Technical Paper Series
Congressional Budget Office
Washington, D.C.

Macroeconomic Analysis of a 10 Percent Cut in Income Tax Rates

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May 2004

2004-07

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Abstract

This paper explores the effects of a simple policy change—a 10 percent tax cut—to shed light on the different models CBO uses to examine the macroeconomic effects of policy changes. Most of the models predict that such a simple tax cut will increase GDP and therefore that the revenue loss from the tax cut will be smaller than the conventional estimate predicts over the first 10 years. None of the models predict that as much as 25 percent of the conventional cost could be offset, however.

This paper is an expanded version of a paper presented at the National Tax Association's annual conference on November 14, 2003.

Introduction

The Congressional Budget Office (CBO) has for many years informed Congress of the economic implications of its fiscal policy decisions. Those analyses, contained in CBO's periodic reports on the budget and economic outlook and in other publications, generally refer to policies already in place and are intended to explain how CBO interprets the effect of fiscal policy on the economic outlook. They have always, and necessarily, considered the full range of possible macroeconomic effects.

More recently, in response to congressional demand, CBO has undertaken extensive analyses of the President's budget proposals for fiscal years 2004 and 2005; CBO's analysis examined how those proposals, if enacted, might affect the outlook for the economy in the subsequent 10 years.[1] The first of those analyses, which dealt with a prospective rather than an enacted policy, was a departure for CBO. However, it used tools that CBO has developed over a number of years.

The details on how CBO conducted its analyses of the President's budget proposals and on the models it used are available on CBO's Web site.[2] However, the President's proposals were complex, including changes in many different provisions of both taxes and spending. In this paper, we use the same tools to examine a much simpler proposal: a 10 percent reduction in personal income tax rates. This experiment illustrates how CBO's models work and provides some insight into the implications of alternative assumptions.

A macroeconomic analysis requires a more comprehensive specification of the budgetary experiment than does a conventional analysis. In the case of a 10 percent reduction in personal income tax rates, the macroeconomic analysis requires making specific assumptions about how the tax cut will be financed—for example, by borrowing, raising other taxes, or spending less—in each year in the 10-year budgetary window. Moreover, to the extent that the tax cut induces cumulative budgetary shortfalls or surpluses, the analysis must specify the corresponding offsetting policy outside the budgetary window. The additional specificity allows for a more comprehensive accounting of budgetary consequences than the conventional estimates made for scoring purposes can provide. Those budgetary consequences include the initial decline in receipts; revenue gains and outlay decreases stemming from higher GDP; and additional interest costs from higher borrowing.

The paper reviews the details of the experiment; the macroeconomic models we used in the analysis; the calculation of impacts on effective marginal tax rates; and the results of the analysis.

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1. Congressional Budget Office, *An Analysis of the President's Budgetary Proposals for Fiscal Year 2004* (March 2003) and *An Analysis of the President's Budgetary Proposals for Fiscal Year 2005* (March 2004). All CBO documents referred to in this paper are available on CBO's Web site, www.cbo.gov.

2. Congressional Budget Office, *How CBO Analyzed the Macroeconomic Effects of the President's Budget* (July 2003).

The Budget Experiment

The analysis is based on CBO's January 2003 economic baseline, adjusted to use tax rates consistent with the Jobs and Growth and Tax Relief Reconciliation Act of 2003 (JGTRRA). Because the experiment looks at additional tax cuts beyond those included in JGTRRA, the estimated effect of further tax cuts is somewhat smaller in the years 2004 and 2005 than if pre-JGTRRA tax rates had been used.

The experiment cuts all federal individual income tax rates by 10 percent, including the following:

- rates on ordinary income;
- rates on long-term capital gains and dividend income; and
- alternative minimum tax rates.

Rates are assumed to be cut on January 1, 2004, and the reduction in revenues is matched by increased deficits for 10 years. Some of our simulations involve forward-looking models, for which policy after the 10-year horizon is also important. We examined a range of policy assumptions in those cases, as discussed below.

