



# Revenue Feedback from the 2001-2004 Tax Cuts

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## Summary

An unexpected increase in revenues has led to a renewed discussion of the effect of the 2001-2004 tax cuts on the economy and the possible feedback effects on revenue. Some proponents of the tax cuts suggest that induced economic growth was large enough that taxes on the additional income more than offset the cost of the tax cuts, causing an increase rather than a decrease in revenues. Other observers doubt that economic growth was related to the tax cuts, or that it was large enough to significantly offset the cost of the cuts.

This report reviews available economic studies, theory, and empirical data to assess the possible revenue feedback from the 2001-2004 tax cuts at this time. Four sources of feedback are examined: short-run demand-side stimulus effects, supply-side effects on labor supply and savings, shifting of income from non-taxable to taxable form, and debt service effects.

Of the potential sources of feedback, none appears very large relative to the direct revenue cost, and offsetting effects suggest that the effects of the tax cut on the deficit will be to magnify the direct cost rather than reduce it. One source of effect is the short-run stimulus; this effect is temporary, and appears likely to be small, resulting at the peak (about a year and a half following adoption) of no more than a 14% feedback. At the same time, the effect of the deficit in crowding out private capital reduces tax revenues. The debt also adds to the deficit directly through debt service, which can increase the cost of a tax by as much as 25% over the first 10 years, and by larger amounts as time goes on.

Conventional supply-side effects arising from increased work and savings are unlikely to have feedbacks of over 10%, and there is some reason to believe that the short-run feedback effect is no more than 3%. There are also some potential feedback effects from shifting into taxable income forms and reducing avoidance, but adding these effects to the conventional supply-side effects still produces a feedback effect in the neighborhood of 10%. Moreover, some of these effects are already incorporated into conventional revenue estimates and they may be overstated for other reasons.

Given the positive and negative effects, it is likely that the feedback effect in the very short run would be positive, but at the current time as the stimulus effects have faded and the effect of added debt service has grown, the 2001-2004 tax cuts are probably costing more than their estimated revenue cost.

This report will not be updated.

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An unexpected increase in revenues, as documented by both the Administration in its Mid-Session Review<sup>1</sup> and the Congressional Budget Office (CBO) in its August update<sup>2</sup> has led to a renewed discussion of the effect of the 2001-2004 tax cuts on the economy and the possible feedback effects on revenue. The OMB Mid-Session Review also summarizes results from two Treasury studies indicating that tax cuts moved the economy out of the recession more quickly than would otherwise have been the case, and will encourage greater long-run economic growth.

Some proponents of the tax cuts suggest that induced economic growth was large enough that taxes on the additional income more than offset the cost of the tax cuts, causing an increase rather than a decrease in revenues. Other observers doubt that economic growth was related to the tax cuts, or that it was large enough to significantly offset the cost of the cuts.<sup>3</sup> After reviewing the data on the revenue increase, this report examines available economic studies, theory, and empirical data to assess the possible revenue feedback from the 2001-2004 tax cuts.

Three major pieces of legislation constitute the bulk of these tax cuts. P.L. 107-16, The Economic Growth and Tax Relief Reconciliation Act (referred to as EGTRRA) passed in 2001: its most important provisions were phased-in rate reductions, expansion of child credits, expansion of brackets and standard deductions for joint returns, and phaseout and eventual repeal of the estate tax. Most provisions were set to expire in 2010 (and some earlier), but some or all of them may be extended or made permanent. The main provision of The Job Creation and Worker Assistance Act of 2002 (P.L. 107-47) was the adoption of bonus depreciation, which allowed a share of investment to be deducted immediately. P.L. 108-27, The Jobs and Growth Tax Relief Reconciliation Act (JGTRRA), passed in 2003, accelerated the 2001 rate reductions, allowed lower tax rates for dividends and capital gains, and expanded and extended bonus depreciation. Bonus depreciation expired at the end of 2004, but there have been extensions of some other expiring provisions.

The first section of this paper examines the data on revenues and growth that have given rise to these arguments. The next three sections discuss the three basic types of behavioral effects that might lead to increased (or decreased) revenues: short-run stimulus effects and the subsequent effects on the debt, “supply-side” effects that alter the amount of labor and capital in the economy, and shifts between taxable and tax-favored activities. The final section presents findings.

## The Growth in Revenues

The OMB Mid-Session Review projected revenues to be \$115 billion higher than forecast in February, while CBO projected revenues \$99 billion higher than its March forecast. According to CBO projections, the deficit will fall from 2.6% of GDP in FY2005 to 2.0% of GDP in FY2006. This revenue increase arose from increases in both individual and corporate income and followed an increase in 2005. In 2005, GDP grew by 6.5%, but revenues grew by 14.5%; in 2006 GDP is

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<sup>1</sup> U.S. Office of Management and Budget, *Fiscal Year 2007 Mid-Session Review, Budget of the U.S. Government*, July 11, 2006.

<sup>2</sup> U. S. Congress, Congressional Budget Office, *The Budget and Economic Outlook: An Update*, Aug. 2006.

<sup>3</sup> Some of the debate is summarized in Krishna Guha and Holly Yeager, “Less Is More? Why Bush Sees Higher Revenues As Vindicating His Tax Cut,” *Financial Times*, July 19, 2006, p. 11.

projected to grow by 6.6% and revenues by 11.6%. In 2005, revenues from social insurance taxes grew by 8.3%, revenues from individual income taxes by 14.6%, and revenues from corporate taxes by 47%. In 2006, CBO estimates revenues from social insurance taxes will grow by 5%, revenues from individual income taxes will grow by 14.3%, and revenues from corporate income taxes will grow by 22.2%.

