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THE TREASURY DEPARTMENT'S DYNAMIC
ANALYSIS OF PRESIDENT BUSH'S TAX RELIEF
PLAN: A SUMMARY AND EVALUATION

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THE TREASURY DEPARTMENT'S DYNAMIC ANALYSIS OF PRESIDENT BUSH'S TAX RELIEF PLAN: A SUMMARY AND EVALUATION

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The recent publication of “A Dynamic Analysis of Permanent Extension of the President’s Tax Relief”¹ marks an important and informative departure for the Office of Tax Analysis (OTA) in the U.S. Department of the Treasury. It is the OTA’s first public attempt to do a dynamic analysis of a major legislative initiative—the President’s proposal to make permanent certain elements of his 2001 and 2003 tax cuts.

The OTA staff find that not all tax relief is created equal. Tax relief measures that permanently reduce marginal tax rates on labor and capital income raise gross national product (GNP) in the long run. In contrast, tax relief measures that also extend expiring deductions and tax credits (like the 10 percent tax bracket and the \$1,000 child credit) bolster after-tax income. However, they have minimal—in some cases negative—effects on GNP.

Whether the economic effects of tax relief are negative in the long run depends in part on how the government finances tax relief. According to the OTA’s estimates, GNP declines in the long run if the government raises income taxes tomorrow to pay for temporary tax relief today. GNP increases in the long run if tax relief is made permanent and financed with future cuts in government consump-

tion. However, gains in GNP are greatest if tax relief is limited to permanent marginal rate cuts and financed with lower spending.

This *Center for Data Analysis Report* summarizes the OTA’s work and recommends three improvements in its modeling and exposition. Future OTA reports should:

- Include additional time periods for estimates of the economic effects of changes in tax policy. In this report, the OTA gives only two sets of point estimates for the impact of a change in policy on GNP—a five-year average percent change falling within the 10-year budget period and a long-run percent change.²
- Include information about the revenue effects—particularly the dynamic feedback effects—of changes in tax policy. In this report, the OTA discusses only the *economic* effects of extending the President’s tax relief.
- Vary the timing and combination of financing rules to determine how sensitive the results are to the government’s long-run fiscal policy. In this report, the OTA assumes that the government finances tax relief today with either an immediate increase in taxes or an

1. See U.S. Department of the Treasury, Office of Tax Analysis, “A Dynamic Analysis of Permanent Extension of the President’s Tax Relief,” July 25, 2006, at www.treasury.gov/press/releases/reports/treasurydynamicanalysisreporjuly252006.pdf (July 31, 2006). References in the OTA report to a measure of real (inflation-adjusted) GNP are referred to in this paper as simply GNP.

2. “Budget period” refers to the time horizon used either to project baseline, current-law revenues or to estimate the revenue effects of a change in current law. A 10-year period is standard in the federal budget process.

immediate decrease in government consumption tomorrow.

DYNAMIC ANALYSIS AT TREASURY

The President's fiscal year 2007 budget submission to Congress includes a number of important initiatives. Among them are proposals to reduce mandatory and discretionary federal spending and to extend permanently tax relief provisions originally enacted in the Economic Growth and Tax Relief Reconciliation Act (EGTRRA) of 2001 and the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA) of 2003.

The President's budget also includes a plan to create a Dynamic Analysis Division within the OTA.³ Dynamic analysis involves accounting for changes in such major macroeconomic factors as labor force participation, investment, and capital accumulation when analyzing how policy changes influence budget outcomes.

Dynamic estimates of the economic and budgetary effects of tax policy changes can differ substantially from conventional revenue estimates. Conventional revenue estimates may include some microeconomic behavioral effects of changes in tax policy. Thus, they may take into account shifts between business sectors and entity forms and in the timing of transactions and income recognition.⁴ However,

they exclude the economy-wide macroeconomic effects of changes in tax policy on federal receipts.

Over the past 10 years, serious work has been underway to develop the tools needed to produce dynamic estimates. Since 1997, the Joint Committee on Taxation (JCT) has been working to build a capability to do dynamic analysis. The JCT has recently published several papers describing the application of its macroeconomic models to the analysis of the economic and revenue effects of tax policy changes.⁵ In 2003, the Congressional Budget Office (CBO) published for the first time a dynamic analysis of the President's budget.⁶ It has since published several technical papers describing the various models and methodologies that it uses in its dynamic analysis of tax policy.⁷ In contrast, until very recently, the Treasury Department published only conventional estimates of the revenue effects of tax proposals.