While this experiment cuts federal income tax rates by a uniform amount, the effective tax rates on labor and capital would drop non-uniformly and by smaller amounts. The experiment does not change either state taxes or social insurance tax rates; as a result, the effective tax on labor, which includes those taxes, would drop by only 5 percent to 6 percent, not 10 percent. Similarly, because neither corporate taxes nor state taxes on capital income would change, effective tax rates on capital income would drop by only about 3 percent (see Table 1).[3]

Conventional Estimate

CBO's analysis of the effects of a tax proposal starts with the conventional or scoring estimate that the Joint Committee on Taxation (JCT) provides. That estimate reflects the following:

- JCT's estimate of the "static" cost of the tax cut, that is, the effect of reducing rates assuming that taxable incomes do not change; and

- JCT's estimate of changes in taxable income as a result of the tax cut that can be accounted for even under the fixed GDP convention. Those include changes in the timing and form of income and deductions as well as changes in compliance. For example, with a lower personal income tax rate, individuals may receive more in taxable

3. The levels of effective marginal tax rates in Table 1 are lower than some others in the literature because they include untaxed capital such as housing, and they also reflect the proportion of income that accrues to untaxed or tax-preferred entities such as pension funds.

wages and less in non-taxed fringe benefits, and businesses may choose the non-corporate organization form in order to qualify for the lower individual tax rates.

For these experiments, we also started with estimates kindly provided by JCT (see Table 2). JCT estimated a conventional revenue loss of $466 billion over the first five years (2004 through 2008) and $775 billion over second five years. The reductions in ordinary and AMT rates account for almost all of the revenue loss, and very little (less than $28 billion over 10 years) comes from reductions in rates on capital gains and dividends.[4]

The macroeconomic analysis would not be complete unless it also took into account the effects of the proposal on interest costs, which are not reflected in the conventional scoring estimate for any proposal. Interest costs cannot be calculated without knowing how the proposal is to be financed—information that is not generally available for specific tax or spending proposals without more assumptions than a legislative proposal provides. In this exercise, we have made an explicit assumption that the tax cut is to be financed by borrowing in the first 10 years. That assumption allows us to calculate the implications for debt service—again, before taking into account any macroeconomic effects such as changes in interest rates. Adding debt service increases the budgetary cost of the tax cut by about 25 percent over 10 years.

Models for Macroeconomic Analysis

CBO does not believe that any single model can adequately explore the macroeconomic implications of fiscal policy: the best that analysts can do is to combine the separate insights that they can glean from different models. For example, the President's 2004 budget proposal, put forward at a time of economic weakness, was intended to accelerate recovery from recession. But it also had implications for incentives to work and to save, as well as for overall national saving. The simple tax cut examined here would also have those effects. To examine how the tax cut would stimulate demand in the short run, we used models that allowed for macroeconomic disequilibrium and for a role for fiscal policy in stimulating aggregate demand relative to aggregate supply. For that reason, we used two commercially available Keynesian models in our analysis, those of Macroeconomic Advisers (MA) and Global Insight (GI).

Those models cannot address the effects of alternative assumptions about the financing of tax cuts, however, because they do not allow consumers and workers to anticipate the likely implications of current policies for future taxes and government spending. For that reason, we also use two forward-looking general-equilibrium growth models developed by CBO staff. Those are the same models as CBO used in its analyses of the President's budget for fiscal years 2004 and 2005.

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4. CBO's analysis of the President's budget for fiscal year 2004 calculated the effects of the proposed dividend tax changes on the cost of capital and on stock prices under two alternative views of how dividend taxation affects the economy. That analysis also estimated efficiency effects from capital reallocation. However, the change in the dividend tax rate is small in the proposal examined here and is likely to have little effect on the overall results, so we did not repeat that extensive analysis.

All of those models are fairly complex, with results that can be quite difficult to interpret. For comparison purposes, therefore, we also include results from a simple textbook growth model—the same one that CBO regularly uses to make its 10-year baseline projections.

Keynesian Models. The two Keynesian models embody what is often known as the neoclassical synthesis—that is, they model short-run demand dynamics while imposing the long-run structure of a neoclassical growth model. They include all the major macroeconomic variables, describing demand, supply, and inflation processes; they also include financial sectors. While prices are sticky and markets do not clear in the short run, excesses of aggregate demand eventually dissipate through higher inflation. (Thus, the long-run Phillips curves in these models are vertical.) The models have as their supply-side core a growth model in which potential GDP depends on investment and on labor supply, along with largely exogenous total factor productivity growth[5]. Generally speaking, shocks to such models generate cycles that are about the same length as business cycles, though the characteristics of those cycles depend a great deal on the monetary policy assumptions made. Personal tax cuts increase GDP in these models in the short run mainly because they increase after-tax incomes and hence consumption spending. Both models are estimated econometrically, using historical time-series data.[6]

We used the results of the Keynesian models for only the first five years. We did this for two reasons. First, the models' strength is in their analysis of demand effects, which are increasingly harder to estimate as the projection extends into the future. Second, although the models contain an underlying growth model, their results do not converge to growth-model results within the 10-year budget window. Instead, they continue to cycle. However, the timing of those cycles is highly uncertain and extremely sensitive to parameters of the models that are likely to be poorly estimated. Thus the results could be quite unreliable after a few years.

