
Federal Revenues and Expenditures
(per cent of GDP)



Source: CBO (2008)

Chart 2
Global Bilateral Trade Flows (all goods)
(per cent of world GDP)



Note: The sizes of the circles are representative of the percentage of world GDP attributed to each region.
Source: Lalonde and Muir (2007)

Chart 3
The Expiration of the 2001 and 2003 Tax Cuts and a Fall in the World Real Interest Rate – Effects on the United States
(Deviation from control, in per cent)

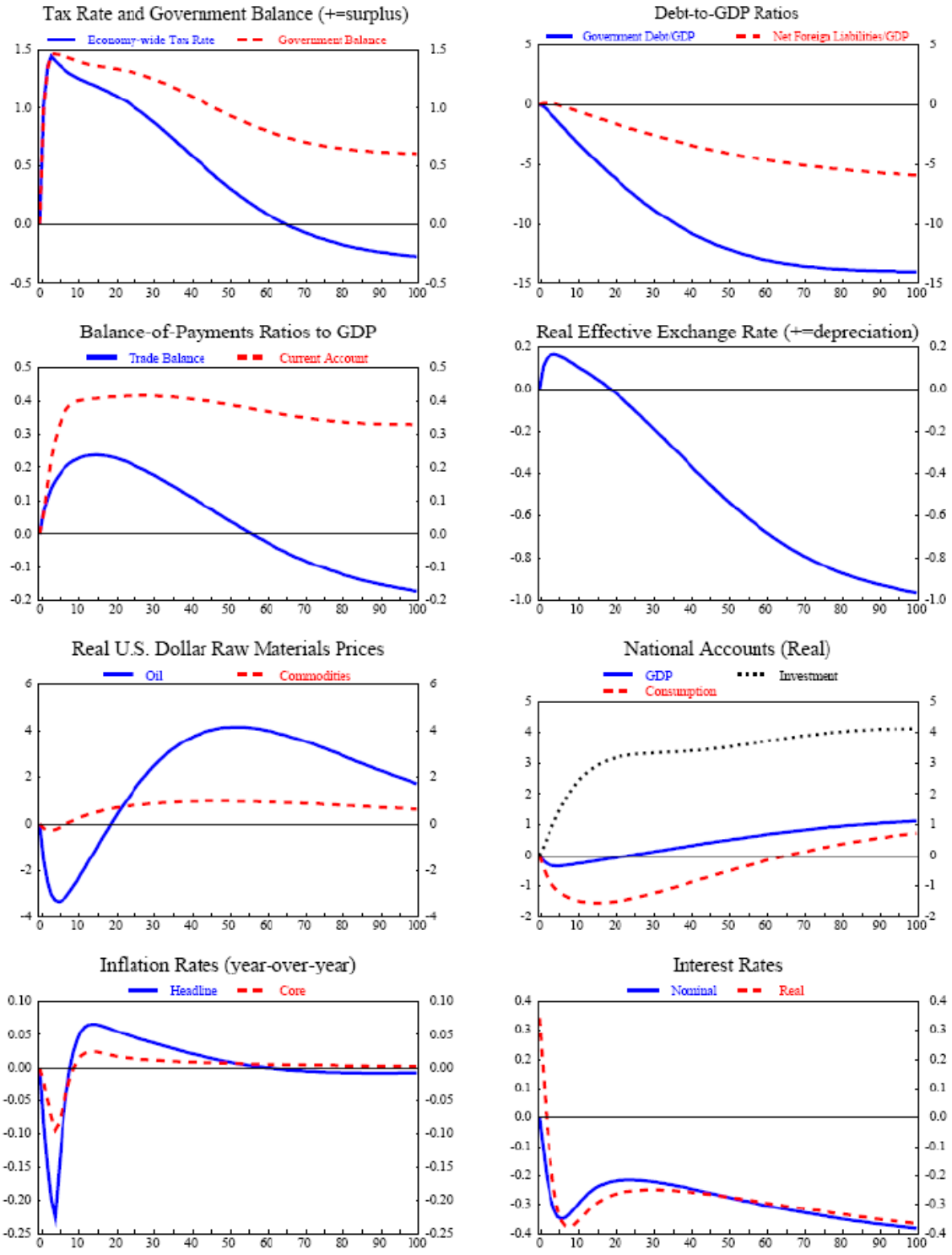


Chart 4
The Expiration of the 2001 and 2003 Tax Cuts and a Fall in the World Real Interest Rate – Effects on the Rest of the World
(Deviation from control, in per cent)