Current work at the Treasury Department has confirmed the value of the President's plan to create a Dynamic Analysis Division within the OTA. The fiscal year 2007 *Mid-Session Review* included for the first time a dynamic analysis of a change in tax policy—the permanent extension of provisions of EGTRRA and JGTRRA that are set to expire in 2010.⁸

3. William W. Beach, "The Bush Budget's Hidden Gold: Dynamic Scoring Comes to Treasury," Heritage Foundation *WebMemo* No. 994, February 9, 2006, at www.heritage.org/Research/Taxes/wm994.cfm.
4. For additional details, see Joint Committee on Taxation, U.S. Congress, *Overview of Revenue Estimating Procedures and Methodologies Used by the Staff of the Joint Committee on Taxation*, JCX-1-05, February 2, 2005, pp. 18-19, at www.house.gov/jct/x-1-05.pdf (July 31, 2006).
5. For example, see Joint Committee on Taxation, U.S. Congress, *Macroeconomic Analysis of Various Proposals to Provide \$500 Billion in Tax Relief*, JCX-4-05, March 1, 2005, at www.house.gov/jct/x-4-05.pdf (July 31, 2006), and *Exploring Issues in the Development of Macroeconomic Models for Use in Tax Policy Analysis*, JCX-19-06, June 16, 2006, at www.house.gov/jct/x-19-06.pdf (July 31, 2006). See also Rosanne Altschuler, Nicholas Bull, John Diamond, Tim Dowd, and Pamela Moomau, "The Role of Dynamic Scoring in the Federal Budget Process: Closing the Gap Between Theory and Practice," *American Economic Review*, Vol. 95, No. 2 (May 2005), pp. 432-436.
6. See Congressional Budget Office, *An Analysis of the President's Budgetary Proposals for Fiscal Year 2004*, March 2003, at www.cbo.gov/ftpdocs/41xx/doc4129/03-31-AnalysisPresidentBudget-Final.pdf (July 31, 2006). Previous such analyses released by CBO did not include a chapter on the potential macroeconomic effects of the President's budgetary proposals.
7. For example, see Congressional Budget Office, "How CBO Analyzed the Macroeconomic Effects of the President's Budget," July 2003, at www.cbo.gov/ftpdocs/44xx/doc4454/07-28-PresidentsBudget.pdf (May 16, 2006), and Robert Dennis *et al.*, "Macroeconomic Analysis of a 10-Percent Cut in Income Tax Rates," Congressional Budget Office *Technical Paper* 2004-07, May 2004, at www.cbo.gov/ftpdocs/54xx/doc5485/2004-07.pdf (July 31, 2006). See also Shinichi Nishiyama, "Analyzing Tax Policy Changes Using a Stochastic OLG Model with Heterogeneous Households," Congressional Budget Office *Technical Paper* 2003-12, December 2003, at www.cbo.gov/ftpdocs/49xx/doc4918/2003-12.pdf (July 31, 2006).
8. See Office of Management and Budget, *Mid-Session Review, Budget of the United States Government, Fiscal Year 2007* (Washington, D.C.: U.S. Government Printing Office, 2006), pp. 3-4, at www.whitehouse.gov/omb/budget/fy2007/pdf/07msr.pdf (July 31, 2006). For a complete list of expiring EGTRRA provisions, see Joint Committee on Taxation, U.S. Congress, *Summary of Provisions Contained in the Conference Agreement for H.R. 1836, The Economic Growth and Tax Relief Reconciliation Act of 2001*, JCX-50-01, May 26, 2001, at www.house.gov/jct/x-50-01.pdf (June 9, 2006).

On July 25, 2006, the OTA released a separate report providing a more detailed description of its analysis.⁹ In that report, the OTA decomposes the President's proposals for extending tax relief into three components and analyzes the economic effects of each.