This growth in revenues is not due to any extraordinary growth of output, as the economy has been growing at rates typical of those following recoveries from previous recessions. Moreover, according to CBO, the economy has essentially reached its full employment level. Rather, the growth in revenues is due largely to an increase in taxes as a percentage of output. Most of the increase in taxes as a percentage of output is due to income taxes, with about 60% of the effect coming from the individual income tax and the remainder from the corporate tax.

**Table 1** reports, since 1990, the growth rate of real output and revenue from the corporate and individual income taxes as a percent of GDP as reported by CBO.<sup>4</sup> Before discussing the data in this table, it is important to correct the data for a major effect from tax legislation, the introduction of bonus depreciation in 2002, its expansion in 2003, and its termination at the end of 2004. This provision is having effects on corporate tax revenue outside of economic performance. Bonus depreciation allowed depreciation deductions to occur earlier than they would have otherwise, thereby shifting revenue from the present to the future.

**Table 1. Growth Rates and Income Tax Shares, 1990-2006**

Fiscal Year	Growth Rate of Real GDP (over previous year)	Individual Income Tax Revenues as a Percent of GDP	Corporate Income Tax Revenues as a Percent of GDP	Corporate Income Tax Revenues as a Percent of GDP (adjusted for depreciation) <sup>a</sup>
1990	1.9%	8.1%	1.6%	1.6%
1991	-0.2	7.9	1.7	1.7
1992	3.3	7.6	1.6	1.6
1993	2.7	7.7	1.8	1.8
1994	4.0	7.8	2.0	2.0
1995	2.5	8.1	2.1	2.1
1996	3.7	8.5	2.2	2.2
1997	4.5	9.0	2.2	2.2
1998	4.2	9.6	2.2	2.2
1999	4.5	9.6	2.0	2.0
2000	3.7	10.3	2.1	2.1
2001	0.8	9.9	1.5	1.5
2002	1.6	8.3	1.4	1.7
2003	2.5	7.3	1.2	1.6
2004	3.9	7.0	1.6	2.0

<sup>4</sup> Congressional Budget Office, *The Budget and Economic Outlook: Fiscal Years 2007-2016*, Jan. 2006; *The Budget and Economic Outlook: An Update*, Aug. 2006.

Fiscal Year	Growth Rate of Real GDP (over previous year)	Individual Income Tax Revenues as a Percent of GDP	Corporate Income Tax Revenues as a Percent of GDP	Corporate Income Tax Revenues as a Percent of GDP (adjusted for depreciation) <sup>a</sup>
2005	3.5	7.5	2.2	2.3
2006 <sup>b</sup>	3.5	8.1	2.6	2.4

**Source:** CRS calculations and data from the Congressional Budget Office (CBO) and Joint Committee on Taxation (JCT).

- a. Note that this adjustment is made based on the estimated revenue effect at the time of the legislative change. There is some evidence, as discussed in the text, that these effects were not as large as originally projected.
- b. Projected

Using the revenue estimates made at the time for bonus depreciation and another small tax issue having to do with losses, and assigning a share to corporations equal to the share of accelerated depreciation on equipment reported in the Joint Committee on Taxation's (JCT) tax expenditure estimates (79%), we correct the corporate tax ratio to see what it would have been without this legislative change.<sup>5</sup> This number is reported in the last column. Using these figures, there no longer appears to be a significant growth in corporate tax revenues from 2005 to 2006. The effect of the depreciation change accounted for 84% of the faster growth in corporate tax revenues, and without it, corporate taxes would have grown by less than 9% rather than by 22%. (It accounts for slightly over half the 47% growth from 2004 to 2005.)

This adjustment probably applies too much weight to bonus depreciation, however, because preliminary evidence through 2003 suggests the usage of bonus depreciation has not been as great as might have been predicted.<sup>6</sup> Thus, the pattern adjusted for this legislative change probably falls between the two last columns of **Table 1**. Nevertheless, adjusting even in part for this effect smooths out the general pattern of corporate taxes during the recession and recovery, with the shares during the recession and slow growth years similar to those in the early 1990s, and the shares now similar to the period prior to the recession in 2000/2001.

Because at least part of the growth in corporate revenues can be explained by legislative changes, and because revenue from the individual income tax was a greater contributor to growth in general, the more important issue to focus on seems to be the growth in the individual income tax share. Some small part of the growth from 2005 to 2006 is also attributable to depreciation for unincorporated businesses, but in this case it accounts for only 14% of the faster growth in revenues based on the original revenue estimates.

Policymakers are interested in the question of what, if any, part of the increasing individual income tax share is a result of economic stimulus brought about by the 2001-2004 tax cuts? The following discussion looks at this issue from a macroeconomic viewpoint.

<sup>5</sup> Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for FY 2006-2010*, JCS-2-06, U.S. Government Printing Office, Washington, DC, Apr. 25, 2006.

<sup>6</sup> See Darryl Cohen and Jason Cummins, *A Retrospective Evaluation of the Effects of Temporary Partial Expensing*, Staff Working Paper 2006-19, Washington, DC, Federal Reserve Board, Apr. 2006.

First, the fact that income taxes as a percentage of output rose does not necessarily mean that effect is due to growth effects arising from the tax cuts. If that were the case, one could also conclude that the rate *increase* in 1993 led to a growth in effective tax rates independent from the direct effects. The share of output collected in individual taxes continued to grow in the late 1990s after the tax rate increases were in place. This growth in the late 1990s generally reflected both an increase in the average effective tax rate on taxable income (which could arise from increasing inequality in incomes and real bracket creep), and increases in taxable income relative to GDP, which could reflect items such as faster growth in capital gains.<sup>7</sup>

Second, were there no similar growth effects following the 1993 tax cut, one could not empirically attribute the recent growth to a specific event because it is not possible to know what would have happened to the economy in the absence of the tax cut. To attribute the growth to the tax cut would be to presume that because one event occurs before another, the first event causes the second.<sup>8</sup> When estimating the effect of tax changes, observing the aftermath really does not change our knowledge derived from observing economy wide changes except in a very marginal way. At best, it is one more observation, and in order to project economic changes we need enough observations to form an adequate statistical sample.