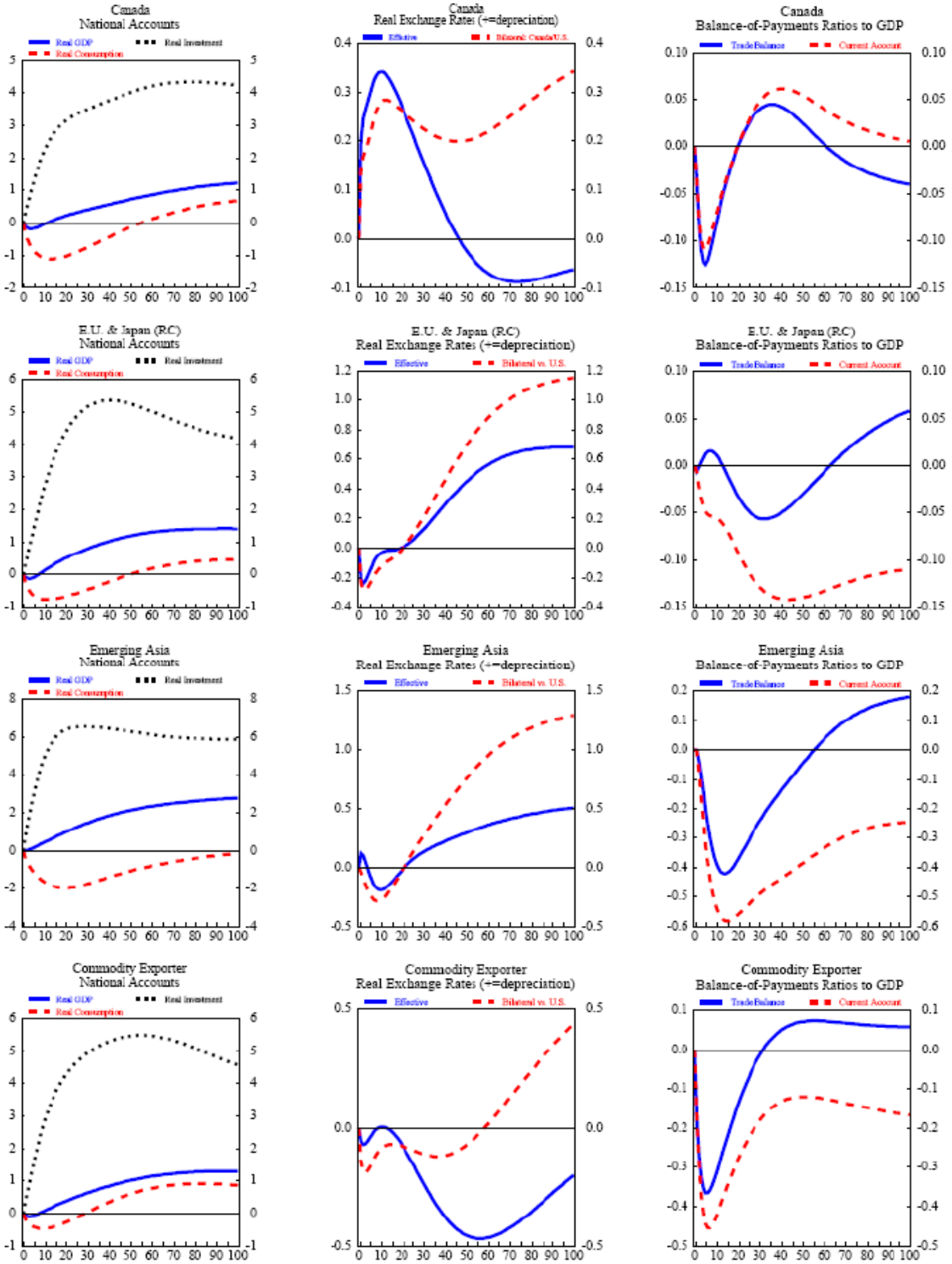


Chart 5
An Increase in U.S. Entitlement Expenditures and an Increase in the World Real Interest Rate – Effects on the United States
(Deviation from control, in per cent)

