OVERVIEW OF WORK OF THE STAFF OF THE JOINT COMMITTEE ON TAXATION TO MODEL THE MACROECONOMIC EFFECTS OF PROPOSED TAX LEGISLATION TO COMPLY WITH HOUSE RULE XIII.3.(h)(2)

Prepared by the Staff
of the
JOINT COMMITTEE ON TAXATION

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CONTENTS

INTRODUCTION

This document,[1] prepared by the staff of the Joint Committee on Taxation, provides an overview of the work done by the Joint Committee on Taxation staff to model the macroeconomic effects of proposed tax legislation. This report details Joint Committee on Taxation staff efforts to comply with House Rule XIII.3.(h)(2), which generally requires that a macroeconomic analysis be included in bills reported by the Committee on Ways and Means that amend the Internal Revenue Code of 1986.

[1] This document may be cited as follows: Joint Committee on Taxation, *Overview of Work of the Staff of the Joint Committee on Taxation to Model the Macroeconomic Effects of Proposed Tax Legislation to Comply with House Rule XIII.3.(h)(2)* (JCX-105-03), December 22, 2003.

EXECUTIVE SUMMARY

Introduction

This report describes the status of efforts by the staff of the Joint Committee on Taxation ("Joint Committee Staff") to model the macroeconomic effects of proposed tax legislation. Conventional revenue estimates prepared by the Joint Committee staff incorporate assumptions that individuals and firms respond to proposed tax changes by modifying their microeconomic behavior. However, consistent with longstanding Congressional budget policy, the behavioral responses that are incorporated in conventional revenue estimates do not include those that would affect total economic output. For example, in estimating the revenue effects of a proposal to increase the excise tax rate on firearms, the Joint Committee staff assumes that purchases of taxable firearms would decline, but purchases of other, untaxed goods would increase, leaving total purchases unchanged. In the case of a proposed change in individual income tax rates, the Joint Committee staff assumes that income would shift between taxable forms, such as wages, and nontaxable forms, such as certain employer-provided benefits, thus resulting in a change in taxable income due to the proposal. But, this estimate does not incorporate any effects from possible changes in work effort as a result of the proposed change, which might change total economic output.

A succession of rules passed by the House of Representatives, the latest in 2003, have directed the Joint Committee staff to supplement conventional revenue estimates with an analysis of the macroeconomic impact of certain tax legislation. Parts I and II of this report describe the efforts of the Joint Committee staff, begun in 1996, to analyze the macroeconomic effects of tax legislation, and the economic models currently used. Part III of this report includes an extended version of the Joint Committee staff's macroeconomic analysis of recent tax legislation, which was provided pursuant to the most recent House Rule, and a description of the major assumptions used in that analysis.

Development and description of Joint Committee staff macroeconomic models

The Joint Committee staff's efforts at providing macroeconomic analysis began in 1996 with a careful investigation of the attributes of several types of models of the economy. The Joint Committee staff hosted a series of meetings with twelve economic modelers who used nine different models to examine the macroeconomic effects of a mutually agreed upon tax reform proposal. This modeling exercise culminated in a macroeconomic modeling symposium held in January 1997.

Since the symposium, much of the Joint Committee staff's developmental work has focused on enhancing and adapting standard models of the economy for use in the analysis of the macroeconomic effects of tax policy changes. Because different types of models have different strengths and weaknesses, the Joint Committee staff has worked to become proficient in the use of several types of modeling frameworks. The most substantial effort, conducted in consultation with a private contractor, has resulted in the development of the Macroeconomic Equilibrium Growth ("MEG") model. The MEG model is based on the standard economic assumption that through the actions of consumers and firms, market prices will adjust until consumers desire to buy exactly the amount of goods and services that businesses want to produce, thus equating

supply and demand. Under this assumption, in the long run, the amount of goods and services produced is determined by the amount of labor and capital that individuals make available for production. Individuals' decisions about how much to work and save, and businesses' decisions on how much to invest are influenced by the amount of taxes levied on these activities. Wage and price adjustments that bring supply and demand into equilibrium are not always assumed to occur instantaneously in response to a fiscal policy change. Thus, the MEG model can be used to analyze possible short-run adjustments of the economy to such changes.

In order to explore multiple perspectives on the economic modeling of tax policy, the Joint Committee staff has worked with several additional macroeconomic models. The most in-depth work involves the use of a model that includes multiple generations of consumers and producers, who are assumed to have forward-looking expectations (that is, consumers and firm managers are assumed to make economic choices based on accurate predictions about the future of the economy). Such a model is commonly referred to as an overlapping generations model ("OLG"). These features are generally thought to be desirable for the analysis of the long-run effects of policy changes; hence this type of model is widely used in the analysis of major changes in tax policy. The Joint Committee staff also maintains service contracts with the distributors of two commercially available econometric models.

In order to account for the complexities of the present-law Internal Revenue Code, much of the Joint Committee staff's macroeconomic modeling work has involved reconfiguring tax-related equations in the macroecomomic models so that they can make better use of the wealth of information available from the Joint Committee microsimulation models. The microsimulation models combine individual and business tax return data with tax calculators that provide detailed estimates of tax liability under current and proposed tax laws. Using these microsimulation models, the Joint Committee staff computes changes in tax depreciation schedules and changes in the average and effective marginal tax rates on the various flows of income incorporated in each macroeconomic model. These computations provide the primary input to the macroeconomic models used by the Joint Committee staff. Use of microsimulation models to estimate changes in tax rates due to proposed law changes permits incorporating the effects of tax proposals in more detail than otherwise possible.

Types of tax proposals likely to have measurable macroeconomic effects

Most tax proposals are unlikely to have any significant positive or negative impact on the United States macroeconomy. In order for a tax proposal to have a measurable effect in the models used by the Joint Committee staff, the proposal would have to have a significant impact on the inputs used to model it. Currently, these inputs consist primarily of the changes in the average and effective marginal tax rates on the various flows of income incorporated in each model as calculated using Joint Committee staff microsimulation models, or through changing tax depreciation schedules. The Joint Committee staff has found that in order for a proposal to have a measurable effect on the economy, the proposal would generally need to have a significant impact on at least one of the following:

- Average individual income tax liability;
- Effective marginal income tax rates on wages, interest, dividends, or capital gains income;

- Average corporate tax liability; or
- The present value of tax depreciation on business investments.

Each of these items refers to aggregate calculations for each type of income as a whole, not just for the specific taxpayers affected by a proposal. Hence, it would be possible for a proposal to have a significant effect on the after-tax income of persons or businesses in a sub-sector of the economy, without significantly affecting the average or effective marginal tax rates for the aggregate sectors appearing in the macroeconomic models currently used by the Joint Committee staff. As additional business sectoral detail is added to Joint Committee staff models, the models will be able to provide more information about the efficiency effects of proposals for which the main effect is to shift investment between types of businesses. Because individuals and firms are likely to react differently to temporary versus permanent changes in policy, it would generally require a larger change in a temporary provision than a permanent provision to have a measurable effect on the economy. A proposal that results primarily in a shift in the timing of an economic activity may have no long run effect on the economy.

Contributions of Blue Ribbon Advisory Panel

The Joint Committee staff's modeling efforts have benefited substantially from the advice of a Blue Ribbon Advisory Panel of 23 economists with expertise in macroeconomic modeling and budgetary policy. The Blue Ribbon Advisory Panel was convened in 2001 at the request of Chairman William Thomas of the House Committee on Ways and Means. During a series of three meetings, the Blue Ribbon Advisory Panel reviewed the MEG model and discussed other modeling frameworks. Blue Ribbon Advisory Panel discussions focused on the following items: (1) the specific attributes of the macroeconomic models employed by the Joint Committee staff; (2) the importance of assumptions about the reaction of the Federal Reserve Board, future fiscal policies, and the reactions of State and local and foreign governments; (3) the importance and uncertainty of econometric evidence regarding the responses of individuals and businesses to changes in tax policy; (4) the relationship between Federal budget deficits and interest rates; and (5) the modeling of individual expectations about the economy. The discussions corroborated the Joint Committee staff's assessment that the prediction of the macroeconomic impact of tax law changes entails considerable uncertainty.

Panel members made a number of suggestions concerning steps the Joint Committee staff should take to improve its modeling capabilities. Some of these modeling improvements were implemented during the Panel review process. In addition, Panel members expressed substantial disagreement on the exact type of modeling framework that the Joint Committee staff should employ. This diversity of opinion on model choice reflects the fact that no single model can address every important implication of policy changes. Because of the disagreement over the correct modeling structure, the Joint Committee staff will continue to work to improve the MEG model, to develop alternative modeling frameworks, and to use multiple modeling assumptions in preparing macroeconomic analyses of proposed tax policy.

Macroeconomic analysis of H.R.2, the "Jobs and Growth Tax Act of 2003," as reported by the House Committee on Ways and Means

On January 7, 2003, the House of Representatives adopted a rule (XIII.3.(h)(2)) directing the Joint Committee staff to prepare a macroeconomic analysis (or to explain why such an analysis is infeasible) for all tax bills reported out of the Ways and Means Committee. Pursuant to this rule, the Joint Committee staff prepared a macroeconomic analysis of H.R. 2, the "Jobs and Growth Tax Act of 2003" as reported by the Ways and Means Committee. This report was inserted into the Congressional Record for Thursday, May 8, 2003. An expanded version of the analysis contained in the report is presented here and includes an expanded description of important data and assumptions used in analyzing the proposal. The analysis presents the results of simulating the changes contained in H.R. 2 as reported by the Ways and Means Committee using the MEG model, the OLG model, and the commercially available Global Insight model. These simulations indicate that this bill would likely stimulate the economy immediately after enactment by creating temporary incentives to increase work effort, business investment, and consumption. This stimulus is reduced over time because the consumption, labor, and investment incentives are temporary, and because the positive business investment incentives arising from the tax policy are eventually likely to be outweighed by the reduction in national savings due to increasing Federal government deficits.

I. JOINT COMMITTEE ON TAXATION MACROECONOMIC MODELING

A. Overview

Conventional revenue estimates prepared by the Joint Committee staff incorporate assumptions that individuals and firms respond to proposed tax changes by modifying their microeconomic behavior. However, consistent with longstanding Congressional budget policy, the behavioral responses that are incorporated in conventional revenue estimates do not include those that would affect total economic output. For example, in estimating the revenue effects of a proposal to increase the excise tax rate on firearms, the Joint Committee staff assumes that purchases of taxable firearms would decline, but purchases of other, untaxed goods would increase, leaving total purchases unchanged. In the case of a proposed change in individual income tax rates, the Joint Committee staff assumes that income would shift between taxable forms, such as wages, and nontaxable forms, such as certain employer-provided benefits, thus resulting in a change in taxable income due to the proposal. But, this estimate does not incorporate any effects from possible changes in work effort as a result of the proposed change, which might change total economic output.