Extending Lower Tax Rates on Capital Gains and Dividend Income. JGTRRA lowered preferential tax rates on capital gains and put in place preferential tax rates on dividend income.¹⁰ The Tax Increase Prevention and Reconciliation Act (TIPRA) of 2005 extended JGTRRA's capital gains and dividend provisions through 2010.¹¹ However, with no further extension, qualified dividend income will be taxed at ordinary income tax rates starting in 2011.¹² Individual long-term net capital gains realizations will be taxed at a pre-JGTRRA maximum rate of 10 percent or 20 percent starting in the same year.¹³

The OTA estimates that permanently extending JGTRRA's preferential rate structure would reduce average marginal tax rates on capital gains by 21 percent or more relative to current law. It estimates that average marginal tax rates on dividends would decline by around 53 percent.

Extending Lower Marginal Tax Rates on Ordinary Income. Under current law, EGTRRA's lower marginal tax rates on ordinary income are also set to expire at the end of 2010. With no extensions, marginal tax rates in the top two tax brackets will rise in 2011 from 35 percent to 39.6 percent and from 33 percent to 36 percent. Marginal rates in the next two income tax brackets will increase from 25 percent and 28 percent to 28 percent and 31 percent.

The OTA estimates that extending EGTRRA's lower marginal rates would reduce average mar-

ginal tax rates on wages by over 5 percent after 2010. It would reduce average marginal tax rates on interest income by 7 percent–8 percent and business income by 11 percent.

Extending EGTRRA Provisions That Increase After-Tax Income. EGTRRA also includes several provisions that directly boost after-tax income. The provisions are scheduled to expire after 2010, but extending them would generate little change in marginal tax rates on ordinary income. These provisions include the 10 percent tax bracket, the \$1,000 child tax credit, and marriage penalty relief. Marriage penalty relief encompasses an increase in both the standard deduction and the size of the 15 percent tax bracket for joint filers.

In its report, the OTA compares three separate scenarios. First, the OTA considers only a permanent extension of JGTRRA's preferential rates on capital gains and dividend income. It then layers onto that an extension of EGTRRA's lower marginal rates on ordinary income. Finally, the OTA combines EGTRRA's and JGTRRA's lower rates on capital gains, dividend income, and ordinary income with provisions of EGTRRA that primarily affect after-tax income. The OTA's analysis does not take into account permanent repeal of the estate tax but instead assumes that the estate tax phases out in 2010 and reverts to its pre-EGTRRA level in 2011. In addition, it excludes permanent alternative minimum tax (AMT) relief.¹⁴

WHAT THE OTA FOUND

Overall, the OTA reaches two broad conclusions:

First, tax relief measures that jointly reduce marginal tax rates on capital gains, dividend income, and ordinary income produce bigger long-run

9. See U.S. Department of the Treasury, "A Dynamic Analysis of Permanent Extension of the President's Tax Relief."

10. Under JGTRRA, taxpayers in the lowest two tax brackets pay a 5 percent tax rate on capital gains and dividend income through 2007 and no taxes on capital gains and dividend income in 2008. Taxpayers in all other brackets pay a 15 percent tax rate on capital gains and dividend income through 2008.

11. JGTRRA's preferential tax rates on individual long-term net capital gains realizations and qualified dividend income were set to expire at the end of 2008. TIPRA extends JGTRRA's preferential rate structure through the end of 2010. For additional details, see Joint Committee on Taxation, U.S. Congress, *Estimated Revenue Effects of the Conference Agreement for the "Tax Increase Prevention and Reconciliation Act of 2005,"* JCX-18-06, May 9, 2006, at www.house.gov/jct/x-18-06.pdf (July 10, 2006).

12. Ordinary income is all income that does not qualify as capital gains. Ordinary income includes wages and salaries, interest income, and business income reported at the individual level.

13. The 10 percent rate will apply to all taxpayers in the lowest (15 percent) tax bracket. The 20 percent rate will apply to taxpayers in all other tax brackets.

gains in GNP than measures that only modify the amount of after-tax income. This is largely because cuts in marginal rates directly increase the after-tax wage rate (i.e., the after-tax rate of return to labor) and the after-tax rate of return to capital. Higher after-tax returns to both labor and capital tend to encourage individuals to substitute leisure for labor (a substitution effect). They also tend to encourage greater private saving and investment, and thus a buildup of the domestic capital stock. New or bigger deductions and tax credits do not have the same incentive effects. They boost after-tax incomes, not after-tax returns. As a result, individuals can increase or even maintain the same level of after-tax income by working the same or fewer hours (an income effect).