We made three different kinds of adjustments to the models. The first, uncontroversial, set of adjustments realigned the models' baselines to approximate real and nominal incomes, spending, revenues, investment, and interest rates in CBO's baseline. In CBO's experience, some effort to approximate a standard baseline is an important, though time-consuming, step.

The second set, perhaps a little more controversial, corrected for some behaviors in the models that seemed unhelpful to the analysis. Large macro models such as these are built mainly with the commercial forecasting market in mind and may have features that diminish their usefulness for policy analysis. For example, the GI model includes what appears to be a poorly supported feedback from changes in capacity utilization to stock prices. When CBO staff use such models, they scan the results to find elements that appear questionable and, by eliminating them, hope to improve the estimates of the effects of fiscal policy. The staff of MA and GI, the model

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5. In the GI model, total factor productivity depends in part on spending on R&D.

6. For details of the GI model, contact Cynthia Latta at Global Insight Inc., 1-800-933 3374. For the MA model, see Macroeconomic Advisers, LLC, *WUMMSIM for Windows: Version 1.6 Model Book* (September 2000).

providers, make similar adjustments when they use their models for policy analysis. The downside is that other users of the same models may make different adjustments and thus get somewhat different results for the same policy simulations.

Finally, we strengthened the supply-side effects in the models. In the MA model, labor supply does not respond to changes in after-tax wages and therefore is not directly affected by a reduction in tax rates. In the GI model, labor supply does respond to tax rates but only weakly. As a result, without adjustment, the models would predict that tax cuts would yield a relatively small increase in potential GDP, which would limit the extent to which increases in demand could add to GDP without causing inflation. To allow the models to describe the demand response appropriately, we forced the labor supply in both models to increase according to our calculations (see Box 1).

The Keynesian models require assumptions about monetary policy. Different monetary policy assumptions may be appropriate at different times. For example, when a policy change occurs in the middle range of a business cycle, with GDP close to its sustainable level, it may be appropriate to assume that the Federal Reserve will not alter its target for the unemployment rate and thus will tend, on average, to offset much of fiscal policy's effect on aggregate demand. On the other hand, when the economy is very weak and the Federal Reserve is running out of options for stimulating demand through monetary policy, it may welcome a boost to aggregate demand from fiscal policy. In that case, there will be little or no monetary offset to a tax cut or other stimulative fiscal policy.

We examined two alternative assumptions about monetary policy. In the first, the Federal Reserve follows a Taylor rule, setting the real federal funds rate to reflect what is happening to both inflation and real GDP. In the second, the Federal Reserve adjusts monetary policy to keep the unemployment rate at baseline, thus completely offsetting any demand effects from the policy but allowing supply-side effects to go though. Those alternative assumptions—especially the second—are not meant to be realistic predictions of how the Federal Reserve might actually respond but are included to show the range of implications of alternative assumptions. The second assumption is also useful analytically because it helps isolate the supply-side impacts of tax cuts in the models.

Box 1. Out-of-Model Labor Supply Calculations

The impact of lower tax rates on labor supply is an important part of the overall macroeconomic effect of tax cuts. In CBO's general-equilibrium models, those labor-supply effects come from more fundamental assumptions about utility functions and the maximum number of hours people can work in a year. In the textbook growth model and the commercial macroeconomic models, by contrast, labor supply effects must be specified directly. The models show either a small (GI) or zero (MA and the textbook growth model) elasticity of labor supply to after-tax wages. Both small and zero elasticities can be found in the literature on labor supply, but our best estimate is that uncompensated labor supply elasticities are positive and larger than GI's prediction, averaging about 0.1 for men and 0.5 for women. See Congressional Budget Office, *Labor Supply and Taxes* (January 1996); CBO's informal review of later studies does not significantly alter its estimates.

Our calculations used a microsimulation model based on tax returns that reflects the tax code in great detail. For each taxpayer in the sample, the model calculates changes in after-tax income and wage rates. Labor supply changes are calculated based on elasticities that are fixed for secondary workers (where the data are thinner) but vary by income class for primary workers. The spread of elasticities for primary workers across income classes comes from Juhn et al., *Current Unemployment, Historically Contemplated* (BPEA 2002:1), adjusted to yield an overall uncompensated elasticity of 0.1. The implied substitution elasticity is 0.15 for primary workers and 0.75 for secondary workers.