Finally, CBO suggests (based on comparing withholding and other receipts) that the recent growth in revenue is not due to growth in wage income, which is the basic conduit through which most economic growth occurs in the short run, but through other routes. Any change in saving and investment induced by the tax cut (and it is not clear there is such a change) would have a negligible effect on the capital stock and output: this effect is a long-run phenomenon, not a short-run one.

To think about the potential revenue offsets due to economic or behavioral change induced by a tax change, it is necessary to turn to a more general analysis of these effects. They can be separated into three types of effects: demand-side stimulus effects including the eventual consequences of increased debt, “supply-side” effects on labor and capital, and changes in the allocation of consumption and other forms of taxpayer avoidance.

## Demand-side Effects

When the economy is in a recession, the demand-side effects of a tax cut can increase output. But do these demand-side effects suggest that a tax cut can pay for itself, or even partially pay for itself?

### The Transitory Nature of Demand-side Effects and the Permanent Effects of Crowding Out of Private Capital

Any effects on output from demand-side stimulus (or contraction) are transitory and the long-run effects are generally negative as the increased government borrowing from the tax cut is likely to crowd out private capital. Demand-side stimulus can have little effect on real output if enacted

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<sup>7</sup> Richard Kasten, David J. Weiner, and G. Thomas Woodward, “What Made Receipts Go Boom and When Will They Go Bust?” *National Tax Journal*, vol. 52, Sept. 1999, pp. 339-348.

<sup>8</sup> The full name of this fallacy is *post hoc ergo propter hoc*, meaning “after this, therefore because of this.”

when the economy is at full employment; however, the 2001-2004 tax cuts took place when the economy was not at full employment. Since the tax cuts began in 2001, much of the demand-side effect has likely faded and will continue to fade, and any offsets would have been temporary and are now on the decline. In any case, they are not likely to explain the current increase in revenues which does not derive primarily from extraordinary growth in output but from an increase in the effective tax rate in the case of the individual tax and from the longer run consequences of bonus depreciation in the case of the corporate tax.

As time goes on, assuming revenues are not fully recovered and as the stimulus fades, the effect of the tax cuts is to reduce output by reducing the capital stock from what it otherwise would have been, magnifying the deficit through growing interest payments and also reducing tax revenue from what it otherwise would have been by reducing output. In the long run a tax cut that results in added debt service, holding behavioral responses fixed, reduces output and leads to a larger revenue loss (depending on the timing of the tax cuts), and a considerably larger cost. For example, the cost of extending the 2001-2004 tax cuts and reforming the alternative minimum tax will be increased by about 14% over the first 10 years due to debt service.<sup>9</sup> CBO reports that debt service would add 25% to the cost of an across-the-board tax cut over 10 years.<sup>10</sup>

## The Limited Magnitude of Demand-side Effects

It would require a much larger multiplier effect than is commonly presumed or found in macroeconomic models to fully or significantly offset the tax cut even on a temporary basis. If the marginal tax rate is 20%, as suggested in a recent Treasury analysis,<sup>11</sup> then a tax cut would have to increase output by a multiplier of 5 in order to bring in enough revenue to offset the original tax cut, and even in the most optimistic of views, the multiplier is not this large. Economic theory suggests that fiscal policy may also be limited in its effect in an open economy if capital is relatively mobile. Expansionary fiscal policy induces an increase in interest rates that causes an inflow of capital, which in turn increases the exchange rate and reduces net exports.

One of the Treasury Department's studies reported in the Mid-Session Review that its own simulations of the tax cuts, using the Macroeconomic Advisers (MA) model, resulted in an increase in output in 2004 of 3.5% to 4%. Given that the 2001-2004 tax cuts are estimated at about 1.4% of output,<sup>12</sup> this Treasury analysis implies a multiplier of around 2.5 to 3, and a revenue offset of 50% to 60%, not 100%.

But this multiplier effect is likely overstated and depends heavily on the response of the Federal Reserve. The monetary authorities have a range of potential actions. They can keep the interest

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<sup>9</sup> See CRS Report RS21922, *Extending the 2001, 2003, and 2004 Tax Cuts*, by Gregg A. Eesenwein.

<sup>10</sup> Congressional Budget Office, *Analyzing the Budgetary and Economic Effects of a 10 Percent Cut in Income Tax Rates*, Economic and Budget Issue Brief, Dec. 1, 2005.

<sup>11</sup> In the tax reform study, Treasury indicated the marginal tax rate on labor income was 24% and the marginal rate on capital income 14%. Robert Carroll, John Diamond, Craig Johnson, and James Makie III, *A Summary of the Dynamic Analysis of the Tax Reform Options Prepared for the President's Advisory Panel on Federal Tax Reform*, U.S. Department of the Treasury, Office of Tax Analysis, May 25, 2006, prepared for the American Enterprise Institute Conference on Tax Reform and Dynamic Analysis, May 20.