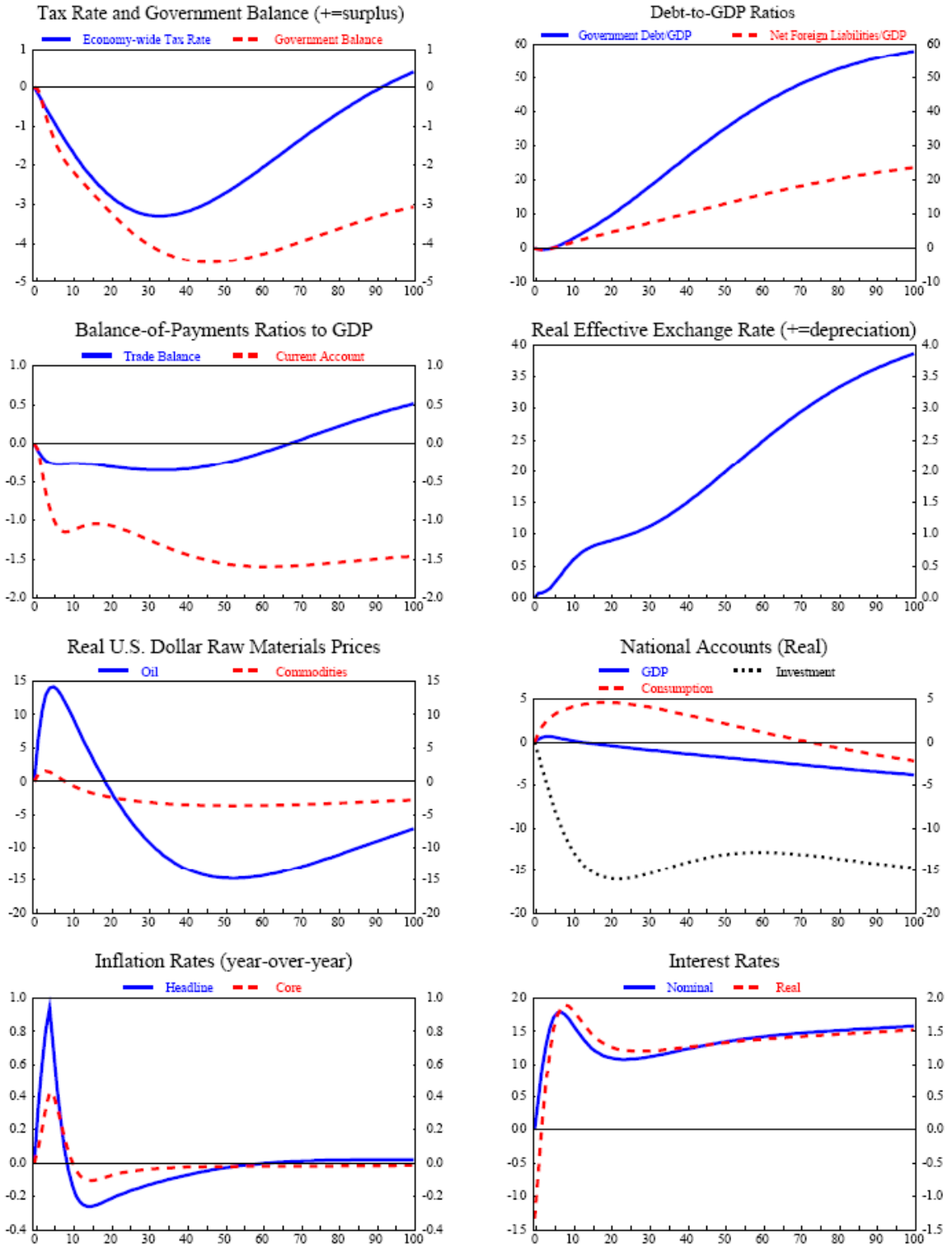


Chart 6
An Increase in U.S. Entitlement Expenditures and an Increase in the World Real Interest Rate – Effects on the Rest of the World
(Deviation from control, in per cent)