A succession of rules passed by the House of Representatives, the latest in 2003, have directed the Joint Committee staff to supplement conventional revenue estimates with an analysis of the macroeconomic impact of certain tax legislation. On January 7, 2003, the House of Representatives passed a revised Rule XIII.3.(h)(2) pertaining to macroeconomic analysis of tax bills. This rule states:

"XIII.3.(h)(2)(A) It shall not be in order to consider a bill or joint resolution reported by the Committee on Ways and Means that proposes to amend the Internal Revenue Code of 1986 unless-

> (i) the report includes an analysis of the macroeconomic impact analysis;
>
> (ii) the report includes a statement from the Joint Committee on Internal Revenue Taxation explaining why such an analysis is not calculable; or
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> (iii) the chairman of the Committee on Ways and Means causes a macroeconomic impact analysis to be printed in the Congressional Record before consideration of the bill or joint resolution.

(B) in subdivision (A), the term "macroeconomic impact analysis" means

> (i) an estimate prepared by the Joint Committee on Internal Revenue Taxation of the expected changes in economic output, employment, capital stock, and tax revenue effect of such change; and

(ii) a statement from the Joint Committee on Internal Revenue Taxation identifying the critical assumptions and the source of data underlying such analysis."[2]

A rule adopted by prior Congresses provided a procedure through which certain Members of Congress could request supplemental macroeconomic analyses of tax proposals.[3]

B. History of the Joint Committee Staff Macroeconomic Modeling Work

Since 1996, the Joint Committee staff has been working to develop the capability to analyze possible effects of proposed changes in tax policy on the economy. The first step in this process was a careful investigation of the attributes of several types of macroeconomic models. In 1996, the Joint Committee staff convened a group of macroeconomic modelers who had developed forecasting or simulation models of the U.S. economy and had used these models to attempt to predict the macroeconomic effects of major tax reform. The group was asked to work together on a modeling experiment that would help the Joint Committee staff to identify the reasons that different models had varying predictions, as well as the strong points of each type of model. The experiment required all of the modelers to start with the same present-law baseline forecast of the economy and to estimate the same tax reform proposals. The modelers met several times over the course of a year to compare results and modeling issues.

The results of the modeling exercise, which were made public in a symposium held in January 1997,[4] varied widely. For example, one proposal that was modeled would replace the present-law individual and corporate income taxes with a consumption tax that included a large personal tax credit and some transition relief for existing capital. For this proposal, each modeler computed the average change in real Gross Domestic Product over the first five years after

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[2] *Rules of the House of Representatives, 108th Congress*, January 7, 2003, p.25.

[3] The first rule on this subject was rule XIII.7.(e), adopted in the 105th Congress, which read: "(1)A report from the Committee on Ways and Means on a bill or joint resolution designated by the Majority Leader (after consultation with the Minority Leader) as major tax legislation may include a dynamic estimate of the changes in Federal revenues expected to result from enactment of the legislation. The Joint Committee on Taxation shall render a dynamic estimate of such legislation only in response to a timely request from the chairman of the Committee on Ways and Means (after consultation with the ranking minority member of the committee). A dynamic estimate pursuant to this paragraph may be used for informational purposes. (2) In this paragraph, 'dynamic estimate' means a projection based in any part on assumptions concerning probable effects of macroeconomic feedback. A dynamic estimate shall include a statement identifying all such assumptions." Charles W. Johnson, Parliamentarian, *Constitution, Jefferson's Manual, and Rules of the House of Representatives*, U.S. GPO, 1997, p. 551. The same language appears in the *Rules* for the 106th and 107th Congresses.

[4] The models, proposals, and results are summarized in Joint Committee on Taxation, *Joint Committee on Taxation Tax Modeling Project and 1997 Tax Symposium Papers* (JCS-21-97), November 20, 1997.

implementation. While most of the simulation results clustered between a 0.7 percent increase and a 4.7 percent increase relative to the baseline forecast over that time period, the full range of results included a decline of 4.2 percent and an increase of 16.4 percent relative to the baseline forecast. The differences in modeling results can be partially attributed to differences in the modelers' assumptions about the following issues: (1) the magnitude of individual and firm behavioral responses to tax incentives; (2) the operations of international financial markets; and (3) the actions of the Federal Reserve Board.[5] Assumptions relating to each of these factors significantly influenced the outcomes predicted by the different models.

Several other equally important factors also contributed to the differences in model predictions. For example, because the Internal Revenue Code is very complex, each model made different simplifying assumptions in modeling the present-law tax system. As a result, the estimated magnitude of tax-induced changes in after-tax investment returns and after-tax wage rates, which are the major factors that influence taxpayer behavior, varied significantly among the models. In addition, the results differed depending on whether the models allowed for temporary unemployment during the transition to equilibrium, or assumed a full-employment transition path. Finally, certain structural features of the different models that were chosen to facilitate the mathematical solutions of the models significantly affected the predicted outcomes of certain types of tax policy.

A modeling challenge that emerged during the exercise was that each variation in the tax reform proposal being analyzed required weeks of new modeling effort to produce a reasonably accurate representation of that change. No single, pre-existing model is configured to simulate every nuance of a particular tax proposal without some adjustment. The amount of time required for reconfiguration varied depending on how much the proposed policy change varied from previously modeled policy changes.

C. Macroeconomic Models Used by the Joint Committee Staff

In general

Since the 1997 symposium, Joint Committee staff has worked on several different types of models. The primary activity has been the development of a macroeconomic equilibrium growth model ("MEG") that can be used in conjunction with detailed tax return data to provide accurate estimates of the effects of specific tax proposals on different groups of taxpayers. This model relies on input from the Joint Committee tax-return based microsimulation models—discussed below—to provide the necessary detail to simulate tax policy proposals within the macroeconomic model. The Joint Committee staff also works with several other models, including an overlapping generations lifecycle model with perfect foresight ("OLG"), and two different commercially available econometric models. As explained below, the Joint Committee

[5] Because the proposal being analyzed in the symposium was a "revenue neutral" proposal, the "financing" of the tax proposal was not a source of variation in results during this exercise. Were this component of the policy left unspecified, assumptions about how a tax policy would affect the overall Federal fiscal picture would introduce another source of variation in results.

staff has devoted considerable effort to creating analytic links between Joint Committee microsimulation models and the models the Joint Committee staff uses for macroeconomic analysis.

In addition, the Joint Committee staff has conducted a review of a number of empirical studies that have estimated the size of behavioral responses to tax policy changes. The review focused in particular on studies that provide information about the behavioral responses of taxpayers to changes in tax policy, so that the appropriate behavioral assumptions can be incorporated in the Joint Committee staff's macroeconomic models. The main growth-related behavioral responses that have been estimated by multiple studies, and that are explicitly built into the MEG model, are the decisions by individuals about how much to work and save, and the decisions by businesses about how much to invest in response to changes in tax policy. It should be noted that estimates of behavioral responses vary substantially depending on what is assumed about changes in international capital flows, monetary policy, and fiscal policy. These uncertainties are particularly high for short-term effects.

Although each type of macroeconomic model examines a set of issues that are critical to understanding the effects of proposed tax changes, none of the models is well suited for addressing all of the issues involved in the macroeconomic analysis of proposed tax changes. For this reason, the Joint Committee staff employs several models and continues to expand its modeling capabilities to gain an understanding of the contributions and limits of the current state of macroeconomic modeling in analyzing proposed tax changes.

Use of microsimulation results to model tax policy changes in Joint Committee macroeconomic models

Tax policy changes typically are incorporated in macroeconomic models, including the models used by the Joint Committee staff, through changes in average and marginal tax rates on different sources of income, and through changes in the after-tax cost of capital. The Joint Committee staff uses microsimulation models based primarily on large samples of tax returns provided by the Internal Revenue Service.[6] The two most frequently used models are based on individual income tax returns and corporate income tax returns. Tax proposals are simulated in the Joint Committee staff's individual income tax model to determine average tax rates and average effective marginal tax rates for personal income.[7] The individual model provides this

[6] These microsimulation models are also used by the Joint Committee staff to produce many of the staff's conventional revenue estimates. Assumed microeconomic behavioral responses used in conventional revenue estimates can introduce uncertainty into both the conventional revenue estimates and the macroeconomic analysis that is layered on top of it. Some conventional revenue estimates require use of data not available through the microsimulation models, which may introduce an additional source of uncertainty.

[7] The term "effective tax rate" is used throughout this report to refer to the average and marginal rates actually faced by taxpayers when deductions and credits are taken into account, as opposed to the statutory tax rates applicable to the taxpayer. "Average tax rates" are calculated as tax liability divided by total income. "Effective marginal tax rates" are obtained by giving taxpayers an additional $100 of income and calculating how much the taxpayers' liability

information for each of the sources of individual income that are modeled in the Joint Committee staff's macroeconomic models. Corporate taxable income is also calibrated in the macroeconomic models with the help of the Joint Committee microsimulation model of the corporate income tax.

Average tax rates and average effective marginal tax rates are calculated using the microsimulation models for the current year and each year in the budget forecast period both under present law and under a proposed change in the tax law. These calculated values are inserted into the appropriate equations in the Joint Committee's macroeconomic models. Because of the complicated structure of deductions, exemptions, and tax credits, the effective changes in tax rates as calculated using the microsimulation models can be quite different from the magnitude of statutory tax rate changes. The average tax rates calculated from the models are weighted by the incomes of the taxpayers, rather than by the number of taxpayers. Weighting the tax rate variables by income provides the best measure of the amount of economic activity affected by particular tax proposals.

Macroeconomic equilibrium growth ("MEG") model

The Joint Committee staff has developed the MEG model with the help of an outside contractor.[8] The MEG model has the following features: (1) a neoclassical growth foundation in which long-run economic growth is determined by the amount of labor and capital available to the economy, and the rate of growth in productivity of those resources; (2) a tax sector characterized by tax rates and taxable incomes calibrated to the Joint Committee staff's microsimulation models of the Federal tax system; and (3) the flexibility to run simulations in an equilibrium mode or to allow short-run disequilibrium adjustments in response to changes in fiscal policy. The values of the key behavioral parameters appear below in the "Data and Assumptions" section of this report.