Second, how the government finances tax cuts matters. Tax cuts can partially—but, as a general rule, not entirely—pay for themselves. The government can respond to any subsequent increase in the debt-to-GNP ratio by cutting spending or raising taxes. In general, the OTA finds that GNP is higher in the long run if tax cuts are made permanent and accompanied by future reductions in federal spending. On the other hand, long-run GNP is lower, or even declines, if the federal government raises average and marginal tax rates on all labor and capital income to pay for what turns out to be only a temporary extension of EGTRRA's and JGTRRA's expiring provisions.

COMMENTS AND RECOMMENDATIONS ON THE OTA'S ANALYSIS

How useful is the information provided in the OTA's analysis of the economic effects of permanently extending EGTRRA's and JGTRRA's expiring provisions? We evaluated the OTA's analysis by considering how well it answers three key policy questions:

- What are the economic effects? Do different types of tax proposals produce different economic outcomes?
- What are the budget effects? Do different types of tax proposals produce different budgetary outcomes?
- What are the effects of the model's financing rules? Do the economic results change depending on what type of long-run fiscal policy is adopted?

Economic Effects

Do different types of tax proposals produce different economic outcomes?

The OTA compares the impact of different types of tax cuts on GNP, private consumption and investment, the domestic capital stock, and labor supply. In general, the OTA's results show that reducing marginal tax rates on capital gains, dividend income, and ordinary income produces larger economic gains than permanently extending both lower marginal rates and the 10 percent tax bracket, the \$1,000 child tax credit, and marriage penalty relief. For example, assuming that tax cuts are financed with future cuts in government consumption, GNP is 1.1 percent higher in the long run if EGTRRA's and JGTRRA's lower marginal rates are extended. However, GNP is 0.7 percent higher if both EGTRRA's and JGTRRA's lower marginal rates and EGTRRA's expiring deductions and tax credits are extended.

The OTA could improve the presentation of its economic results in one regard. The OTA provides estimates of the impact of a tax policy change on GNP, private consumption and investment, the domestic capital stock, and labor supply for only two periods. It shows the average percent change (relative to baseline) between 2011 and 2016 and a "long-run" percent change.¹⁵ Long-run here refers to a steady-state value, or the percent change (relative to baseline) in a given economic indicator after the model has converged to its final solution.

Recommendation. In a more technical document like the OTA's July 25 report, some additional detail would be helpful. For example, the OTA could show average percent changes for a handful of five-year periods after 2017. Doing so would give the reader some sense of how quickly the model that the OTA uses—the Tax Policy Advisers (TPA) model—converges.¹⁶ It would thus define the

14. OTA analyzed the President's fiscal year 2007 tax relief proposals, which include permanent repeal of the estate tax. However, they limit AMT relief to a one-year extension of the 2005 AMT exemption amount (with no inflation indexing) and a one-year extension of the AMT's unrestricted use of some personal tax credits. TIPRA, which President Bush signed into law on May 17, 2006, increases the individual AMT exemption amount for 2006 and extends through 2006 the AMT's treatment of nonrefundable personal credits. For additional details, see Joint Committee on Taxation, *Estimated Revenue Effects of the Conference Agreement for the "Tax Increase Prevention and Reconciliation Act of 2005."*

“long run” in the context of the specific tax policy change being considered.

Budget Effects

Do different types of tax proposals produce different budgetary outcomes?

Not all tax proposals are created equal. The OTA shows that different types of tax proposals produce different economic outcomes. If different types of proposals produce different economic outcomes, they are also likely to produce different budgetary outcomes. Regrettably, the OTA’s analysis is silent on one important budgetary outcome—the dynamic revenue (feedback) effects—of extending EGTRRA’s and JGTRRA’s expiring provisions.

Macroeconomic models such as the one used by the OTA can estimate dynamic feedback effects, but these are different from dynamic revenue estimates. Specifically, they are not estimates of tax revenues that will be collected over the 10-year budget period. Rather, they are estimates of the *additional* tax revenues that will be collected relative to a long-run baseline forecast as a result of the macroeconomic effects of a change in tax policy on federal receipts. Policy analysts can use such information to evaluate different proposed changes in tax law. They can also use such information to gauge the extent to which tax cuts are likely to pay for themselves.

In a July 27 talk to the National Economists Club, Robert Carroll, Deputy Assistant Secretary of the Treasury for Tax Analysis, indicated that the OTA envisioned “that dynamic analysis at the Treasury Department may ultimately evolve” in the direction of providing estimates of dynamic feedback effects.¹⁷ However, he gave no indication as to when—or even if—such information would be provided.