That microsimulation model predicts that the 10 percent cut in taxes would increase labor supply by about 0.5 percent. We imposed that estimate in both of the commercial macroeconomic models and in the textbook growth model. The general-equilibrium models predicted much larger changes in labor supply impacts (see Appendix Table A-2).

General-Equilibrium Growth Models. The general-equilibrium (GE) growth models that we used, although complex, are still in some ways much simpler than the Keynesian models. They have no aggregate prices, money, or financial sectors; they do not contemplate disequilibrium, so they cannot be used to examine the ways fiscal policy can shift demand relative to supply; and they assume that agents (workers and savers) are forward-looking and know as much about future fiscal policy as does the modeler.

The GE growth models also have two important strengths relative to the Keynesian models:

- Agents' decisions are based on utility functions rather than on historical relationships that reflect mixtures of fundamental parameters and accidental circumstances; and

- Government policies obey an intertemporal budget constraint.

We used two GE growth models in this analysis. One is a stochastic OLG model, in which agents' decisions reflect the uncertainty of both their own life span and their own relative income. There is no aggregate uncertainty in the model, so agents can know with certainty what prices (interest rates and wage rates) they face. But the uncertainty about an individual's life span and future income means that agents have a precautionary as well as a life-cycle motive for saving. The amount of uncertainty is enough to generate a plausible volume of accidental bequests. The model can be run in both closed-economy and open-economy versions, which provides a useful check on the robustness of results. This model, developed by Shinichi Nishiyama, is described in a number of papers on CBO's Web site, most recently in Nishiyama , *Analyzing Tax Policy Changes Using a Stochastic OLG Model with Heterogeneous Households,* Technical Paper 2003-12 (December 2003).

The other GE growth model is an infinite-horizon model along lines originally suggested by Frank Ramsey. The model assumes that agents are alike and that they value the utility of future generations as much as they do their own, discounting it in the same way. Thus, in essence, agents in the model behave as if they had infinite lives. The model focuses on the incentive effects of changes in tax rates. A summary description of the Ramsey model can be found in *How CBO Analyzed the Macroeconomic Effects of the President's Budget*, cited previously.

Both of the GE growth models impose an intertemporal budget constraint on the government, so that the tax cut must be offset at some point either by increased future taxes or by lower future spending. That financing, by the definition of the experiment, does not occur during the 10-year budget window; we assume in all simulations that the government simply increases its borrowing in that period. However, different assumptions about financing outside the budget window affect the results, even in the first 10 years.

We explored two different financing assumptions for the tax cut:

1. Government spending (on goods and services, not transfers) is cut gradually over the 10-year period starting in 2014. By 2024, those cuts are deep enough to stabilize the ratio of debt to GDP. In these models, such government spending is assumed to be quite different from private spending, and differing levels of government spending do not directly enter into private decisions about saving or spending. But lower government spending leaves more resources available for private consumption.

2. Federal income tax rates are raised gradually over the same 10-year period by enough to stabilize the ratio of debt to GDP in 2024. The tax increase ultimately has to be larger than the initial 10 percent tax cut in order to pay interest on the additional debt that accrues between 2004 and 2024. From a welfare point of view, this is an unfavorable assumption because the distortion caused by raising tax rates in the long run exceeds the distortions avoided by reducing tax rates in the short run.

The GE growth models assume that agents know how the tax cut will ultimately be financed. Workers who anticipate that income taxes will rise in the future will tend to increase their hours

worked before the taxes go up, with the expectation that they will work less when rates are higher. There is no such anticipatory increase in labor supply when people expect the tax cut to be financed by reduced government spending on goods and services.

Textbook Growth Model. The simple textbook growth model is an enhanced version of the model developed by Robert Solow.[7] The model determines output (GDP) using the number of hours of labor supplied by workers, the size and composition of the capital stock, and total factor productivity. Unlike the GE growth models, the textbook growth model is not forward-looking: people do not respond to expected changes in future policy. Unlike the Keynesian models, the model does not incorporate any demand or cyclical effects; rather, it assumes that output is always at its potential level.

The estimates using the textbook growth model incorporated the same increase in labor supply as was imposed on the Keynesian models (see Box 1). The model also reflects the government's increased borrowing, which "crowds out" private investment—much less than one-for-one, but still a significant effect. The model is calibrated to reduce private investment by 36 cents for every dollar of government borrowing—a calibration that reflects estimates of both how much an increase in the government's borrowing directly adds to private saving and how much of a reduction in national saving is financed by increased capital inflows.