In the MEG model, the amount of labor supplied to the economy is determined by taxpayers' responses to changes in their average and marginal after-tax wage rates and by changes in population. Separate responses are modeled for primary and secondary earners and for low-income taxpayers. Capital resources are determined by the stock of capital remaining after accounting for depreciation, plus investment in the current period. Consumption and saving are determined by the taxpayers' response to after-tax income, the after-tax rate of return on saving, and the strength of taxpayers' preferences for current consumption versus future consumption. Investment in housing is modeled separately, allowing for an analysis of the effects of changes in tax policy that affect the relative returns of housing and business investment.

The amount of domestic capital available for investment is determined by the response of domestic savings to changes in the after-tax rate of return on investment, which is determined in

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increases as a percent of the $100. "Average effective marginal rates" are the income-weighted average of the marginal rates thus calculated.

[8] The outside contractor is Joel Prakken, Chairman of Macroeconomic Advisers, LLC.

part by the tax rate on income from individual investments. The amount of international capital available for investment in the United States is responsive to changes in U.S. demand for imports relative to foreign demand for U.S. exports, and to changes in interest rates, exchange rates, and the global allocation of wealth. The Joint Committee staff uses its microsimulation individual and corporate income tax models to determine the effects of a tax proposal on changes in average and effective marginal tax rates on the following sources of income: wages, dividends, interest, rents, capital gains, and corporate income. Payroll taxes are also modeled as a function of wages. This information is used as inputs into the behavioral equations in the MEG model. Behavioral parameters in the model are drawn from published empirical economic research.

The MEG model is designed to predict economic growth under different assumptions about the economy's equilibrium growth path. One set of assumptions emphasizes a growth path in which the levels of aggregate demand and supply in the economy are maintained in near-balance in every period by a Federal Reserve Board policy that targets short-term interest rates to eliminate short-term stimulus responses to fiscal policy. Alternatively, the MEG model can simulate short-run adjustment paths in which the economy operates above or below capacity ("out of equilibrium") for a period of time. A lag structure is in place for most of the behavioral decisions so that movements toward equilibrium occur over several quarters or years rather than instantaneously.

The Joint Committee staff selected the MEG model as the focus of its initial development effort because it allows for the analysis of the effects of a tax proposal on the short-run disequilibrium path of the economy, in addition to long-run economic growth. Because the MEG model was developed specifically for this purpose, it can be more easily configured to model specific tax policy proposals than the more standard, commercially available econometric models. In addition, the MEG model can be used for cases in which the tax proposal, unaccompanied by offsetting tax or spending proposals, creates a change in the Federal deficit that might be unstable in the long run.

The MEG model allows simulations of eventually unstable paths because it does not include forward-looking expectations. The forward-looking expectations model is considered by many economists to be more theoretically pure because it incorporates two key assumptions from microeconomic theory: (1) that Federal government tax and expenditure policy must at some point be constrained by the amount of government debt the economy can sustain, and (2) that people recognize this constraint and make decisions based on a rational and informed prediction of future fiscal policy changes, rather than acting as if they expect no change from the current policy. For this reason, the Joint Committee staff also works with an overlapping generations life-cycle model with forward-looking individuals.

Overlapping generations lifecycle model

The overlapping generations life-cycle ("OLG") model used by the Joint Committee staff is a macroeconomic model that is based on microeconomic theory. This model assumes that individuals borrow money in the early years of life, repay their debts and save for retirement in their prime working years, and draw down their savings during retirement, consistent with the

life-cycle theory of consumption and saving.[9] Under this assumption, lifetime consumption tends to be smoothed out over an individual's lifetime, which moderates the responsiveness of consumption to temporary changes in income. In the OLG model, an individual's willingness to work is also determined by his life-cycle consumption preferences. The decision to work is modeled as the product of two tradeoffs. In an intraperiod labor-leisure tradeoff, an individual's desire to enjoy more leisure time in any period must be reconciled with the individual's desire to consume goods and services in that period (which may require additional labor income and therefore permit less leisure). There is also an interperiod tradeoff requiring individuals to reconcile their current and future needs for leisure and consumption and thereby determine how much of their work effort should be accelerated or postponed. Thus, labor supply in the OLG model is affected both by the current after-tax return to labor, or wages, and by anticipated future after-tax returns to labor and saving.

In the simulations presented in the sample analysis of this report, the OLG model includes the following features: tax deferred savings, a simple bequest motive, a model of the Social Security system, payroll taxes, effective marginal tax rates on capital income, and a progressive wage tax rate structure. As with the MEG model, the Joint Committee staff uses its microsimulation individual and corporate income tax models to determine the effects of a tax proposal on changes in average and marginal tax rates in the OLG model.

Production is determined in the OLG model by firm managers choosing the optimal levels of labor and investment to maximize the value of the firm in each year. The base model includes a non-housing business sector, a rental housing sector, and an owner-occupied housing sector; this allows for a more detailed modeling of changes in taxes on capital that affect different types of firms differently. Adjustment costs of implementing and installing new capital investments are included and play an important role in determining the optimal level of investment during the transition to the long-run steady state equilibrium. Unlike the MEG model, the OLG model assumes that resources in the economy are fully employed in each year and, therefore, does not account for short-run deviations from full employment in the markets for labor, capital, or other goods, which might be expected to occur during transition periods. The values of important parameters used in this model appear below in the "Data and Assumptions" section of this report.

Other models

The Joint Committee staff subscribes to two commercially available macroeconomic models to provide additional references in analyzing the effects of proposed tax changes. The models are the Washington University Macroeconomic Model, provided by Macroeconomic

[9] As explained by Oliver Jean Blanchard and Stanley Fischer in *Lectures in Macroeconomics*, MIT Press, Cambridge, MA, 1993, p.91, "The overlapping generations model…is the second basic model used in micro-based macroeconomics. The name implies the structure: at any one time individuals of different generations are alive and may be trading with one another, each generation trades with different generations in different periods of its life, and there are generations yet unborn, whose preferences may not be registered in current market transactions."

Advisers, Inc., and the Global Insight econometric model. Both of these models include econometrically estimated lag structures that can highlight the very short-run dynamics of the economy's response to tax policy. Unlike the MEG model, these models are designed primarily to predict the likely short-run fluctuations in the economy, rather than any changes in long-run equilibrium. Thus, they are most useful in analyzing the possible short-run demand stimulus effects of a proposal. They also allow for the simulation of several different patterns of Federal Reserve Board responses to policy initiatives. Because of the uncertainty inherent in making such monetary policy assumptions, these types of simulations are particularly useful for providing a sense of the possible range of outcomes and the degree of sensitivity of the estimated ranges to the assumptions used.

D. Identification of Proposals Likely to Have Measurable Macroeconomic Effects

Most tax proposals are unlikely to have any significant positive or negative impact on the economy. In order for a tax proposal to have a measurable effect in the models used by the Joint Committee staff, the proposal would have to have a significant impact on the inputs used to model it. These inputs consist primarily of the changes in the average and effective marginal tax rates on the various flows of income incorporated in each model as calculated using Joint Committee staff microsimulation models, or through changing tax depreciation schedules. Some proposals may affect the size of the taxable income base through changes in rules governing inclusion of income and the timing of deductions, which could affect both the average and effective marginal tax rates in the models, and through these rate changes, the after-tax return to savings and investment, depending on which income bases are affected. The Joint Committee staff has found that in order for a proposal to have a measurable effect on the economy, the proposal would generally need to have a significant impact on at least one of the following:

- Average individual income tax liability;
- Effective marginal income tax rates on wages, interest, dividends, or capital gains income;
- Average corporate tax liability; or
- The present value of tax depreciation on business investments.

Each of these items refers to aggregate calculations for each type of income as a whole, not just for the specific taxpayers affected by a proposal. Hence, it would be possible for a proposal to have a significant effect on the after-tax income of persons or businesses in a sub-sector of the economy without significantly affecting the average or effective marginal tax rates for the aggregate sectors appearing in the macroeconomic models used by the Joint Committee staff. Because individuals and firms are likely to react differently to temporary versus permanent changes in policy, a temporary provision generally would require a larger change than a permanent provision to have a measurable effect on the economy. A proposal that results primarily in a shift in the timing of an economic activity may have no long-run effect on the economy.

For example, a proposal that would provide a large tax credit for investment in a particular industry could be expected to increase investment in that industry, but would not be expected to have a significant effect on total investment in the economy, as it would be likely to

shift investment from other sectors into the favored sector. Thus, while the proposal could boost growth in the favored industry significantly, this growth would be at least partially at the expense of growth in the rest of the economy. Such a targeted policy would affect total investment either (1) to the extent that the affected industry is a significant enough portion of the economy that the average tax rate on investment as a whole is significantly affected, or (2) to the extent that the induced re-allocation of resources between industries significantly affects the productive efficiency of the economy. Both of the models used by the Joint Committee staff capture these efficiency effects directly as they relate to shifts between housing and other types of production in the economy. The OLG model also can capture efficiency effects related to shifts between corporate and non-corporate sectors. Efficiency effects related to the reallocation of capital across other sectors, such as between an industry targeted for a special tax credit and other industries, are not, at present, explicitly accounted for in all of the macroeconomic models used by the Joint Committee staff and must be calculated outside the models. One of the areas of modeling improvement currently being investigated by the Joint Committee staff is improving the incorporation of efficiency effects within the models, which would require additional sub-division of the business sectors in these models to allow for analyzing more differences in tax treatment between sectors.

II. DESCRIPTION OF THE ACTIVITIES OF THE BLUE RIBBON ADVISORY PANEL

A. Blue Ribbon Advisory Panel

In 2002, the Joint Committee staff, at the request of House Committee on Ways and Means Committee Chairman William Thomas, convened a Blue Ribbon Advisory Panel ("Panel")[10] to review the Joint Committee staff's macroeconomic modeling capability. Panel members were asked to provide suggestions on the Joint Committee staff's work in order to improve the staff's ability to analyze the macroeconomic impacts of tax changes. The Panel met three times over a period of six months (June 10, October 7, and December 16, 2002) to discuss the work of the Joint Committee staff. In the initial meeting, the Joint Committee staff and consultant Joel Prakken (Chairman, Macroeconomic Advisers, LLC) provided a detailed overview of the MEG model and described the staff's work with an overlapping generations life-cycle model and a commercial econometric model. At the subsequent meetings, presentations focused on particular aspects of the MEG model, including interfaces with Joint Committee microsimulation models, and how the MEG model treats consumption, labor supply, investment, monetary policy, fiscal policy, and international capital flows. At each meeting, sample simulation results were provided to give Panel members a sense of the impacts of the different modeling features. Panel discussions focused on the following items: (1) the specific attributes of the macroeconomic models employed by the Joint Committee staff; (2) the important role played by assumptions about the reaction of the Federal Reserve Board to tax law changes, future fiscal policies, and the reactions of State and local and foreign governments to tax law changes; (3) the importance and uncertainty of econometric evidence on the responses of individuals and businesses to changes in tax policy; (4) the relationship between Federal budget deficits and interest rates; and (5) the modeling of individual expectations about the economy. A more detailed description of the issues discussed and the range of opinions expressed in the Panel meetings is provided below in Section B. In general, the discussions corroborated the Joint Committee staff's assessment that the prediction of the macroeconomic impact of proposed tax legislation entails considerable uncertainty.