The TPA model implicitly accounts for dynamic feedback when it adjusts income tax rates or government consumption to target a ratio of debt to GNP.¹⁸ An increase in GNP implies gains in individual and corporate incomes and in federal tax revenues. The greater the increase in GNP, the greater in general is the gain in federal tax revenues. Thus, permanently extending just EGTRRA’s and JGTRRA’s expiring marginal rate provisions should generate larger dynamic feedback effects than would extending both lower marginal rates and EGTRRA’s expiring deductions and tax credits. In turn, tax cuts that are accompanied by larger dynamic feedback effects should require smaller hikes in average and marginal income tax rates or smaller cuts in government consumption to hold the growth rate of the federal debt stock to the growth rate of GNP.

Recommendation. The CBO and the JCT already regularly estimate the dynamic feedback effects of different tax proposals.¹⁹ The OTA should be encouraged to use estimates of economic and budgetary outcomes from the TPA model (and its other macroeconomic models) to tease out similar measures of dynamic feedback effects.

Long-Run Fiscal Policy

Do the economic results change depending on what type of long-run fiscal policy is adopted?

As a general rule, tax cuts—particularly those that reduce marginal rates—will produce some dynamic revenue (feedback) effects, but they will not pay for themselves. In the TPA model, this means that either federal consumption must fall or federal revenues must rise beginning in 2017 to ensure a constant debt-to-GNP ratio. The OTA compares the effects of

15. In a July 27 talk for the National Economists Club, Robert Carroll, Deputy Assistant Secretary of the Treasury for Tax Analysis, emphasized that OTA dynamic analysis was focused on the long-run effects of tax policy. See Robert Carroll, remarks before the National Economists Club, July 27, 2006, at www.ustreas.gov/press/releases/hp29.htm (July 31, 2006). Both the CBO and the JCT present results of their dynamic analyses using tables that are very similar to those adopted by the OTA. In particular, they typically give five-year average percent changes for the first 10 years of a simulation and then a long-run percent change. For example, see Dennis *et al.*, “Macroeconomic Analysis of a 10-Percent Cut in Income Tax Rates,” and Joint Committee on Taxation, *Macroeconomic Analysis of Various Proposals to Provide \$500 Billion in Tax Relief*.
16. See the next section for additional information on the TPA model.
17. Carroll, remarks before the National Economists Club.
18. The same could be said for any intertemporal CGE model that imposes the government’s intertemporal budget constraint by targeting the debt-to-GNP ratio.
19. See, for example, Congressional Budget Office, *An Analysis of the President’s Budgetary Proposals for Fiscal Year 2007*, March 2006, pp. 29–43, at www.cbo.gov/ftpdocs/70xx/doc7069/03-14-presidentsbudget.pdf (July 31, 2006). See also Joint Committee on Taxation, *Exploring Issues in the Development of Macroeconomic Models for Use in Tax Policy Analysis*.

different financing rules on GNP, private consumption and investment, the domestic capital stock, and labor supply. Economic outcomes in both the short run and the long run are influenced by the financing rule that the OTA adopts.

Estimates of economic outcomes can be very sensitive to the type of model used and the modeling assumptions made. Thus, some care is required when evaluating economic effects under alternative financing options, particularly in the second five years before the onset of debt-to-GNP targeting. For example, between 2011 and 2016, private investment is an average of 1.8 percent higher if tax cuts today are financed with increases in income tax rates tomorrow. It is an average of 3 percent lower if tax cuts today are financed with cuts in government spending tomorrow.

Such results imply that financing temporary tax cuts today with higher taxes on labor and capital income tomorrow produces superior economic outcomes in the short run. However, such a conclusion is partly an artifact of the financing and modeling assumptions adopted in the OTA analysis. For example, the TPA model assumes that households have perfect foresight about future federal tax and spending policies. In addition, the OTA assumes that the federal government imposes debt-to-GNP targeting in a single period.

Both assumptions tend to maximize the near-term economic consequences of the financing rules. They do so by giving individuals and firms a strong incentive to shift labor supply and investment activity forward to take advantage of temporarily lower average and marginal tax rates on labor and capital income. In reality, we would probably not see such a pronounced response to a temporary extension of EGTRRA's and JGTRRA's expiring provisions. This is partially because future fiscal policies are highly uncertain and partially because any changes in taxes or spending needed to make fiscal policy sustainable in the long run are likely to be phased in over an extended period.

