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**Memorandum**

July 27, 2006

**TO:****FROM:** Jane G. Gravelle  
Senior Specialist in Economic Policy  
Government and Finance Division**SUBJECT:** Comments on the Treasury Dynamic Analysis of Extending the Tax Cuts

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This memorandum responds to your request for a discussion of the dynamic model used by the Treasury Department to analyze the extension of the 2001 tax cuts.<sup>1</sup> The memorandum also compares this modeling exercise with a previous one by Treasury analysts estimating the effects of the tax reform proposals made by the President's Advisory Panel on Federal Tax Reform.<sup>2</sup> A more detailed discussion of the models and modeling issues can be found CRS Report RL33545, *The Advisory Panel's Tax Reform Proposals*.

As discussed below, the analysis has been changed by limiting the model type, but allowing sensitivity analysis with respect to elasticities within that model. The base case estimates 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.

**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.

The earlier 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

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<sup>1</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>2</sup> 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.

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%. In the long run steady state, the effects were 1.4%, 2.2% and 4.8%. 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 features that moderate the effects of the OLG model,<sup>3</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>4</sup>

At the same time, one can also make a case for choosing a reduced form model (the Solow model). As noted in the CRS report cited above, intertemporal models present many limitations. 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 consistent with an extremely small savings response.

The second change was the introduction, within the context of the OLG model, of different parameters that could yield different magnitudes of response. 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, 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, as discussed in the report mentioned above). In the new study, this elasticity is set at around 0.3 in the base case, around 0.2 in

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<sup>3</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>4</sup> These conditions include asexual reproduction, identical preferences for consumption bundles, and no progressive tax rates, open economies, or varying state tax rates.

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) 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 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 (see discussion in CRS Report 31949, *Issues in Dynamic Revenue Estimating*).

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>5</sup>

## Results

Since the 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 ten years and an across the board increase in marginal and average tax rates after ten 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. These are summarized in Table 1.

**Table 1: Summary of Output Effects in Treasury 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

<sup>5</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 that 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.

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.

Even in the context of an intertemporal model with relatively large behavioral responses, the effects are not very large. 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? According to CBO projections, individual income taxes would be 8.4% of GDP in FY 2009 and 9.8% in FY2012, suggesting that the tax cuts are 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. 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% in the steady state.

Please contact me at [REDACTED] with any further questions.