B. Modeling Issues Discussed by the Panel

The major point of consensus among Panel members was that any macroeconomic analysis provided to Members of Congress should make clear the assumptions underlying the analysis and convey information about the sources and magnitude of uncertainty in the analysis. Major sources of uncertainty discussed include assumptions about the size of individual saving and labor responses, expected changes in Federal fiscal policy in response to changes in tax policy, changes in monetary policy by the Federal Reserve Board, the reaction of foreign governments, and the responsiveness of international capital flows.

[10] A list of Panel members appears in the Appendix to this report. Of the 23 members, 20 attended at least one of the three meetings. All members received background materials from the Joint Committee staff and provided some commentary.

Behavioral assumptions

The effect of tax policy changes on the long-run growth of the economy is determined by the responsiveness of the suppliers of labor and capital to changes in the after-tax returns to labor and capital. While empirical studies provide some information about reasonable ranges of many of these behavioral responses, the information is far from conclusive. The Joint Committee staff provided information to Panel members about the sensitivity of the results to changes in the assumed size of the behavioral responses in the MEG model. Most Panel members agreed that most assumed behavioral responses were consistent with the reasonable range indicated by economic research. There was some disagreement among Panel members about the appropriate size of the response of international capital flows. Panel members also questioned the assumption in the MEG model relating to how easily firms can substitute between capital and labor in response to changing tax policy.

Some Panel members emphasized that even though the assumed behavioral responses are generally consistent with the economic literature, it should be made clear to Members of Congress that there is uncertainty involved in the assumption of specific parameters.

It was noted that the choice of model structure is also very important because it determines the characterization of the relationships between behavioral assumptions and taxes. Models vary significantly in the manner in which they determine labor supply and investment responses to changes in after-tax relative prices. Some models incorporate these effects by including the estimated behavioral response parameters in labor supply, savings, and investment equations. In reduced-form computational models, these parameters are derived from economic research. In econometric models, many of these parameters are estimated using historical time series data that is input into the model. In macroeconomic models based on microeconomic theory, these responses are based on parameters derived from individual utility maximization and firm profit maximization. In either case, the results generated can vary significantly depending on the functional forms used in the model and the amount of detail that is included about firms and individuals.

The role of Federal fiscal policy

Like households, the Federal government faces a budget constraint that requires it to determine a level and allocation of spending and whether it will finance spending by raising revenue (including how that revenue will be raised) or by issuing debt. In order to analyze the macroeconomic effects of non-revenue neutral tax proposals, the Joint Committee staff must make assumptions about the effects of a change in tax policy on spending and debt accumulation. In general, the Joint Committee staff must assume some combination of the following: (1) that the proposed tax change is unaccompanied by an offsetting fiscal policy change or is financed by government debt; (2) that the change in taxes is offset by a change in spending in either current or future periods; (3) that other taxes are adjusted to balance the government's long-term budget constraint; or (4) the Federal Reserve Board adjusts the money supply.

There was a lack of consensus on the Panel regarding what type of fiscal policy assumption should be adopted to analyze the macroeconomic effects of a change in tax policy. Some Panel members suggested that macroeconomic analysis should be performed only for

revenue neutral proposals. Some argued that the Joint Committee staff should analyze policies exactly as proposed, which would imply, for example, an assumption of debt financing for net tax reductions. Others suggested that the Joint Committee staff should explore using a "fiscal reaction function," which would model any net tax cut policy as being offset by some combination of spending cuts and other tax increases, based on historical patterns. Still others argued that the Joint Committee staff should present a range of analyses that separately shows the effects of each of these assumptions.

The predicted macroeconomic effect of a change in tax policy can vary significantly depending on what is assumed about Federal fiscal policy. For example, the short-run impacts of a change in tax policy may vary significantly from the long-run impacts under various fiscal policy assumptions about both the timing and the nature (spending versus revenue adjustments) of the fiscal policy response. Thus, the Joint Committee staff believes it is desirable to provide Members of Congress with information about the effects of tax policy changes with varying Federal fiscal policy assumptions.

Spending analysis

Some Panel members questioned the appropriateness of providing macroeconomic analysis of tax proposals when no similar analysis is being conducted for Federal spending program initiatives. Such Panelists cited, for example, possible growth effects from Federal government investment in infrastructure and education. Without this parallel analysis, a tax proposal and a spending proposal that might have the same impact on the Federal deficit if macroeconomic effects were taken into account in a similar way for both would appear to have differing impacts if only the tax proposal received a macroeconomic analysis.

A related issue raised by Panel members is the coordination of macroeconomic analysis between the Joint Committee staff and the staff of the Congressional Budget Office ("CBO"). For example, CBO provides baseline forecasts to the House and Senate Committees on the Budget as part of the budget reconciliation process. Panel members suggested that it is important that the Joint Committee staff be aware of any macroeconomic effects incorporated in these CBO forecasts that are the result of the fiscal policy embedded in the reconciliation targets in order to prevent double counting of these effects. Conversely, if estimates of spending induced by a tax proposal, such as debt service costs (i.e., interest charges on debt required to be incurred as a result of a tax proposal) engendered by a net tax decrease, are not incorporated in the macroeconomic analysis of that proposal, the analysis could provide an incomplete picture of the effects of the proposal.

Monetary policy and the Federal Reserve Board

Another major source of uncertainty about which Panel members commented extensively is the reaction of the Federal Reserve Board to Federal fiscal policy. Whether or not the Federal Reserve Board decides to counteract the fiscal effects of a tax policy change can significantly affect the impact of that policy within the ten-year Federal budget period. For example, if the Federal Reserve Board believes there is a risk of inflation associated with increased demand from an expansionary fiscal policy, then it may raise interest rates to dampen demand and thereby reduce the risk of inflation. An increase in interest rates reduces consumer purchases of

durable goods and business investment and, thus, would slow the cyclical expansion of the economy. In addition, as interest rates rise, so does the value of the dollar (relative to other foreign currencies). An increase in the value of the dollar makes U.S. goods relatively more expensive for foreigners and imports relatively cheaper for U.S. consumers. These market responses would counteract the impact of an expansionary fiscal policy and render macroeconomic revenue estimates less reliable if the Federal Reserve Board's actions are not predicted accurately.

The unpredictable time lags associated with the implementation and effectiveness of monetary policy present another source of uncertainty in predicting the effect of changes in fiscal and monetary policy on the path of the economy. No consensus was reached among Panel members on how to deal with this uncertainty. Existing macroeconomic models use many different monetary policy rules to describe the actions of the Federal Reserve Board. In order to examine a range of simulation results, the Joint Committee staff has used the following three assumptions about the behavior of the Federal Reserve Board: (1) the Federal Reserve Board follows a monetary policy rule based on the observed pattern of past policies;[11] (2) the Federal Reserve Board always exactly offsets the demand effects of a change in tax policy through changing interest rates; and (3) the Federal Reserve Board does not react to changes in fiscal policy, but targets a certain growth rate in the money supply.[12]

Many Panel members suggested that the best approach for macroeconomic analysis is to assume that the Federal Reserve Board will offset any demand effects of fiscal policy, which mainly occur within the budget window. This approach is thought to isolate the supply side responses to tax policy. The short-run demand effects of changes in tax policy are hard to predict because demand effects depend on, among other things, whether the economy is operating near full employment, above full employment (for instance at the peak of an expansion), or below full employment (for instance at the trough of a downturn). Because it is nearly impossible to predict turning points in the economy, the determination of the correct short-run demand effects is subject to uncertainty. Depending on whether the economy is operating at capacity at the time of the tax policy, the short-run effects of tax policy on receipts may reflect changes in the price level rather than changes in real economic activity.

Other Panel members suggested that many Members of Congress are interested in the effects of tax policy within the ten-year budget period and, thus, both the cyclical demand effects

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[11] This approach is most commonly implemented using some variation of the "Taylor rule" (developed by economist John Taylor), which prescribes monetary intervention when the unemployment rate, the inflation rate, or short-term interest rates deviate too far from targeted levels. See, for example, Judd, John P., and Glenn D. Rudebusch, "Taylor's Rule and the Fed: 1970-1997," *Federal Reserve Board of San Francisco Economic Review,* 1998, no.3, pp. 3-16.

[12] The first assumption is commonly employed in a wide array of macroeconometric models. Simulation results from the Global Insights model assume this type of Federal Reserve Board reaction function. The second and third assumptions are used in the MEG model to present a range of simulation results depending on the assumed reaction of the Federal Reserve Board.

and supply side effects of tax policy changes should be provided. In this case, the assumed monetary policy response of the Federal Reserve Board would be governed either by an estimated rule (assumption (1) above) or by assuming a fixed rate of growth in the money supply (assumption (3) above). While it would be desirable to show a range of results reflecting several different assumptions about monetary policy responses, Panel members cautioned that care should be taken to distinguish between the inflationary and the real impacts on both receipts and spending if this approach is used. The extent to which such impacts are inflationary as opposed to real depends in part on whether the policy provides incentives for taxpayers to work and invest more, thus increasing the productive capacity of the economy. It also depends on how much additional consumer demand is stimulated relative to the productive capacity of the economy.

When the economy is doing very well, at a "peak" stage of the business cycle, virtually everyone who wants to be employed at the current wage rate is already employed and productive buildings and equipment are operating near capacity. Under these circumstances, domestic businesses would be unable to increase production significantly in response to a sudden increase in demand such as would be created by a large net tax cut. When demand for goods and services increases more rapidly than the supply of goods and services, a potentially inflationary situation exists. Any apparent growth in output of the economy (as measured by the dollars spent on goods and services or dollars received as income) is likely to be primarily from an increase in the growth rate of prices, rather than in real production.