<sup>12</sup> According to CBO projections, individual income taxes would be 8.4% of GDP in FY2009 and 9.8% in FY2012, suggesting that the revenue loss from tax cuts is about 1.4% of GDP. For the base case reported above, output increases by 0.5% in the short run and 0.7% in the long run. See Congressional Budget Office, *The Budget and Economic Outlook: Fiscal Years 2007-2016*, January 2006.

rate fixed, which means they accommodate and enhance the fiscal stimulus. They can keep the money supply fixed, which means taking no action. They can keep the inflation rate and output level fixed, which means counteracting the fiscal policy. Gregory Mankiw, economics professor at Harvard and former chairman of the Council of Economic Advisors in the current Administration, reports the tax multiplier in a major macroeconomic model (Data Resources Inc., or DRI, a predecessor of DRI-WEFA, and in turn a predecessor of Global Insight) is 1.19 if the interest rate is held constant (which would require a monetary expansion), 0.26 if the money supply is held constant (the interest rate would rise but output could also rise), and zero if the inflation rate is held constant (the interest rate rises so much that output is fixed).<sup>13</sup>

There is some disagreement among economists on what the monetary authorities tend to do in response to fiscal expansion.<sup>14</sup> Currently, two major private sector macroeconomic models (MA and Global Insight) tend to use a Taylor rule, which targets the real interest rate but has it rise as inflation and output increase. This policy expands the money supply to keep interest rates constant in the very short run but eventually allows the interest rate to rise. The multiplier for a lump sum tax change using this assumption, over four to eight quarters, is about 0.7 in the MA model and about 0.8 in the Global Insight model.<sup>15</sup> A lump sum tax change tends to produce a larger effect than a change in the tax rate because none of the increased output is taxed. In the MA model, the effect fades to zero after about four years, while in the Global Insight Model it fades to zero after about eight years.

A recent survey of multipliers by researchers at the International Monetary Fund (IMF) found that a proportional tax cut had a short-run multiplier of 0.6 and 0.7 in the two models it examines that estimate effects in the United States, the OECD Interlink and the IMF Multimodel, respectively.<sup>16</sup> The first assumed real interest rates were fixed, the second that the money stock was fixed. Empirical estimates of multipliers also tended to find tax multipliers less than one.

There is apparently no report or study available to determine what assumptions were made in the Treasury simulation to produce their results, and no strictly comparable studies that cover several years, all tax cuts, and are confined to demand-side effects.<sup>17</sup> However, several related studies either done by the forecasting firms themselves or by congressional researchers suggest more modest effects. These studies are described in more detail in a recent CRS report,<sup>18</sup> but for EGTRRA the MA model reported a 1.2% increase in the second half of 2001 and a 0.3% increase in 2002, while DRI-WEFA reported a 0.4% increase in the second half of 2001. JCT used a modified MA model and a Global Insight model to examine JGTRRA, that also included some

<sup>13</sup> N. Gregory Mankiw, *Macroeconomics*, 5<sup>th</sup> Edition, New York: Worth Publishers, p. 287.

<sup>14</sup> See, for example, the discussion in Mankiw's and Delong's blogs:  
[http://delong.typepad.com/sdj/2006/06/fiscal\\_policy\\_m.html](http://delong.typepad.com/sdj/2006/06/fiscal_policy_m.html) and  
<http://gregmankiw.blogspot.com/2006/06/monetary-vs-fiscal-policy.html>.

<sup>15</sup> Information supplied by the Macroeconomic Analysis Division of the Congressional Budget Office. Data Resources Inc., mentioned earlier, is a predecessor of Global Insight, (after joining with Wharton Economic Forecasting Associates in the interim).

<sup>16</sup> Richard Hemming, Michael Kell, and Selma Mahfouz, *The Effectiveness of Fiscal Policy in Stimulating Economic Activity—A Review of the Literature*, IMF Working Paper WP/02/08, Dec. 2002.

<sup>17</sup> Another study by Treasury briefly mentions this analysis and indicates that full monetary accommodation (keeping the interest rate fixed) was assumed which would lead to a larger effect than if the Taylor rule were assumed. See Office of Tax Analysis, United States Department of the Treasury, *A Dynamic Analysis of Permanent Extension of the President's Tax Relief*, July 25, 2006.

<sup>18</sup> CRS Report RL32502, *What Effects Did the 2001 to 2003 Tax Cuts Have on the Economy?*, by (name redacted).

supply-side effects and found a 0.2% increase in the first five years for MA and a 0.9% increase for Global Insight; output fell by 0.1% in the next five years. CBO, also using a model with supply-side effects, assessed the 2004 budget proposals which included JGTRRA and some other provisions, and found a 0.2% increase for the MA model and a 1.4% increase for the Global Insight model in the first three years, and negative effects in the following three.

Using a value of the multiplier of 0.7, at the peak, the tax cuts would have recovered 14% (the tax rate times the multiplier) of the initial cost between the first and second years and the overall peak would have already passed, especially for the earlier tax cuts. (Of the combined tax cut, about 15% took place in 2001, around a quarter in each of the next two years and about a third in 2004, all in early or mid year.)<sup>19</sup> They do not likely explain the increase in revenues projected for FY2006 as they amount to no more than 2/10 of a percent of GDP even at the peak, and the effect should be declining.

## Should a Feedback Effect be Attributed to Tax Policy?

A third issue is whether the short-run stimulus is unique to a tax cut. It is not a tax cut per se that stimulates the economy but rather an increase in the deficit which alternatively could be accomplished via spending increases. Indeed, spending multipliers are larger than tax multipliers. Mankiw reports spending multipliers in the DRI model at 1.93 with fixed interest rates and 0.6 at a fixed money supply, respectively 60% and 130% larger than the tax multiplier.<sup>20</sup> In the OECD and IMF models, the spending multiplier was 1.1 in both models, or 60% to 80% larger than the tax rate multiplier. If revenue feedback were to be a justification, it would apply with greater force to spending increases than to tax cuts. Thus any revenue obtained from the feedback due to the stimulus effect could have also been obtained through expansionary fiscal policy via increased government spending. Both of these stimulative policies were in place during the recession and recovery. Further, the economy can be stimulated via monetary policy as well as fiscal policy, and monetary policy does not leave a residual debt and deficit that undermines capital formation. Monetary policy is also likely more powerful in an open economy.