Economic Effects (GDP)

All of the models predict that a 10 percent cut in income tax rates will increase real GDP within the first 10 years (see Table 3). The results fall into two groups: the textbook growth model and the Keynesian models, with unemployment held at baseline, predict relatively small effects; the remainder of the model simulations fall into a narrow range of larger effects. CBO's previously published estimates of the macroeconomic effects of the President's budget have sometimes found much wider differences among models (see *An Analysis of the President's Budgetary Proposals for Fiscal Year 2004*, cited earlier).

The narrow range of results, especially among the GE models, reflects both the simplicity of the experiment and the fact that the reduction in marginal tax rates is large compared with the overall budget cost of the tax cut. The models differ most in the way that they handle the increase in the deficit, and in this experiment the deficit increases play a much smaller role than they did in the analysis of the President's budget for 2004 (which also included spending and tax proposals that did not reduce marginal rates).

Textbook Growth Model. The smallest effects on GDP come from the textbook growth model, reflecting two offsetting effects: the increase in labor supply and the "crowding out" of private investment from the increased deficit. The labor supply is assumed to respond quickly to the tax cut, but the decline in investment has a cumulative effect, which starts out small, on the capital

7. For a detailed description of the textbook growth model, see Congressional Budget Office, *CBO's Method for Estimating Potential Output: An Update* (August 2001).

stock. Consequently, in the first five years GDP rises, on average, but by the second five years the crowding out catches up, and the net effect on GDP is very close to zero. (Because the model assumes that some government borrowing will be financed from abroad, the effect on GNP, which reflects the cost of servicing that debt, is generally more negative than the effect on GDP).

GE models (OLG and Ramsey). All of the GE growth model simulations showed significantly more growth in the short run than did the textbook growth model. In these models, unlike the textbook growth model, a cut in income taxes means a cut in taxes on capital as well as labor. The result is to encourage both private saving and work effort in the short run. The increase of labor supply is significantly larger than in the textbook growth model. A lot of the increased income from labor goes to higher investment, and as a result, in these models, the private capital stock is actually higher in the short run; there is "crowding in" rather than crowding out.

By the second five years, however, the models' results, while remaining positive, begin to diverge as two opposing effects become important. In the closed-economy OLG model, crowding out becomes increasingly important in the second five years as the deficit grows and private capital begins to fall. If the tax cut is ultimately expected to be financed with lower government spending, the result is that the tax cut increases GDP by less in the second five years than in the first five. If the initial budget cost is eventually expected to be financed by raising tax rates, by contrast, the prospect of imminently higher rates causes workers to supply more labor. Paradoxically, therefore, a tax cut will increase GDP by more in the second five years if it is expected to be reversed.

In the open-economy version of the OLG model, the results for GDP are higher and more stable because that model has no crowding out; higher government borrowing is entirely met by increased capital inflows from abroad. Of course, those capital inflows mean that foreigners will own an increased proportion of U.S. output. GNP, which reflects that change in ownership, looks very much like the closed-economy results for GDP.

The Ramsey model has generally more optimistic predictions than the OLG models in the second five years because that model predicts that the worsening of the government deficit from a tax cut will be entirely offset by an increase in private saving, thus ruling out any crowding out of investment when the deficit increases because of tax cuts. But the Ramsey model predicts an even larger increase in the labor supply than the OLG models do when tax rates are expected to rise, thereby producing the largest increase in GDP among the models examined (see Table 3).

The GE models are able to compute a long-run economic impact, which, not surprisingly, depends on how the short-run tax cut is eventually financed. Financing through tax increases reduces GDP (or GNP) in the long run in both GE models because the higher rates discourage work effort and saving. However, financing through cutting government spending produces an increase in long-run GDP in the Ramsey model and a small decrease in the OLG closed-economy model. The difference arises because, as noted above, the Ramsey model does not permit crowding out, so the capital stock is permanently larger in that model than in the OLG model, which does incorporate crowding out.

Keynesian models (MA and GI). The Keynesian model results also show larger supply-side increases in GDP than the textbook growth model for the first five years. (Supply-side effects are imperfectly approximated by the results from the Keynesian models that hold the unemployment rate at its baseline value.) Because the impact on labor supply is constrained to be the same as in the textbook growth model, all of the difference is in capital; that difference arises because private saving increases by more than it does in the growth models.

The textbook growth model assumes that a fixed 40 percent of any increase in the government deficit will be offset by increased private saving—a calculation that does not depend on the source of the larger deficit. The Keynesian models, by contrast, assume that the size of the offset depends on what causes the deficit to grow; the deficit will be a lot larger when it results from a tax cut. In those models, cutting taxes increases personal consumption spending only slowly and, even in the long run, increases consumption less than the tax cut does. The difference is the increase in private saving.