In contrast, if the economy is slowing down, nearing the "trough" of a business cycle, unemployed people and under-used productive capacity will be available to respond to increases in demand with increases in supply. In this situation, less inflationary pressure exists and growth in output is likely to reflect an actual increase in economic activity. Although the increase in demand would be likely to result in an increase in tax receipts for the Federal government in both cases, the distinction between inflationary and real growth is important from a budgetary "scoring" standpoint. In the first case, the costs faced by the government to provide the same level of services will also increase due to inflation, resulting in possibly no net improvement of the Federal government's fiscal situation. In the second case, a temporary increase in real economic activity could generate additional revenues without generating additional costs, thus improving the net fiscal position of the Federal government.

International capital flows and the reaction of foreign governments

Another source of uncertainty for macroeconomic estimating is the size and timing of the response of international capital inflows to a change in tax policy. The sensitivity of international capital flows to changes in the after-tax rate of return on investment depends on: (1) the effects of a U.S. policy on the economies of its trading partners, which determines the flows of imports and exports; (2) whether capital is free to move across national borders; and (3) the degree of capital market integration across countries. Some Panel members pointed out that existing evidence indicates that the international capital market is segmented; even though capital is free to move across national borders, many investors typically prefer to invest their funds in their home country.[13] Other Panel members questioned the strength of this home-

[13] For more on this see Martin Feldstein, "Tax Policy and International Capital Flows" *NBER Working Paper No. 4851*, September (1994).

investment preference. To the extent foreign investors prefer investing in their home countries, changes in international capital flows in response to changes in the after-tax rate of return would likely be small, but non-negligible. The international sector in the MEG model produces this type of response.

The independent actions of foreign governments and foreign central banks in response to U.S. tax or monetary policy are also a source of potential uncertainty with respect to the movement of capital across countries. Some Panel members suggested that the Joint Committee staff could enhance its modeling efforts by including more explicit recognition of these factors.

Interactions with State and local fiscal policies

Some Panel members pointed out that certain changes in Federal taxes could impact the budgets of State and local governments, both directly because many State tax bases are tied to Federal definitions of taxable income and indirectly through the feedback effects of Federal tax policy on State economies. Because most States have balanced budget rules, States would have to respond to the impact of Federal tax policy on their budgets by changing the level of their taxes or spending. For example, if the Federal government were to allow for a significant increase in allowable deductions from taxable individual income (e.g., full deductions for employee business expenses or health expenditures), many State tax systems would automatically afford the same deduction. The resulting reduction in State tax receipts could cause States to respond by decoupling their definition of taxable income from the Federal definition, thus complicating the tax filing process for individuals, and reducing the incentive effects of the Federal policy change. Alternatively, States could raise various other State tax rates and the effect of the change in State taxes on the economy would depend on which taxes the States choose to increase. States could also reduce their government spending programs, which would produce a different set of feedback effects. Thus, the tax and spending policy responses of State and local governments may reinforce, partially offset, or leave unchanged the effects of a proposed Federal change in taxes on long-term economic growth. At present, the Joint Committee staff does not explicitly model any State response, thus effectively assuming that States do not change their fiscal policies, because of the inherent uncertainty and complexity of trying to predict the actions of more than 50 independent government entities.

The formation of expectations about the economy

An issue that surfaced throughout Panel discussions about specific behavioral responses and policy assumptions was the way in which individual and firm expectations about all of these behaviors should be modeled. The MEG model assumes that individuals and firms expect that the economy will be the same in the future as it is in the current period. This type of assumption is referred to as "myopic expectations." In contrast, the modeling approach referred to as "perfect foresight," assumes that individuals anticipate future changes in the economy, including the effects of future fiscal and monetary policy. In a myopic expectations model such as MEG, behavioral responses are based on current period prices, interest rates, and incomes. In contrast, in a perfect foresight model, behavioral responses are based on accurate predictions of future

prices, interest rates, and incomes.[14] This distinction can have a significant effect on predicted responses of consumption, labor supply, and investment to changes in tax policy. Empirical research does not provide clear guidance as to the extent to which individuals act rationally.

There was disagreement among panelists as to which modeling of expectations would be most appropriate for macroeconomic analysis provided by the Joint Committee staff. Many panelists suggested that at a minimum, the Joint Committee staff should be able to provide a range of analysis based on different expectations assumptions. One consequence of incorporating rational expectations in the Joint Committee staff analysis is that it requires an explicit assumption that a tax policy change would be eventually accompanied by a tax or spending offset.

C. Panel Suggestions for Future Modeling Efforts

Panel members offered a number of suggestions concerning steps the Joint Committee staff should take to improve its modeling capabilities. These suggestions varied from ways the Joint Committee staff could improve the MEG model to what type of model the Joint Committee staff should use. Following is a brief description of some of the major areas for modeling extensions that were suggested by Panel members.

Improvements to the MEG model

Several modeling improvements of particular interest to Panel members were completed during the Panel review process. The equations in the MEG model that determine the level of consumer purchases, or consumption, were formally derived from the assumption that households maximize their desired consumption subject to a budget constraint, which is a standard economic paradigm. In these equations, aggregate consumption depends on income, wealth, the average tax rate on labor income, the average tax rate on asset income, and the marginal propensities to consume out of income and wealth. In addition, the MEG model was expanded to include two alternative frameworks for determining labor supply. First, the aggregate labor supply function in MEG was also derived jointly from the consumer's utility maximization, under the same paradigm. Second, the Joint Committee staff decomposed the original single behavioral equation for determining the labor supply response in MEG into four separate equations to account for differences in tax-induced labor supply responses across four different types of taxpayers: low income primary earners; other primary earners; low income secondary earners; and other secondary earners. This improvement allows the Joint Committee staff to make better use of both existing research on different types of response for these groups,

[14] A perfect foresight model is an extreme version of the rational expectations framework. The starting premise of this framework is that people behave rationally and that a rational person uses all available information to predict future market conditions. Computationally, a rational expectations model solves for expected equilibrium prices and output in all future periods and assumes that individuals incorporate this knowledge of future prices and output into their current period decisions about how much to work, invest, and consume. The perfect foresight version of this assumption is frequently made in computable general equilibrium models such as OLG because it greatly simplifies the solution algorithm.

and the detailed tax data used to measure the effects of tax policy changes on the marginal and average tax rates of different individuals. For example, this decomposition allows different types of tax proposals to affect labor supply in different ways, depending on how they separately affect the average and marginal tax rates of each group. These improvements were presented at the second Panel meeting on October 7, 2002.

Modeling frameworks

There was substantial disagreement among Panel members on the exact type of modeling framework that the Joint Committee staff should employ. Some Panel members supported use of the MEG model, while others expressed firm opposition against relying on the MEG model as the main tool to analyze the effects of changes in tax policy. Other suggested model types included intertemporal life-cycle models, stochastic life-cycle models, structural econometric models, and detailed microsimulation life-cycle models that use individual level detail from the Joint Committee's microsimulation models.[15] For example, several Panel members thought that it is important that the Joint Committee staff use models capable of examining the distributional effects of tax policy changes across generations. Other Panel members recommended against the use of that type of model either because it has not been empirically tested, it was not based on historically estimated parameters, or it was very sensitive to parameter values and model structure.

The diversity of opinion on model choice reflects the fact that no single model can address every important implication of policy changes. Panel members and the Joint Committee staff agreed that model choice would depend to some extent on the specific proposal in question, as well as on the time frame of interest for analysis. For this reason, and because of the disagreement over the correct modeling structure, the Joint Committee staff will continue to work to improve the MEG model, to develop alternative modeling frameworks, and to use multiple modeling assumptions in preparing macroeconomic analyses of proposed tax policy.

[15] Intertemporal life-cycle models are models such as the OLG model. Stochastic life-cycle models are life-cycle models that include earnings uncertainty about future earnings and the individual's lifespan as opposed to the assumption of perfect certainty that is often assumed because of its simplicity. Structural econometric models are structural models of the economy consisting of a large set of econometrically estimated equations that interdependently determine the macroeconomic effects of fiscal and monetary policy. Microsimulation life-cycle models would derive each individual's behavioral responses by combining the life-cycle theory of consumption and saving and individual level information from the Joint Committee's microsimulation models.

III. ANALYSIS OF H.R. 2, THE JOBS AND GROWTH TAX ACT OF 2003, AS REPORTED BY THE HOUSE WAYS AND MEANS COMMITTEE ON MAY 6, 2003

Pursuant to House Rule XIII.3.(h)(2), the Joint Committee staff produced an analysis of the macroeconomic effects of H.R. 2, the "Jobs and Growth Tax Act of 2003," as reported by the House Ways and Means Committee on May 6, 2003. This report was inserted into the *Congressional Record* for Thursday, May 8, 2003. An expanded version of this analysis is presented here. This analysis presents the results of simulating the changes contained in H.R. 2 using three types of economic models. These models use a variety of assumptions about Federal fiscal and monetary policy, and behavioral responses to the proposed changes in the law.

The proposal analyzed below includes the following components:

- Reduction in the individual income tax rate on dividends and capital gains to 15 percent, or five percent with respect to income which would otherwise be taxed at the 10- or 15-percent rate; sunset after 12/31/12;

- Additional first-year depreciation deduction equal to 50 percent of the adjusted basis of qualified property placed in service after May 5, 2003, and before January 1, 2006;

- Accelerate to 2003 the following provisions from the Economic Growth and Tax Reduction Reconciliation Act of 2001 ("EGTRRA"): (1) the reduction in individual income tax rates to their 2006 levels in EGTRRA; (2) the increase in the standard deduction amount for joint returns to its 2009 level in EGTRRA; (3) the expansion of the 10-percent tax bracket to its 2008 width in EGTRRA; (4) the increase in the child tax credit to $1,000 per child, the 2010 amount in EGTRRA; and (5) the expansion of the 15-percent tax bracket for joint returns to the 2008 size in EGTRRA of twice the width of the single bracket;

- Increase the exemption amount for the alternative minimum tax ("AMT") by $7,500 for single filers and $15,000 for joint filers for 2003 and 2004, and maintain that level for 2005;

- Increase, beginning in 2003, the amount that can be expensed under Internal Revenue Code section 179 from $25,000 to $100,000 and increase the phaseout threshold from $200,000 to $400,000; include software in section 179 property; and index the deduction limit and the phaseout threshold after 2003; sunset after 2007;

- This proposal does not include a repeal of the EGTRRA sunset. Therefore, the income tax rates, credits, and AMT adjustments are not extended beyond the periods described above.