## Supply-side Effects

A second way in which behavioral response can lead to a feedback, either positive or negative, is through “supply-side” behavioral responses, that is, increases in labor supply and in the capital stock, and which are based on growth models. The OMB Mid-Session Review included a Treasury Department estimate of these effects, and the Treasury also prepared a separate study.<sup>21</sup> This section examines that modeling exercise, and compares it with a previous one by Department of Treasury analysts estimating the effects of the tax reform proposals made by the President’s Advisory Panel on Federal Tax Reform.<sup>22</sup>

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<sup>19</sup> Note that these effects are restricted to revenue feedback, not overall effects on the deficit. The stimulus would also presumably have temporarily reduced spending on programs such as welfare and unemployment compensation at the same time, although it would have added to the deficit through growing interest payments.

<sup>20</sup> N. Gregory Mankiw, *Macroeconomics*, 5<sup>th</sup> Edition, New York: Worth Publishers, p. 287.

<sup>21</sup> Office of Tax Analysis, United States Department of the Treasury, *A Dynamic Analysis of Permanent Extension of the President’s Tax Relief*, July 25, 2006.

<sup>22</sup> Robert Carroll, John Diamond, Craig Johnson, and James Makie III, *A Summary of the Dynamic Analysis of the Tax* (continued...)

As discussed below, the Treasury's analysis of the 2001 tax cut as compared to the analysis of the tax reform proposals has been changed by limiting the model type, but allowing sensitivity analysis with respect to elasticities (behavioral responses of labor supply to changes within that model).

The Treasury analysis considers both short run and long-run effects. Macroeconomists note that the important behavioral response in the short run is the labor supply response, since even significant increases in saving can do little to affect the capital stock or output in the short run. If the labor supply effect is to completely offset the revenue cost in the short run, output must increase by 7% with a tax rate of 20%, and since labor accounts for about two-thirds of output, the labor supply would have to increase by over 10%. Government statistics do not show a change of this magnitude.<sup>23</sup>

The base case estimates in the Treasury study suggest that the induced effect on output were the tax cuts to be extended would lead to a revenue offset of 7% of the initial cost in the first five years and 10% in the long run.

## Models and Modeling Approaches

The models and modeling approaches used in the two studies differ in two important ways: limiting the type of model used to a single one and providing sensitivity analysis with respect to elasticities within that model.<sup>24</sup>

The earlier Department of the Treasury study used three types of models—a reduced form growth model (Solow model), and two intertemporal models, the overlapping generations model (OLG) and the Ramsey model (which treats the economy as an infinitely lived individual). The tax cut extension study uses only the OLG. This change is significant because the intertemporal models tend to yield much larger behavioral responses to changes in the tax on capital income than the reduced form growth models, especially in the short run.

In the initial tax reform study of the consumption tax where there were significant changes in the capital income tax rates, the Solow model had the smallest result and the Ramsey model had the largest result. In the 10-year budget horizon, the Solow, OLG, and Ramsey models resulted in output increases of 0.1%, 1.5%, and 1.9% respectively. In the long-run steady state, the effects were 1.4%, 2.2%, and 4.8% respectively. It is difficult to determine how much of the difference between the OLG and Ramsey models is due to the elasticities, how much is due to some specific

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(...continued)

*Reform Options Prepared for the President's Advisory Panel on Federal Tax Reform*, U.S. Department of the Treasury, Office of Tax Analysis, May 25, 2006, prepared for the American Enterprise Institute Conference on Tax Reform and Dynamic Analysis.

<sup>23</sup> Labor force participation rates declined slightly as did average hours over the period 2001 to 2005. See *Economic Report of the President*, Transmitted to the Congress, February 2006, Washington, DC, U.S. Government Printing Office. The civilian labor force participation rate declines from 66.8% to 66.0% from 2001 to 2005 (p.325), and average weekly hours declined from 34.0 to 33.8 (p.339).

<sup>24</sup> A more detailed discussion of the Treasury models and modeling issues can be found in CRS Report RL33545, *The Advisory Panel's Tax Reform Proposals*, by (name redacted). Additional discussions of modeling issues in general and empirical evidence can be found in CRS Report RL31949, *Issues in Dynamic Revenue Estimating*, by (name redacted) and in CRS Report RL32502, *What Effects Did the 2001 to 2003 Tax Cuts Have on the Economy?*, by (name redacted).

features that moderate the effects of the OLG model,<sup>25</sup> and how much is due to the time horizon of the model. One can certainly make a case for preferring the OLG model, of the intertemporal models, because it does not require strict conditions to achieve an internal equilibrium (where a broad range of people hold assets).<sup>26</sup>

At the same time, one can also make a case for choosing a reduced form model (the Solow model). Intertemporal models present many problems. They involve some fairly heroic assumptions about the abilities of individuals to make complex decisions, including choosing work hours and consumption over a lifetime in response to tax changes and the general equilibrium consequences of those tax changes. Such a calculation is beyond the skill of most professional economists, much less the ordinary individual. Intertemporal models also have not been empirically tested. Much of the savings response reflects intertemporal substitution of labor in response to interest rate changes, where virtually no evidence of a response is available. Moreover, there is no evidence of the savings response for time periods that are very far apart, which largely drives the results in the model for savings.

Alternative “rules of thumb” savings behavior may be more consistent with individual savings behavior and tend to imply a zero or negative elasticity. The savings rate has had a tendency to change little over much of history, as has the capital output ratio; all observations are consistent with an extremely small savings response.