Because of that difference, the Keynesian models predict supply-side effects in the first five years that are between those of the textbook growth model and the GE models. (Recall that we imposed a labor-supply response in the models; running the models without that adjustment would again reduce their predicted effects.) The Keynesian models produced somewhat larger effects on GDP in the simulations run with a Taylor rule for monetary policy because under that assumption, the models predict demand as well as supply effects.

Further details of the simulations are provided in Appendix Tables A1 and A2.

Budget Implications

The budgetary implications of the macroeconomic results reflect much more than increases in GDP. In the GE models, the calculations reflect the changes in depreciation as investment increases. In the Keynesian models, the calculations also reflect changes in tax bases as a result of increased inflation, as well as changes in incomes and interest rates induced by the assumed response of the Federal Reserve. Details are provided in *How CBO Analyzed the Macroeconomic Effects of the President's Budget*, cited above.

In the first five years, up to 22 percent of the cost of a simple cut in personal income taxes is offset by the revenue flowing from higher GDP (see Table 4). Similar numbers apply for the second five years, although we did not continue the Keynesian model simulations into those years. The Ramsey model predicts as much as a 26 percent feedback if taxes are later expected to rise. (The textbook growth model predicts negligible budget effects from its small macroeconomic feedbacks.) It is also interesting to note that almost all of the budgetary consequences of the macroeconomic feedbacks that the models predict are smaller over 10 years than the additional debt service that a tax cut implies, even without an increase in interest rates.

Table 1. Effective Marginal Rates on Labor and Capital (Percent)

Calendar Year	Tax on Labor: Current Law	Proposal	Change	Percent Change	Tax on Capital: Current Law	Proposal	Change	Percent Change
Effective Federal Income Tax Rates (Corporate and Individual Combined)								
2004	18.1	16.3	-1.8	-10	13.9	13.4	-0.4	-3
2005	19.0	17.1	-1.8	-10	13.9	13.5	-0.4	-3
2006	19.0	17.2	-1.8	-10	14.0	13.5	-0.4	-3
2007	19.3	17.4	-1.9	-10	14.0	13.6	-0.4	-3
2008	19.5	17.6	-1.9	-10	13.9	13.5	-0.4	-3
2009	19.7	17.8	-1.9	-10	14.9	14.3	-0.5	-4
2010	20.0	18.1	-1.9	-10	14.9	14.3	-0.5	-4
2011	21.8	19.7	-2.1	-10	15.5	14.9	-0.6	-4
2012	22.0	19.8	-2.2	-10	15.5	14.9	-0.6	-4
2013	22.0	19.8	-2.2	-10	15.5	14.9	-0.6	-4
Effective Federal and State Income Tax Rates and Federal Social Insurance Tax Rates								
2004	32.0	30.3	-1.7	-5	16.8	16.4	-0.4	-3
2005	32.8	31.0	-1.8	-5	16.9	16.4	-0.4	-3
2006	32.9	31.1	-1.8	-5	16.9	16.5	-0.5	-3
2007	33.1	31.3	-1.9	-6	17.0	16.5	-0.5	-3
2008	33.3	31.5	-1.9	-6	16.9	16.5	-0.4	-3
2009	33.6	31.7	-1.9	-6	17.8	17.3	-0.5	-3
2010	33.8	31.9	-1.9	-5	17.8	17.3	-0.5	-3
2011	35.5	33.5	-2.0	-6	18.4	17.8	-0.6	-3
2012	35.8	33.7	-2.1	-6	18.4	17.8	-0.6	-3
2013	35.8	33.6	-2.2	-6	18.4	17.8	-0.6	-3

Table 2. Conventional Estimate of the Budgetary Costs of Cutting Federal Individual Income Tax Rates by 10 Percent (Billions of Dollars)

	2004-2008	2009-2013
10% Cut in statutory rates (except gains and dividends)	-452	-761
10% Cut in dividend and gains rates	-14	-13
Total revenue loss (conventional estimate)	-466	-775
Debt service	56	261
Total effect on the budget surplus	-522	-1,035

SOURCE: Joint Committee on Taxation.

NOTE: Estimate against January 2003 baseline, adjusted for the effects of JGTRRA.