A. Description of Simulation Alternatives and Results Format

The Joint Committee staff estimated the macroeconomic effects of the proposal using five different simulations of the economy. The first two sets of simulations were run using the Joint Committee staff's Macroeconomic Equilibrium Growth model. As described above in Part I.B., the MEG model has the following features: (1) a neoclassical growth foundation in which long-run economic growth is determined by labor supply, investment and savings, and total factor productivity growth; (2) a tax sector calibrated to the Joint Committee staff's microsimulation models of the Federal tax system; (3) the flexibility to run simulations in an equilibrium mode, or to allow short run disequilibrium adjustments in response to changes in fiscal policy; and (4) a myopic expectations decision structure. The values of the key behavioral parameters appear below in the "Data and Assumptions" section of this pamphlet.

In the MEG simulations in each of the tables below, it is assumed that the Federal Reserve Board either acts aggressively by raising interest rates to counteract almost completely any demand stimulus provided by the proposal ("aggressive Fed reaction") or that the Federal Reserve Board remains neutral with respect to any changes in fiscal policy by targeting a fixed rate of money growth, allowing temporary changes in demand to affect levels of employment and output ("neutral Fed reaction").

The third simulation was run using the commercially available Global Insight ("GI") econometric model. Like the MEG model, the GI model is capable of simulating disequilibrium adjustments to changes in demand. The model is made up of a set of equations that estimate from historical data the behavioral coefficients that determine the timing and strength of economic relationships within the model.[16] As in the MEG model, individuals and firms behave myopically in the GI model. For this analysis, the Joint Committee staff used an estimated monetary reaction function designed to offset (but not completely) deviations from full employment by lowering or increasing interest rates ("estimated Fed reaction function").[17] Thus, if the economy is operating near capacity, proposals that increase employment, reduce the actual unemployment rate, and accelerate the economy, will result in increasing interest rates. This type of monetary response is generally less contractionary than the "aggressive Fed" and less accommodating than the "neutral Fed."

The fourth and fifth simulations use an overlapping generations life-cycle model with perfect foresight.[18] Individuals are assumed to make consumption and labor supply decisions with perfect foresight of economic conditions such as wages, prices, interest rates, tax rates, and government spending over their lifetimes. One result of the perfect foresight assumption is that

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[16] Comparable parameters in the MEG and OLG models are derived from economic research. In many cases this research is also based on econometric analysis of historical data.

[17] Comparable parameters in the MEG and OLG models are derived from economic research. In many cases this research is also based on econometric analysis of historical data.

[18] The OLG model is similar to the type of model described as a "life-cycle model" in CBO, *ibid*. It is described in more detail in section I.B., above.

if a policy results in an economically unstable outcome, such as increasing government deficits indefinitely into the future, the model will not solve. Therefore, to run simulations in this model, it is necessary to assume that an offsetting budget balancing fiscal policy will be enacted. It is assumed that either government spending will be reduced after 2013 to offset the tax cut[19] ("OLG future government spending offset") or that individual income tax rates will be increased after 2013 ("OLG future tax rate increase"). The values of the structural parameters used in these simulations appear below in the "Data and Assumptions" section of this pamphlet.

Results format

Because the exact time path of the economy's adjustment to changes such as a new tax policy is highly uncertain, the Joint Committee staff provides estimates of the proposal's impact on real and nominal Gross Domestic Product, real business and residential capital stock, and employment in multi-year increments. The policy impacts on these variables are presented as percent changes from the present law baseline forecast[20] relative to totals for the first six years and the next five years after implementation of the policy.[21] The percent change in each variable for the first six years is calculated by summing the change in the reported variable due to the proposal over the period from 2003 to 2008, and dividing that change by the sum of the baseline values of each variable over the same period. This same calculation is applied to the period from 2009 to 2013 to obtain the percent change in each variable for the second forecast period. This calculation produces results equivalent to income-weighted annual averages for the two time periods.

Estimated changes to conventional revenue estimates are presented as percent changes relative to six- and eleven-year totals for the first six years and the entire eleven-year period after enactment of the policy, coinciding with Congressional budgeting time frames.

In addition, for the MEG and OLG models, which have been designed to provide long-run equilibrium results, information is provided about the long run in the text. While it is

[19] The cut in government spending to offset the costs of a tax cut can be modeled either as a cut in transfer payments, as is presented here, or as a cut in "non-productive government spending." The latter assumption is used in CBO, *ibid.* The difference between the two approaches is that consumers are assumed to value transfer payments, and thus work and save more within the budget window in anticipation of losing them. However, they are assumed not to value non-productive spending, and therefore do not increase work or savings in anticipation of this cut. Thus, the anticipation of valued spending cuts results in more growth in the early years than the anticipation of non-valued spending cuts.

[20] The Joint Committee staff configures the present-law baseline forecasts for Federal receipts and spending in each of the macroeconomic models to approximate the forecast of the Congressional Budget Office as closely as possible.

[21] The Joint Committee staff configures the present-law baseline forecasts for Federal receipts and spending in each of the macroeconomic models to approximate the forecast of the Congressional Budget Office as closely as possible.

impossible to incorporate unknowable intervening circumstances, such as major resource or technological discoveries or shortages, these models are designed to predict the long-run effects of policy changes, assuming other, unpredictable influences are held constant.[22]

B. Estimated Macroeconomic Effects of H.R. 2

Joint Committee staff model simulations indicate that H.R. 2 would likely stimulate the economy immediately after enactment by creating temporary incentives to increase work effort, business investment, and consumption. This stimulus is reduced over time because the consumption, labor, and investment incentives are temporary, and because the positive business investment incentives arising from the tax policy are eventually likely to be outweighed by the reduction in national savings due to increasing Federal government deficits. The magnitude of these effects depends upon the assumptions described above that are inherent in the models used, and several additional assumptions detailed below.

Economic growth

Table 1.–Effects of H.R. 2 on Nominal Gross Domestic Product
Percent Change in Nominal GDP Relative to Present Law Baseline

Calendar Year Period	**2003-2008**	**2009-2013**
Neoclassical Growth Model		
MEG - aggressive Fed reaction	0.3	0.2
MEG - neutral Fed reaction	0.9	1.0
Econometric Model		
GI estimated Fed reaction function	1.5	1.2
Life Cycle Model with Forward-Looking Behavior		
OLG reduced government spending in 2014	n.a.	n.a
OLG increased taxes in 2014	n.a	n.a

Table 2.–Effects of H.R. 2 on Real Gross Domestic Product
Percent Change in Real GDP Relative to Present Law Baseline

Calendar Year Period	**2003-2008**	**2009-2013**
Neoclassical Growth Model		
MEG - aggressive Fed reaction	0.2	-0.1
MEG - neutral Fed reaction	0.3	0.0

[22] Because the MEG model is myopic, if the policy simulated is ultimately a fiscally unstable policy, such as a net decrease in taxes that produces deficits that grow faster than the rate of growth of the economy, "long-run" is defined as the last period before the model fails to solve because of this unstable situation. For the OLG simulations, which incorporate a stabilizing fiscal policy offset, "long-run" is defined as the steady-state solution. The steady state solution is reached when the model returns to a constant rate of growth and relative prices are no longer changing.

Calendar Year Period	**2003-2008**	**2009-2013**
Econometric Model		
GI estimated Fed reaction function	0.9	-0.1
Life Cycle Model with Forward-Looking Behavior		
OLG reduced government spending in 2014	0.2	-0.1
OLG increased taxes in 2014	0.2	-0.2

Table 1 shows the estimated change in nominal Gross Domestic Product ("GDP") due to this proposal under different model frameworks, with differing assumptions about the Federal Reserve Board reactions to the policy. These simulations forecast an increase in nominal GDP due to this proposal ranging from 0.3 percent to 1.5 percent relative to the baseline from 2003 to 2008.[23] The equivalent average annual dollar change ranges from $43 billion to $183 billion. The predicted increase in nominal GDP ranges from 0.2 percent to 1.2 percent during the 2009-2013 period. Table 2 shows the estimated change in real (inflation adjusted) GDP due to this proposal under different model frameworks, with differing assumptions about the Federal Reserve Board and fiscal reactions to the policy. The simulations predict an increase in real GDP due to this proposal ranging from 0.2 percent to 0.9 percent in real GDP over the first six years. The equivalent average annual real dollar amount ranges from $18 billion per year to $76 billion per year. In the next five years, the simulations predict a slight decline in real GDP.

Supply side effects

Tax policy can affect economic growth by altering taxpayers' incentives to work, save, and invest. When individuals work more, or make more of their income available to businesses to invest in productive equipment and structures by saving more, the productive capacity of the economy expands. Tax policy also can affect business investment directly through its effect on the after-tax return to investment. Policies that increase incentives to work, save, and invest result in an increase in the quantity of productive resources available to the economy, thus increasing output and growth. This class of incentives is often referred to as "supply side" incentives. The supply side incentives in this proposal include savings and investment incentives in the form of reduced tax rates on business, dividend, and capital gains income and increases in expensing allowance for business equipment, each of which increases the after-tax rate of return on capital.[24] In addition, reductions in individual income tax rates create incentives for individuals to supply more labor hours, thus generating more individual income, savings, and consumption.

[23] As described in the "Results format" section above, this percent change is calculated as the change in GDP due to the proposal summed over the six-year period from 2003 through 2008 and similarly through the five-year period from 2009 through 2013, divided by the baseline GDP summed over the same periods.

[24] A decrease in individual tax rates mitigates the benefit of existing and additional expensing allowances, however, the overall effect of a reduction in individual tax rates increases the after-tax rate of return.

Saving and investment

Reductions in marginal tax rates (tax rates on the last dollar of income earned) on interest, dividend, or capital gains income create incentives for individuals to save and invest a larger share of their income, as each additional dollar of savings yields more after-tax income. Conversely, reductions in the average tax rate on interest, dividend, or capital gains income provide taxpayers with more after-tax income for the same amount of investment, reducing their incentive to save and invest. Changes in the statutory tax rate affect both marginal and average rates of tax on these sources of income, providing potentially offsetting incentives. Consistent with economic research, the model simulations assume that on net the marginal rate effect is slightly larger than the average rate effect, and thus that decreases in tax rates on capital income increase savings.[25]

There is general consensus that if corporate firms rely on the new issue of stock to finance new investment, the reduction in tax rates on dividends and capital gains would reduce the user cost of capital (the minimum return an investment must earn to be profitable) and encourage businesses to increase investment.