The second change in the Treasury analysis was the introduction, within the context of the OLG model, of different elasticities that could yield different magnitudes of response. This sensitivity analysis is very useful and has been little used in previous supply-side dynamic modeling experiments.<sup>27</sup> Presented were a base case, a low case, and a high case. The base case elasticities were quite similar to the parameters used in the earlier study for the OLG model, but below those for the Ramsey model.

In the earlier study of tax reform, the “static” substitution effect for labor (which determines the within-period labor supply response to changes in marginal tax rates on labor income) was around 0.5 in the Ramsey model, and 0.3 in the OLG model, with the former clearly much higher than standard estimates, and the latter still slightly toward the high side (these estimates would probably be between 0.2 and 0.3<sup>28</sup>, as discussed above). In the new study, this elasticity is set at around 0.3 in the base case, around 0.2 in the low case, and around 0.5 in the high case. The income elasticities (where tax cuts reduce labor supply) are all high.

The intertemporal substitution elasticity for labor, which measures how labor is shifted over time in response to wage changes over time (and that also governs the response to interest rates even though this response has not been directly tested) was originally around 0.75 in the Ramsey model and around 0.49 in the OLG model. Under the current analysis, the estimates appear to be

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<sup>25</sup> Moderating features include a fixed target bequest and a fixed retirement age, although the latter should not matter much for the steady state.

<sup>26</sup> These conditions include “asexual reproduction,” identical preferences for consumption bundles, and no progressive tax rates, open economies, or varying state tax rates.

<sup>27</sup> The absence of sensitivity analysis with respect to elasticities has been absent from CBO studies as well although provided to a limited degree in Joint Committee on Taxation (JCT) studies. Some of these studies are reviewed in CRS Report RL31949, *Issues in Dynamic Revenue Estimating*, by (name redacted) and in CRS Report RL32502, *What Effects Did the 2001 to 2003 Tax Cuts Have on the Economy?*, by (name redacted).

<sup>28</sup> As discussed in the CRS Report RL33545, *The Advisory Panel’s Tax Reform Proposals*, by (name redacted).

around 0.4 for the base case, around 0.2 for the low case, and around 0.75 for the high case. Most empirical evidence suggests that elasticity is quite small, around 0.2.<sup>29</sup>

The Department of the Treasury discussion implies that a similar measure would have been chosen for men, but that the intertemporal elasticity was increased to around 0.4 to reflect a presumably large intertemporal substitution elasticity for women. There appears to be no evidence of women's responses referred to in the study although women are generally believed to have a more elastic labor supply. However, one recent study that did estimate the intertemporal labor supply response of women found it to be not significantly different from zero.<sup>30</sup>

## Results

Since the Treasury paper is studying a tax cut, rather than a revenue neutral change, some assumption must be made as to how the revenue loss would be made up; otherwise one cannot solve an intertemporal model. Two assumptions were made: a cut in government spending after 10 years and an across-the-board increase in marginal and average tax rates after 10 years. The study also divided the effects into dividend and capital gains cuts, which had a relatively small but positive effect; the reductions of the top rates (which had the largest positive effects with spending cuts, reflecting the labor supply substitution effect); and the remaining extensions, which tended to be negative (with spending cuts) because of income effects. The overall effects are summarized in **Table 2**.

**Table 2. Summary of Output Effects in Department of the Treasury Dynamic Study of Tax Cut Extensions**  
(percentage change)

	Financed with Spending Cuts		Financed with Tax Increases	
	2011-2016	Long Run	2011-2016	Long Run
Base Case	0.5	0.7	0.8	-0.9
Low Case	0.1	0.1	0.4	-0.9
High Case	0.9	1.2	1.1	-0.9

As this analysis suggests, the choice of elasticities can make a great deal of difference, reflecting the uncertainty about these responses. The empirical evidence discussed above actually supports the low case somewhat more. Note also that with tax increases, the effects are larger in the short run, but negative in the long run. This comparison illustrates the importance of the intertemporal substitution response, which is causing a shifting of labor into the present because of the temporarily higher wages in the next five years.

<sup>29</sup> See CRS Report RL31949, *Issues in Dynamic Revenue Estimating*, by (name redacted) for a survey of the empirical evidence.

<sup>30</sup> Adam Looney and Monica Singhal, "The Effect of Anticipated Tax Changes on Intertemporal Labor Supply and the Realization of Taxable Income," Finance and Economics Discussion Series, 2005-44. This study used the loss of a dependent to identify an expected change in the marginal tax rate and found a change in labor *income* (for men) but not in labor supply (either in participation, or in hours worked by existing participants) for either men or women. The increase in labor income of men is not easily explained, although it is possible that there was a shifting of income over time periods or a shift to fringe benefits, or perhaps an increase in work intensity.

Even in the context of an intertemporal model with relatively large behavioral responses, the effects are not very large. In this model, the fact that revenues must be made up by spending cuts clearly acknowledges that the tax cuts do not pay for themselves. But what is the magnitude? As noted earlier, the tax cut is about 1.4% of GDP. For the base case reported above, output increases by 0.5% in the short run and 0.7% in the long run when offset by spending increases. In the tax reform study, Treasury indicated the marginal tax rate on labor income was 24% and the marginal rate on capital income 14%. Using an overall rate of 20%, the offsetting revenue gain from induced economic effects would be 0.1% of output, or 7% of revenue loss in the next five years. It would be about 10% of revenue loss in the steady state. In the high case, it would be 18% in the short run and 24% in the long run. However, with the lower elasticity case, which seems more consistent with empirical evidence, it would be less than 1% in both the short and long run.