Recommendation. The OTA could conduct some further sensitivity analysis to clarify the extent to which financing rules affect the near-term economic consequences of extending EGTRRA's and JGTRRA's expiring provisions. For example, in its dynamic analysis of the President's budget, the CBO typically phases in the government's long-run (intertemporal) budget constraint over 10 years.²⁰ The CBO also assumes that a blend of government consumption and transfer payments to individuals is cut to impose the government's intertemporal budget constraint. The OTA could show the short-run and long-run economic effects of extending EGTRRA's and JGTRRA's expiring provisions under such alternative assumptions and compare the results to what it already reports.

THE MODEL USED BY THE OTA

The OTA's report provides a detailed description of the OTA's dynamic analysis of the economic effects of extending EGTRRA's and JGTRRA's expiring provisions. This analysis is comparable in many ways to work already underway at the CBO and the JCT. For example, the OTA uses a four-sector version of the Tax Policy Advisers' overlapping generations (OLG) model.²¹ The JCT frequently uses a slightly smaller version of the same OLG model in its dynamic analysis of the economic and revenue effects of tax proposals.

The TPA model is a large-scale dynamic computable general equilibrium (CGE) model with overlapping generations of taxpayers. Taxpayers maximize utility over a 55-year adult life that includes 45 working years and 10 retirement years. Individual lifetime utility is a discounted aggregation of utility in each of those 55 adult years. In each period, individuals choose leisure and consumption to maximize their utility. They also save and accumulate assets. At the end of 55 years, individuals leave bequests to younger generations.

The TPA model accounts for production and investment decisions made by firms and households. It includes four production sectors: corporate non-housing goods and services, non-corporate

20. See Congressional Budget Office, *An Analysis of the President's Budgetary Proposals for Fiscal Year 2005*, March 2004, pp. 43–45, at www.cbo.gov/ftpdocs/51xx/doc5151/03-08-PresidentsBudget.pdf (July 31, 2006). The final section of this report includes a description of the government's intertemporal budget constraint.

21. For additional details, see John Diamond and George Zodrow, "Description of the Tax Policy Advisers' Model," unpublished working paper, Rice University, March 15, 2005. See also Tax Policy Advisers, LLC, Web site, at www.taxpolicyadvisers.com (August 2, 2006).

non-housing goods and services, owner-occupied housing, and rental housing. Corporate and noncorporate firms choose labor inputs and make investment decisions to maximize their value or profits. They consider likely changes in tax policy when planning the optimal time path for investment. Similarly, homeowners and landlords make investments to maximize the value of their housing stock. They explicitly consider how changes in the tax treatment of housing will likely affect home prices.

All economic models are approximations of reality. Some models focus on long-run economic outcomes; others focus on short-run economic outcomes. Some models include individuals for whom consumption in any given period is a fixed proportion of current after-tax income. Others include individuals for whom consumption is a function of real accumulated wealth. The basic features of an economic model determine its focus and influence the types of questions that it is best suited to answer.

The TPA model is an intertemporal CGE model. Thus, in the model, individuals and firms are forward-looking. They anticipate changes in the policy environment when making decisions about current and future investment, consumption, and labor supply. In addition, individuals and government are subject to intertemporal budget constraints. Neither an individual household nor the federal government can live beyond its means indefinitely. In the long run, the present value of consumption or spending must be tied to the present value of income or revenues.

Finally, in the model's baseline economy, all resources (e.g., labor) are fully employed, and GNP is at its potential in every period. Models that assume full employment are not appropriate tools for analyzing the short-run effects of changes in tax policy or tax policies designed to stimulate private investment or consumption at a time when aggregate demand is below aggregate supply. However, they are good vehicles for analyzing the long-run incentive effects of lower marginal tax rates on output, labor supply, private saving and investment, and the allocation of capital.

Implementing these three basic features of an intertemporal CGE model requires certain simpli-

fying assumptions. These assumptions are necessary if the model is to be solved. They are standard to intertemporal CGE models as a class and should not be considered peculiarities of the TPA model.