There are two competing views regarding the effect of dividend taxation on marginal corporate investments financed with retained earnings.[26] One view, the "traditional view," holds that reductions in dividend taxes would lower the cost of corporate investment financed with retained earnings, and thus the proposal would provide an incentive for corporations to increase investment. Under this view, firms determine the dividend payout so that the non-tax benefits of paying dividends, such as signaling information about the financial health of the firm, are offset by the additional tax cost of dividends relative to other means of distributing earnings. Alternatively, the "new view," holds that a reduction in the dividend tax rate would not lower the cost of corporate investment financed with retained earnings because firms are implicitly saving on behalf of investors so that individuals are not subject to the dividend tax until the return on the original investment is distributed in the form of a dividend. For investments financed with retained earnings, the deferral of the tax that would have been paid if the earnings were distributed effectively exempts the return on retained earnings from taxation. Under this view, a decrease in the dividend tax rate would not result in a decrease in the cost of corporate investment financed with retained earnings. However, there would be an immediate increase in the value of outstanding stock reflecting the reduction in dividend tax payments, thus increasing the wealth of the stockholders, and providing an incentive for additional consumption. The

[25] See Charles L. Ballard, "Taxation and Saving, " in John G. Head and Richard Krever (eds.), *Taxation Toward 2000*, Melbourne: Australian Tax Research Foundation, 1997, pp. 267 - 292, and Jane G. Gravelle, *The Economic Effects of Taxing Capital Income*, (Cambridge, MA: MIT Press), 1994, for summary descriptions of this research.

[26] See Auerbach, Alan J. and Kevin Hassett, "On the Marginal Source of Investment Funds," *Journal of Public Economics*, January 2003, 87 (1): 205-232; and Zodrow, George R., "On the 'Traditional' and 'New' Views of Dividend Taxation," *National Tax Journal*, December 1991, 44 (4): 491-510.

model simulations assume that half of the corporate sector finances investment according to the traditional view and half according to the new view.

Another investment incentive in this proposal is an increase in the amount of business investment that may be expensed for the period from after May 5, 2003, and before January 1, 2006. This provision reduces the cost of investment in equipment and software, thus raising the rate of return on that investment, and providing an incentive for firms to invest more. The temporary nature of this provision makes it likely that businesses will accelerate some of their planned investment into years for which the expensing is available. Both the acceleration and the net increase in investment will increase the productive capital stock in the years immediately following enactment of the policy, resulting in increased economic growth. However, because businesses have shifted future investment expenditures forward in an effort to take advantage of the accelerated depreciation schedule, there will be a lull in investment relative to investment in the baseline in the years immediately after the provisions expire.

This proposal provides what many economists view as additional positive growth effects due to increases in the efficiency of resource allocation. The increase in efficiency is primarily due to the reduction in taxation of income from corporate investment, which would shift investment in the non-corporate and housing sectors to the corporate sector. The tax advantage of debt-financed investment would also be reduced, leading to lower corporate debt holdings and a reduced risk of bankruptcy. The reduction in the tax cost of paying dividends will tend to increase dividend payments, thereby reducing retained earnings or share repurchases. This effect is somewhat mitigated by the decrease in individual income tax rates, which reduces the incentive to shift into the corporate sector by reducing the tax rate on proprietor income, partnership income, rental income, and Subchapter S corporate income.

Finally, increased Federal government budget deficits are expected to increase the amount of borrowing by the Federal government. Unless individuals increase their savings enough to finance completely the increased deficit, the increase in government borrowing will reduce the amount of domestic capital available to finance private business investment. This effect is often referred to as the "crowding out" of private business activity by Federal government activity. This reduction in national (combined private and public) saving may lead to a reduction in domestic investment, and domestic capital formation, depending on the mobility of international capital flows. As the U.S. government and private firms compete for the supply of available funds, interest rates are expected to rise to equate the demand and supply of funds, attracting some international investors. Foreign capital inflows would slow the increase in interest rates, and thus limit the extent to which increasing deficits would crowd out private investment. However, returns on foreign investments would accrue mainly to foreign persons, and would only increase the income available to U.S. persons to the extent that higher domestic investment resulted in higher wages in the United States.

The MEG and GI simulations incorporate an assumption that there would be some inflow of foreign capital to the extent that the rate of return on capital is increased by the tax policy. Because some of the reductions in taxes on capital are available to foreign investors in U.S. firms, and because of the projected increases in the Federal deficit, it is expected that this proposal would result in an inflow in foreign capital relative to the baseline; however, the inflow in foreign capital would not be not enough to offset completely the crowding out effects of

increased Federal borrowing. The OLG simulations do not assume an inflow of foreign capital. These differences in assumptions about international capital flows contribute to the slower growth in non-residential investment predicted by the OLG model, shown in the table below.

Table 3.–Effects of H.R. 2 on Capital Stock
Percent Change in Capital Stock Relative to Present Law Baseline

Calendar Year Period	**2003-2008**	**2009-2013**
Percent Change in Non-Residential Capital Stock		
Neoclassical Growth Model		
MEG - aggressive Fed reaction	0.6	0.4
MEG - neutral Fed reaction	0.8	0.6
Econometric Model		
GI estimated Fed reaction function	1.5	0.4
Life Cycle Model with Forward-Looking Behavior		
OLG reduced government spending in 2014	0.1	-0.7
OLG increased taxes in 2014	0.1	-0.8
Percent Change in Residential Capital Stock		
Neoclassical Growth Model		
MEG - aggressive Fed reaction	-1.0	-1.5
MEG - neutral Fed reaction	-0.8	-1.1
Econometric Model		
GI estimated Fed reaction function	-0.5	-1.3
Life Cycle Model with Forward-Looking Behavior		
OLG reduced government spending in 2014	-0.2	-0.1
OLG increased taxes in 2014	-0.2	-0.1

Table 3 shows the predicted changes in capital stock due to the proposal under different model structures, and differing assumptions about Federal Reserve Board and fiscal policy reactions. For the 2003-2008 period, the simulations indicate that the proposed legislation is likely to increase investment in non-residential capital relative to the present law baseline, resulting in an increase in non-residential capital ranging from 0.1 percent to 1.5 percent. During the same period, falling investment in residential capital (housing) leads to a decrease in residential capital stock relative to the present law baseline ranging from -0.2 percent to -1.0 percent. These changes in the capital stock are the result of the reduction in taxation of dividends and capital gains, and the temporary bonus depreciation.[27] The investment incentives for producers' equipment in this proposal are likely to shift some investment from housing to other capital. The size of the shift differs between the simulations because of different assumptions about adjustment costs and savings responses. In the second forecast period, the sunset of the bonus depreciation provision, combined with the negative effects of crowding out, will slow increases in private nonresidential investment. The simulations indicate that eventually the effects of the increasing deficit will outweigh the positive effects of the tax policy, and the accumulation of private nonresidential capital stock will likely decline relative to baseline levels.

[27] The change in expensing under Internal Revenue Code section 179 in this proposal is too small to have a measurable impact relative to the other capital-related provisions.

Labor supply and employment

Tax rate reductions provide competing labor supply incentives. Reductions in the marginal tax rate on wages create an incentive to work more because taxpayers are able to keep more of each dollar earned, making each additional hour of work more valuable. In contrast, reductions in the average tax rate on income create an incentive to work less, because they result in taxpayers having more after-tax income at their disposal for a given amount of work. Thus, there are two offsetting effects of an increase in after tax wages on how much an individual is willing to work. In addition, to the extent that individuals make decisions based on their expectations of future after-tax compensation as well as current after-tax compensation, the impact of the tax policy proposal on future taxes and disposable income also affects the amount of labor available to the economy. The two OLG simulations show the effects of assuming that individuals make their labor and consumption decisions on this basis.

Reductions in statutory tax rates usually result in reductions in both marginal and average tax rates, providing offsetting incentives to taxpayers. Conversely, changes in tax credits or deductions may affect average tax rates more than marginal tax rates for most taxpayers, as would be the case for the child credit. To the extent that tax credits, including the child credit, are phased in or phased out based on income levels, they can have significant marginal effects for taxpayers with incomes in the phaseout range. Research has shown that the largest response generally comes from secondary workers (individuals whose wages make a smaller contribution to household income than the primary earner in the household) and other underemployed individuals entering the labor market.[28] The response parameters in these simulations are consistent with this research. The acceleration of the EGTRRA rate cuts, marriage penalty relief, AMT relief, and child tax credits (for those in the income phaseout range) can be expected to provide a temporary incentive for some individuals to work more, as the rate cuts would temporarily reduce the marginal tax rate on additional earnings.[29] At the same time, these provisions also would provide a temporary incentive for some individuals to work less as they could receive the same amount of after-tax income with fewer work hours. For the child tax credit, the incentive to work less would outweigh the incentive to work more since only a small fraction of individuals affected by these provisions would experience a reduction in marginal tax rates. These effects are temporary because the proposal changes marginal and average rates relative to present law only during the period of acceleration.

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[28] See Pencavel, John (1986), "Labor Supply of Men: A Survey," in Orley Ashenfelter and Richard Layard, eds., *Handbook of Labor Economics*, vol. I, Amsterdam: North-Holland, 1986, pp. 3-102; Heckman, James J. (1993), "What Has Been Learned About Labor Supply in the Past Twenty Years?," *American Economic Review, Papers and Proceedings*, May 1993, vol. 83 no. 2, 116-121; Eissa, Nada and Jeffrey B. Liebman (1996), "Labor Supply Response to the Earned Income Tax Credit," *The Quarterly Journal of Economics*, May 1996, 111(2):605-637; and Eissa, Nada and Hilary W. Hoynes (2003), "Taxes and the Labor Market Participation of Married Couples: The Earned Income Tax Credit," forthcoming, *Journal of Public Economics.*

[29] For those people who may be moved off the AMT by this provision, marginal rates could increase or decrease, depending on their regular income tax bracket.

Another factor affecting willingness to work is induced changes in before-tax wages due to the policy. To the extent that the investment incentives in the proposed policy lead to an increase in the build-up of business capital stock, labor productivity will increase, resulting in an increase in wage rates. The increasing wage rates provide additional incentives, similar to those resulting from statutory tax rate changes, for taxpayers to alter their willingness to work. This effect is more lasting than the effects of the acceleration of the EGTRRA provisions, but it too eventually declines as the growing government deficit crowds out private investment, which lowers the capital to labor ratio in the long run.

Table 4.– Effects of H.R. 2 on Employment
Percent Change in Hours of Employment Relative to Present Law Baseline

Calendar Year Period	**2003-2008**	**2009-2013**
Neoclassical Growth Model		
MEG - aggressive Fed reaction	0.2	0.0
MEG - neutral Fed reaction	0.4	-0.1
Econometric Model		
GI estimated Fed reaction function	0.8	-0.4
Life Cycle Model with Forward-Looking Behavior		
OLG reduced government spending in 2014	0.2	-0.1
OLG increased axes in 2014	0.2	-0.1

As shown in Table 4, the simulations predict employment may increase relative to the present law baseline from 0.2 percent to 0.8 percent during the period from 2003 to 2008, as the effects of the acceleration of individual rate cuts and the initial increase in investment prevail. These increases correspond to an increase in the number of new jobs during the 2003-2008 period ranging from 230,000 to 900,000. Employment is predicted to increase in the first six years because of both the positive labor supply incentive from the individual rate cuts, and the economic stimulus effect of the proposal taken as a whole. This increase disappears by the end of the budget period, ranging from no change to -0.4 percent during the 2009-2013 period. The acceleration of the individual tax rate reductions is effectively a temporary provision relative to present law; thus, the positive labor supply incentives are temporary.