## Other Behavioral Responses: Shifting of Taxable and Non-Taxable Income

There is a third type of empirical evidence which might be considered to assess revenue feedback effects, and that is empirical evidence that directly examines how taxable income changes in response to tax changes. This approach could, in theory, capture all of the feedback effects, but the empirical methodology used limits it to supply-side effects discussed above (labor response), and adds other behavioral responses, such as substituting taxable for tax exempt income (i.e., reducing fringe benefits relative to wages, or reducing charitable contributions when taxes are cut). Some of these latter effects are, however, already incorporated in conventional revenue estimates by the JCT.

These studies use a “difference-in-difference” approach to estimating the taxable income response by comparing taxpayers who were subject to different tax rate changes and comparing their behavioral change. For example, if taxpayers in one group had no tax change and taxpayers in another who were similar (i.e., had income that was similar) had a tax change, a relative change in their taxable income could be ascribed to the tax difference, presuming they were otherwise affected by other common economic factors.

Note that theoretically, one cannot be sure whether this effect is positive or negative, because of income and substitution effects. A tax cut’s marginal effects may increase taxable income through increased labor supply or shifting into taxable forms, but the income effect may reduce labor supply or increase charitable contributions. In addition, a tax cut can shift income between corporate and noncorporate sources.

As shown in the **Appendix** the feedback share effect is  $E/(1-t)$ , where  $E$  is the elasticity and  $t$  is the tax rate. With  $t$  at 0.20, the elasticity would have to be 4 to have a tax cut pay for itself and no study has found an elasticity of this level.

Some of the earliest studies tended to find elasticities in excess of one, and even as high as three, but critics have identified some serious statistical problems with these studies that suggest their results not be considered.<sup>31</sup> As these problems are technical in nature, they are discussed in more

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<sup>31</sup> These studies are reviewed in a Congressional Budget Office, *Recent Literature on Taxable Income Elasticities*, by Seth H. Giertz, Technical Paper 2004-16, Dec. 2004.

detail in the appendix, but essentially they arise because of failure to account for a trend in increasing inequality of income and failure to allow elasticities to vary across income classes.

More recent studies have produced smaller elasticities that tend to be around 0.4, although even these estimates are subject to serious uncertainties (discussed briefly in the appendix as well) so that it is difficult to rely upon these later estimates. Moreover, while the studies are based on the marginal tax share, there would, in theory, be very different effects for different tax revisions because behavior is affected by average tax rates. For example, the 1981 tax cut was an across-the-board rate cut with some other changes, but the 1986 tax reform act preserved distributional neutrality. The 1990 and 1993 tax increases concentrated on very high incomes. The 2001-2004 tax cut, however, had significant income effects with little marginal effect on tax rates as well, because of the child credit and increases in standard deductions and rate brackets for married couples. Income effects tend to decrease taxable income.

Nevertheless, it may be useful to note that the revenue feedback effect with a 0.4 elasticity is 10%. Note also that most of the evidence does not suggest a significant labor supply response. In the working paper version of his study, Feldstein essentially found no effect on labor income.<sup>32</sup> Saez and Gruber<sup>33</sup> find an elasticity of 0.12 for total income, but 0.4 for taxable income, suggesting that labor supply would have a much smaller feedback effect: at an elasticity of 0.12, the feedback arising from an overall income increase would be only 3%. This feedback effect is similar to the lower elasticity measures from the Treasury study.

Although this taxable income methodology has some advantages, it is also fraught with a variety of difficulties and with a number of factors that make it likely elasticities are overstated due to transitory effects. In addition, one of the most serious problems is that each tax revision has a different mix of income and substitution effects. This issue is particularly important with the 2001-2004 tax cut which has many important provisions that affect income without altering marginal tax rates, and should increase taxable income, meaning that feedback effects could be negative. Eventually, when data become available, it might be possible to use this method as another way of assessing the 2001-2004 tax cuts' revenue feedback.

## Conclusion

The analysis presented above based on currently available data and studies suggests that short term stimulus effects that produce feedback are fleeting and small and are unlikely to have played an important role in the recent increase in revenues. The permanent revenue feedback effect for the 2001-2004 tax cuts is also likely to be relatively small, no more than 10%, and the magnitude is not entirely clear. In any case these effects are increasingly offset by the effects of the accumulating debt. In the case of effects on the deficit, these offsetting effects probably occur within the first few years, and thereafter, the accumulation of debt and interest payments adds increasingly to the deficit beyond the conventional revenue costs. The studies and information presented in this report suggest that, at this time, there is not convincing evidence that the positive

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<sup>32</sup> Martin Feldstein, *The Effect of Marginal Tax Rates on Taxable Income: A Panel Study*, NBER Working Paper 4496, October 1993.

<sup>33</sup> Reported in Congressional Budget Office, *Recent Literature on Taxable Income Elasticities* by Seth H. Giertz, Technical Paper 2004-16, Dec., 2004.

revenue feedback from the 2001-2004 tax cuts have been of sufficient scale to fully offset their cost to the Treasury.

## Appendix. Further Discussion of Taxable Income Elasticity Estimates

This first part of this section explains how to derive a revenue feedback effect from a taxable income elasticity. The second part provides more details about problems with methodologies, particularly in the early estimates of taxable income elasticity.

### Measuring the Revenue Offset

To determine the revenue offset from using a taxable income elasticity, begin with the equation:

$$(1) R = t \text{ times } Y(1-t)$$

where R is revenue, t is the tax rate, and Y is taxable income that is a function of the after tax share, (1-t).

Totally differentiate equation (1) with respect to t to obtain:

$$(2) dR = Y dt - dt \text{ times } dY/d(1-t)$$

Define the taxable income elasticity, E, as  $dY/d(1-t)$  times  $(1-t)/Y$ . Substituting into equation (2), obtain:

$$(3) dR = Ydt(1-Et/(1-t))$$

Since the revenue change with no feed back is  $Ydt$ , the feedback share is  $Et/(1-t)$ .