Table 3. Impact on Real GDP of a Deficit-Financed 10 Percent Cut in Federal Income Tax Rates (Average Percent Difference from Baseline)

Model	2004-2008	2009-2013	Long Run
Textbook Growth Model	0.2	0	NA
OLG—Closed Economy Model			
Financed by cuts in government spending after 10 years	0.6	0.3	-0.1
Financed by increases in tax rates after 10 years	0.6	0.5	-1.5
OLG—Open Economy Model			
Financed by cuts in government spending after 10 years	0.8	0.5	0.5
Financed by increases in tax rates after 10 years	0.9	0.7	0.2
Ramsey Model			
Financed by cuts in government spending after 10 years	0.6	0.5	0.6
Financed by increases in tax rates after 10 years	0.8	1.1	-0.9
Global Insight Model			
Taylor Rule	0.4	NA	NA
Unemployment rate at baseline	0.2	NA	NA
Macroadvisers' Model			
Taylor Rule	0.6	NA	NA
Unemployment rate at baseline	0.3	NA	NA
Memo: Effect on Real GNP			
Textbook Growth Model	0.2	-0.1	NA
OLG—Open Economy Model			
Financed by cuts in government spending after 10 years	0.5	0.2	-0.4
Financed by increases in tax rates after 10 years	0.6	0.3	-2.1
Global Insight Model			
Taylor Rule	0.4	NA	NA
Unemployment rate at baseline	0.1	NA	NA
Macroadvisers' Model			
Taylor Rule	0.5	NA	NA
Unemployment rate at baseline	0.3	NA	NA

NOTE: NA = Not applicable

Table 4. The Cumulative Impact on the Budget Surplus of a 10 Percent Cut in Federal Income Tax Rates (Billions of Dollars)

	2004-2008	2009-2013	2004-2013
Conventional Estimate	-466	-775	-1,241
Additional Debt Service on Conventional Estimate	56	261	317
Conventional Estimate plus Debt Service	-522	-1,035	-1,557
Macroeconomic Feedbacks from Various Models			
Textbook Growth Model	6	-39	-33
OLG—Closed Economy Model			
Financed by cuts in government spending after 10 years	77	107	184
Financed by increases in tax rates after 10 years	82	132	214
OLG—Open Economy Model			
Financed by cuts in government spending after 10 years	98	142	240
Financed by increases in tax rates after 10 years	104	154	258
Ramsey Model			
Financed by cuts in government spending after 10 years	58	99	158
Financed by increases in tax rates after 10 years	81	199	280
Global Insight Model (Taylor Rule)	62	NA	NA
Macroadvisers' Model (Taylor Rule)	67	NA	NA
Memo: Macroeconomic Feedbacks (As a Percent of the Conventional Estimate)[1]			
Textbook Growth Model	1%	-5%	-3%
OLG—Closed Economy Model			
Financed by cuts in government spending after 10 years	17%	14%	15%
Financed by increases in tax rates after 10 years	18%	17%	17%
OLG—Open Economy Model			
Financed by cuts in government spending after 10 years	21%	18%	19%
Financed by increases in tax rates after 10 years	22%	20%	21%
Ramsey Model			
Financed by cuts in government spending after 10 years	12%	13%	13%
Financed by increases in tax rates after 10 years	17%	26%	23%
Global Insight Model (Taylor Rule)	13%	NA	NA
Macroadvisers' Model (Taylor Rule)	14%	NA	NA

NOTES: Totals may not add due to rounding.

NA = Not applicable

1. Excludes debt service on the conventional estimate

Appendix: Detailed Macroeconomic Results

Table A-1. Effects of a 10 Percent Cut in Income Tax Rates: Results from Keynesian Macroeconomic Models (Percent Difference from Baseline, Except Where Noted)

	2004	2005	2006	2007	2008	2004-2008
Global Insight Model (Taylor Rule)						
Nominal GDP	0.5	0.7	0.7	0.8	0.8	0.7
Real GDP	0.4	0.5	0.4	0.5	0.4	0.4
Real Gross Private Domestic Investment	0.9	0.8	-0.1	-0.1	-0.4	0.2
Real Consumption	0.6	0.9	0.9	1.0	1.0	0.9
Employment	0.5	0.6	0.6	0.6	0.6	0.6
Full-employment labor force	0.4	0.5	0.5	0.5	0.5	0.5
Unemployment rate (in percentage points)	-0.1	-0.1	-0.1	-0.1	0.0	-0.1
CPI inflation (in percentage points)	0.1	0.1	0.1	0.1	0.1	0.1
3-month T-bill rate (in percentage points)	0.1	0.1	0.1	0.1	0.2	0.1
10-year T-note yield (in percentage points)	0.1	0.1	0.2	0.2	0.3	0.2
Global Insight Model (Unemployment Rate at Baseline)						
Nominal GDP	0.3	0.4	0.5	0.6	0.6	0.5
Real GDP	0.2	0.3	0.3	0.2	0.2	0.2
Real Gross Private Domestic Investment	-0.1	-0.3	-0.8	-0.9	-0.7	-0.6
Real Consumption	0.4	0.7	0.9	1.0	1.0	0.8
Employment	0.5	0.5	0.5	0.5	0.5	0.5
Full-employment labor force	0.4	0.5	0.5	0.5	0.5	0.5
Unemployment rate (in percentage points)	0.0	0.0	0.0	0.0	0.0	0.0
CPI inflation (in percentage points)	0.1	0.1	0.1	0.1	0.1	0.1
3-month T-bill rate (in percentage points)	0.9	0.6	0.4	0.4	0.0	0.4
10-year T-note yield (in percentage points)	0.6	0.4	0.3	0.4	0.1	0.4