For example, the TPA model is calibrated to a steady-state balanced growth path. All sector outputs, capital and debt stocks, final demands (e.g., consumption and investment), and incomes in the model's baseline expand at a constant rate, typically set equal to the growth rate of labor productivity. Baseline fiscal policy is also assumed to be stable or sustainable in the long run. The federal government can run deficits and accumulate debt, but not without bounds. Rather, federal revenues, spending, and ultimately debt grow at the same rate as GNP, making all three fiscal policy variables constant shares of output in every period.

In addition, the TPA model assumes perfect foresight. This means that in the TPA model, firms and individuals are assumed to know with certainty the future values of all factor prices and policy variables and to adjust their current and future behavior accordingly. The perfect-foresight assumption plays an important role in determining the timing and magnitude of households' and firms' responses to changes in fiscal policy.

In the TPA model, the federal government is subject to an intertemporal budget constraint. Specifically, the government can initially—but not indefinitely—finance tax cuts with new borrowing and deficits. Thus, in any given year, the sum of the government's expenditures on goods and services, transfer payments to individuals, net interest on the existing debt, and other spending can exceed total revenues from income and other taxes. However, in the long run, the government's overall deficit cannot grow faster than GNP. Rather, the government's intertemporal budget constraint requires that the government run a compensating budget surplus in the future by raising taxes or cutting spending.

The OTA imposes the government's intertemporal budget constraint using "financing" rules similar to those frequently applied in models used by the CBO.²² Between 2007 and 2016, the federal government finances the extension of EGTRRA's and JGTRRA's expiring provisions with deficits and new debt. However, beginning in

22. For example, see Congressional Budget Office, *An Analysis of the President's Budgetary Proposals for Fiscal Year 2007*, pp. 29–43.

2017, it either cuts government consumption or proportionately increases tax rates on corporate, individual,²³ and capital income²⁴ to limit the growth rate of debt to the growth rate of GNP.²⁵ Tax relief is permanent if it cuts government consumption. Tax relief is only temporary if it proportionately increases income tax rates. In either case, income tax rates immediately rise or government consumption immediately falls in 2017 so that the federal government's primary surplus increases by enough to cover the increase in net federal interest payments.

How the government imposes its intertemporal budget constraint influences individuals' labor-supply decisions and firms' and households' investment decisions. If the government finances tax cuts today with higher taxes tomorrow, economic activity in the long run generally declines. However, anticipation of higher average and marginal tax rates on labor and capital income after 2016 boosts hours worked, private saving and investment, and the capital stock over the first 10 years.

Conversely, if the government finances tax cuts today with lower government consumption tomorrow, economic activity increases in the future. However, the gains in labor supply, private saving and investment, and capital stock are not as great within the first 10 years because individuals and firms anticipate the continuation of lower marginal income tax rates in the future. As a result, the initial increase in private saving is not enough to offset increased borrowing by the government, and new government borrowing crowds out some private investment. That crowding out is particularly pronounced if all expiring components of EGTRRA and JGTRRA—including the 10 percent bracket

and the child tax credit, which affect only after-tax incomes—are extended.

There is one exception. If the government finances marginal rate cuts today with higher income taxes in the future, economic activity is uniformly higher in the long run—just not by as much as would be the case if the government financed tax cuts today with lower government consumption tomorrow. This is because this particular combination of tax cuts followed by tax hikes reduces the burden of taxation on corporate investment relative to labor income and capital income in other sectors. The result is a more efficient allocation of capital and a modest increase in GNP.

CONCLUSION

On July 25, the OTA published a detailed summary of its dynamic analysis of the President's proposal to make permanent certain expiring provisions of EGTRRA and JGTRRA. That report, "A Dynamic Analysis of Permanent Extension of the President's Tax Relief," represents the OTA's first public attempt to do a dynamic analysis of a major legislative initiative.

The OTA is to be congratulated for its effort. However, future OTA reports on the subject of dynamic analysis could be improved by including additional information on not only the economic and budgetary effects of changes in tax policy, but also the sensitivity of the OTA's results to assumptions about the government's long-run fiscal policy.

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23. The individual income tax includes a progressive wage income tax. It assumes a tax base that is adjusted for various exclusions, exemptions, deductions, and credits.
 24. Capital income here includes non-corporate business income, interest income, dividends, and capital gains. Different average rates are applied to each type of capital income.
 25. This means that the model adjusts taxes or consumption to hold the debt-to-GNP ratio constant at its 2017 value.