### Technical and Methodological Problems with Early Taxable Elasticity Estimates

The basic method of estimating the taxable income elasticity was to compare taxpayers with different changes after tax share (1 minus the tax rate) and examine how their changes in taxable income related. Thus, if an individual with a large percentage increase in after tax share had a larger percentage increase in taxable income, that would be evidence of a response.

The first estimates of taxable income elasticity were by Lindsey,<sup>34</sup> Feldstein,<sup>35</sup> and Auten and Carroll,<sup>36</sup> all of these estimates tended to be relatively high. Lindsey examined the 1981 tax cut and obtained an elasticity of 1.6 to 1.8. Feldstein examined the 1986 tax reform and found

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<sup>34</sup> Lawrence Lindsey, "Individual Taxpayer Response to Tax Cuts: 1982-1984, with Implications for the Revenue Maximizing Tax Rate," *Journal of Public Economics*, vol. 33, July 1987, pp. 173-206.

<sup>35</sup> Martin S. Feldstein, "The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform Act," *Journal of Political Economy*, vol. 103, June 1995, pp. 551-572.

<sup>36</sup> Auten, Gerald and Robert Carroll, "Behavior of the Affluent and the 1986 Tax Reform Act, in *Proceedings of the 87<sup>th</sup> Annual Conference on Taxation of the National Tax Association*, Columbus, Ohio, 1994, pp. 7-12.

elasticities of 1.04 to 3.05, and Auten and Carroll, also examining the 1986 reform, obtained estimates similar to Feldstein's.

Navratil presented some important critiques of these two studies.<sup>37</sup> First, the Lindsey study did not actually have panel data, so that the same person could be followed over time, and people thus shifted across groups. Navratil was able to obtain panel data and estimated an elasticity of 0.8.

Navratil also has a more general critique of these studies, reflecting problems with exogenous income shifts (the increasing inequality of income) and with the assumption that the elasticities are the same across income classes. He illustrates with an example from Feldstein's study where he obtains the estimate of 1.04.

To derive the estimating equation consider the two equations for the high group and the low group. In this section of the appendix,  $y$  refers to the average *percentage change* in taxable income of a group and  $(1-t)$  refers to the average *percentage change* in after-tax share of that group. The subscript  $h$  refers to high and  $l$  to low.

$$(4) y_h = a_h + b_h(1-t_h)$$

$$(5) y_l = a_l + b_l(1-t_l)$$

where  $a$  is a term that captures all of the change outside the tax share variable, and  $b$  is the elasticity.

The methodology of these studies is called difference in differences and it assumes that  $a_h = a_l$  and  $b_h = b_l$ . In that case, by subtracting (5) from (4) you obtain an estimate of  $b$ :

$$(6) b = (y_h - y_l) / ((1-t_h) - (1-t_l))$$

In Feldstein's data that yielded the 1.04 estimate, the percentage change in taxable income of the high group was 20.3% and the percentage change in after tax share was 25.6%. For the low group, the percentage change in taxable income was 6.4% and the percentage change in after tax share was 12.2%. Thus  $b$  would be calculated as  $(.203 - .064) / (.256 - .122)$  which is 1.04. The peculiar aspect of this change is that the percentage change in taxable income divided by the percentage change in after tax share in each case is smaller than this elasticity—0.79 for the high group and 0.52 for the low group. This implies that the value of  $a$  is negative—and, in fact, a negative 6.3%. If interpreted literally, it means that the taxable income would have declined by this amount if no tax changes had occurred. Since income normally grows this is an unreasonable expectation. The more likely explanation is that the  $a$ 's are different for the two groups or that the  $b$ 's are different. There is reason to expect the  $a$ 's to be larger for the high income group because of the trend in inequality of income that had been going on for some time.

Navratil re-estimated allowing different values for different income groups, and comparing each group in different time periods; he obtains elasticities that are much smaller than Feldstein's,

<sup>37</sup> John F. Navratil, *The Tax Reform Act of 1986: New Evidence on Individual Taxpayer Behavior From Panel Tax Return Data*, Presented at Society of Government Economists Sessions, Allied Social Sciences Association Meetings, New Orleans, LA, Jan. 4-6, 1997.

ranging from 0.11 for the lowest group to 1.09 for the highest. He suggests these estimates are still probably too high because of other factors, including shifting of income across time.

A CBO study<sup>38</sup> reviews the remaining studies which have attempted to counter some of the difficulties in the earlier studies, and while the author notes that most of these studies tend to be around 0.4, he also suggests that because of the many methodological issues remaining, any numbers should be used with caution. Among the problems are the exogenous income changes mentioned above which cannot be entirely controlled for, mean reversion (when incomes fluctuate, high-income taxpayers are more likely to have incomes decline and low income ones are more likely to have incomes rise), the possibility of shifting across time or business form to avoid taxes (which means the estimates may be measuring transitory rather than permanent responses), endogeneity of the tax rate, and the problem of controlling for all tax changes. The transitory effects can be quite significant for high-income individuals who can more easily time income source such as bonuses and deductions such as charitable contributions to have low taxable income when tax rates are high. An example of shifting across income sources and contemporaneous tax policy changes was the shift in income from corporate source to Subchapter S income, which may have been affected by both the changes in relative tax rates, and the increase in the number of shareholders allowed for S corporations.

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<sup>38</sup> Congressional Budget Office, *Recent Literature on Taxable Income Elasticities*, by Seth H. Giertz, Technical Paper 2004-16, Dec., 2004.

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