Table A-1 Continued

MacroAdvisers' Model (Taylor Rule)

Nominal GDP	0.6	0.9	0.9	1.0	0.9	0.8
Real GDP	0.7	0.8	0.6	0.6	0.3	0.6
Real Gross Private Domestic Investment	2.2	2.4	0.6	0.5	-1.1	0.9
Real Consumption	0.7	0.9	0.8	0.9	0.7	0.8
Employment	0.4	0.8	0.7	0.6	0.5	0.6
Full-employment labor force	0.4	0.5	0.5	0.5	0.5	0.5
Unemployment rate (in percentage points)	0.0	-0.3	-0.1	-0.1	0.0	-0.1
CPI inflation (in percentage points)	-0.2	0.5	0.2	0.2	0.2	0.2
3-month T-bill rate (in percentage points)	0.0	0.5	0.2	0.3	0.2	0.2
10-year T-note yield (in percentage points)	0.0	0.3	0.2	0.2	0.3	0.2

MacroAdvisers' Model (Unemployment Rate at Baseline)

Nominal GDP	0.4	0.3	0.4	0.3	0.4	0.3
Real GDP	0.5	0.2	0.4	0.3	0.3	0.3
Real Gross Private Domestic Investment	1.5	-0.6	0.2	-0.3	0.0	0.2
Real Consumption	0.6	0.4	0.5	0.6	0.7	0.6
Employment	0.4	0.5	0.5	0.5	0.5	0.5
Full-employment labor force	0.4	0.5	0.5	0.5	0.5	0.5
Unemployment rate (in percentage points)	0.0	0.0	0.0	0.0	0.0	0.0
CPI inflation (in percentage points)	-0.1	0.2	-0.1	0.0	0.0	0.0
3-month T-bill rate (in percentage points)	0.5	0.3	0.4	0.0	0.1	0.3
10-year T-note yield (in percentage points)	0.2	0.3	0.3	0.2	0.2	0.2

Table A-2. Effects of a 10 Percent Cut in Income Tax Rates on Real GDP: Estimates from GE Models (Percent Change from Baseline)

Source of Financing	2004-2008	2009-2013	Long Run
OLG Model—Closed Economy–Financed by Cuts in Government Spending			
Real GDP	0.6	0.3	-0.1
Labor Input	0.8	0.6	0.3
Capital Stock	0.1	-0.2	-1.1
Consumption	0.9	1.2	1.7
OLG Model—Closed Economy–Financed by Income Taxes			
Real GDP	0.6	0.5	-1.5
Labor Input	0.9	0.7	-0.3
Capital Stock	0.1	0.0	-4.3
Consumption	0.8	1.1	-0.9
OLG Model—Open Economy—Financed by Cuts in Government Spending			
Real GDP	0.8	0.5	0.5
Labor Input	0.8	0.5	0.5
Capital Stock	0.8	0.5	0.5
Consumption	1.1	1.3	1.7
OLG Model—Open Economy—Financed by Income Taxes			
Real GDP	0.9	0.7	0.2
Labor Input	0.9	0.7	0.2
Capital Stock	0.9	0.7	0.2
Consumption	1.1	1.3	-0.9
Ramsey Model—Financed by Cuts in Government Spending			
Real GDP	0.7	0.7	0.8
Labor Input	1.0	1.1	0.3
Capital Stock	0.1	0.0	1.5
Consumption	0.9	1.2	3.4
Ramsey Model—Financed by Income Taxes			
Real GDP	0.8	1.1	-1.2
Labor Input	1.2	1.4	-0.5
Capital Stock	0.2	0.7	-2.3
Consumption	0.7	1.0	-1.1