Demand stimulus

Generally, any net reduction in taxes results in taxpayers purchasing more because they have more take-home income at their disposal. To the extent that tax proposals increase after-tax income and individuals do not save the extra money, they will increase present consumption. Policies that increase incentives for taxpayers to spend their income rather than save it provide a larger market for the output of businesses. This class of incentives is often referred to as "demand" or economic stimulus incentives. The amount of economic stimulus resulting from demand side incentives depends on whether the economy possesses excess capacity at the time of enactment of the policy, as well as on the Federal Reserve Board reaction to the policy. Tax cuts can increase economic output if the economy is not already producing at its capacity - if there are people who are unemployed and looking for work, and if there are business facilities that are not operating at capacity. If the economy is already producing near capacity, demand-side policies may, instead, result in inflation, as consumers bid up prices to compete for a fixed amount of output. If the Federal Reserve Board believes there is a risk that the policy will result

in inflation, it may raise interest rates to discourage consumption. Depending on how aggressively the Federal Reserve Board reacts, little, if any, increase in spending will occur as a result of would-be stimulative tax policy. If the economy is not operating significantly below capacity, increases in consumption as a result of fiscal stimulus may diminish, not enhance, the long-term health of the economy.

Regardless of the policies of the Federal Reserve Board, if taxpayers anticipate that any current increase in the deficit due to tax cuts will eventually be reversed through government spending cuts or offsetting tax increases, they will be less likely to increase their purchases in response to a tax cut. To the extent that individuals take into account expected future fiscal policy, increases in consumption may be moderated. The perfect foresight assumption implies that individuals will change how much they consume today in anticipation of changes in fiscal policy in the future. If the tax cut as enacted is explicitly temporary, individuals are also less likely to increase their purchases in response to the tax cut. A substantial portion of the tax cuts in the proposed growth package – those attributable to the acceleration of the individual income tax provisions in the Economic Growth and Tax Relief Reconciliation Act of 2001 ("EGTRRA") and the bonus depreciation/NOL carryback combination – are temporary (operating from 2003-2006), and therefore likely to result in modest demand stimulus primarily in the first six years. This implies that the predicted demand stimulus in the first six years will likely be larger in myopic models, such as MEG, than in models that include forward-looking individuals, such as OLG.

Revenue feedback

When the macroeconomic effects of a change in tax policy are taken into account, estimates of the change in receipts due to the proposal may change. To the extent that a new policy changes the rate of growth of the economy, it is likely to change the amount of taxable income, which will have a "feedback effect" on receipts. Furthermore, by increasing the after-tax return on investments in capital that generate taxable income, a change in policy may shift investment from non-taxable or tax-favored sectors, such as owner-occupied housing, into the taxable sector, and thereby increase receipts. The model simulations indicate that the policy analyzed here is likely to result in more economic growth in the first six years than under current law, and hence results in less revenue loss than what is predicted using conventional revenue estimates. As the GDP growth declines in years 6-10, the revenue feedback also declines.

A change in policy, however, may result in inflation as well as real economic growth. Inflation causes increases in nominal revenues (revenues measured in current dollars), without necessarily increasing the purchasing power of the Federal government. Conventional budget analysis is conducted in nominal dollars. To the extent that this analysis applies equally to revenue and expenditure estimates, this practice provides a reasonably accurate picture of the effects of inflation on the Federal budget. However, the Joint Committee staff analyzes the effects of tax policy on receipts, but not spending. Reporting revenues due to inflation, without reporting the commensurate budget effects, would present an inaccurate picture of the effects of the proposal on the entire deficit. Therefore, the Joint Committee staff provides feedback effects in real (inflation-adjusted), rather than nominal terms. Table 5 shows the percent revenue feedback relative to the conventional revenue estimate, in real terms.

Table 5.–Effects of H.R. 2 on Real Revenues
Percent Feedback in Real Revenues Relative to Real Conventional Estimate

Calendar Year Period	**2003-2008**	**2003-2013**
Neoclassical Growth Model		
MEG - aggressive Fed reaction	9.8	3.6
MEG - neutral Fed reaction	27.5	23.4
Econometric Model		
GI estimated Fed reaction function	16.1	11.8
Life Cycle Model with Forward-Looking Behavior		
OLG reduced government spending in 2014	6.1	3.0
OLG increased taxes in 2014	5.8	2.6

Table 5 shows the percent feedback in real revenues, which is calculated by subtracting the inflation adjusted conventional revenue estimate from the inflation adjusted revenue estimate generated using macroeconomic analysis and then dividing by the conventional revenue estimate adjusted for inflation. A positive percentage indicates the estimated revenue loss is less when macroeconomic effects are included than when estimated using conventional methods, which implies there is a positive revenue feedback effect,. As the simulations indicate, depending on how much stimulus is generated by the proposal, the revenue feedback could range from 5.8 percent to 27.5 percent during the period from 2003 to 2008, and 2.6 percent to 23.4 percent over the entire budget period.

Even when presented in real terms, revenue feedback analysis alone may provide an incomplete picture of the effects of tax policy on the Federal budget. To the extent that the policy results in a net decrease in Federal receipts, with no offsetting expenditure reductions, the policy results in an increase in the Federal deficit. Increases in the Federal deficit generate additional debt service costs. To determine how changes in tax policy affect the ability of the government to meet its current and future obligations it is helpful to compare tax-induced changes in the deficit and GDP. If GDP is growing faster than the deficit, the fiscal situation is improving. Conversely, if deficits grow faster than GDP, the ratio of Federal debt to GDP would increase, which would imply that future generations would have less income to consume and invest after making payments on the debt.

Conclusion

The Joint Committee staff model simulations indicate that H.R. 2 would likely stimulate the economy immediately after enactment by creating temporary incentives to increase work effort, business investment, and consumption. This stimulus is reduced over time because the consumption, labor, and investment incentives are temporary, and because the positive business investment incentives arising from the tax policy are eventually likely to be outweighed by the reduction in national savings due to increasing Federal government deficits.

C. Data and Assumptions

Data

All of the macroeconomic models used by the Joint Committee staff are based primarily on quarterly National Income and Product Account ("NIPA") data published by the Bureau of Economic Analysis, U.S. Department of Commerce. In the MEG model, and to the extent possible in the commercial models, Joint Committee staff uses the Congressional Budget Office forecast for Federal and State and local government expenditures and receipts[30] instead of the NIPA series for these fiscal variables. For purposes of modeling changes in average and marginal tax rates, and in the cost of capital in the macroeconomic models, the Joint Committee staff uses microsimulation models that are based on tax return data provided by the Statistics of Income Division of the Internal Revenue Service ("SOI").

To obtain information about the how proposals affect average tax rates, marginal tax rates, and individual income tax liability, the Joint Committee staff uses its individual income tax model, which uses as its primary data source a stratified random sample of approximately 164,000 individual income tax returns. The SOI file currently in use is for tax year 1998. It is weighted so that it is a nationally representative sample of individual income tax returns, containing detailed information about each taxpayer's sources of income, deductions, and tax liabilities. This data is statistically matched with the March 1999 Current Population Survey to provide demographic and other information not available from income tax returns, and to supplement the income tax return data with information about individuals who do not file income tax returns. The matched file contains data for approximately 224,000 tax filing units and non-filer households. These files are extrapolated to cover the budget forecast period by growing values for income and related variables on these files, and adjusting statistical weights assigned to observations in the sample in order to match the CBO forecast for income flows and components of taxable income for this period.

The Joint Committee staff uses the individual income tax model to determine average tax rates and average marginal tax rates for the different sources of income in each model, and to calculate the changes in these rates due to the proposal. A tax calculator calculates the change in liability due to the proposal for each return. These changes are aggregated as appropriate for use in each of the macroeconomic models according to the different levels of disaggregation in each model. In the aggregations, averages are weighted by the income for each group. As an example, Table 6 shows the percent change in average and marginal rates due to H.R. 2 that were calculated for purposes of the extended sample analysis in Part III of this pamphlet.

[30] The quarterly series used by the Joint Committee staff are those underlying the annual figures published in *The Budget and Economic Outlook: Fiscal Years 2003-2012*, published by the Congressional Budget Office, January 2002.

Table 6.–Percent Change in Income-Weighted Federal Tax Rates Due to H.R. 2

Year	Average Tax Rate on Wages	Average Marginal Tax Rate on			
		Wages	Interest	Dividends	Capital Gains
2003	-11	-9	-11	-51	-24
2004	-10	-6	-8	-49	-23
2005	-9	-3	-6	-52	-24
2006	0	0	0	-48	-23
2007	-1	0	0	-48	-23
2008	0	0	0	-50	-22
2009	-1	0	0	-47	-22
2010	-1	0	0	-48	-22
2011	-1	0	0	-52	-22
2012	-1	0	0	-50	-21
2013	0	0	0	0	0

To obtain information about the effects of proposals affecting business tax liability, the Joint Committee staff uses a corporate tax microsimulation model that is similar in structure to the individual tax model. The data source for the corporate model is a sample of approximately 140,000 corporate tax returns provided by SOI. The model comprises a detailed set of calculations that replicate the present-law construction of taxable income, regular tax and tax credits, and the alternative minimum tax and minimum tax credit. As in the individual model, the sample returns are weighted to represent the entire population of approximately five million U.S. corporations, with major income and deduction items summed to the totals observed for the entire population. The model simulates the aggregate corporate income tax by calculating the tax liability for each return in the sample file. The Joint Committee staff also uses other SOI files on partnership and S-Corporation returns to provide information about the effects of proposals on pass-through entities.

Depending on the requirements of the policy simulation, the corporate model can be run either on a full cross-section of sampled tax returns (i.e. one full year) or on a panel of returns constructed from any combination of tax years in the 1987 through 1998 period. This panel feature is particularly useful in tracking net operating losses ("NOLs") and credits that can be either carried back or carried forward to other tax years. As with the individual SOI data, for purposes of revenue estimating, the income and related variables are generally assumed to grow in the present law baseline at the rate of growth forecasted by CBO for corporate profits.

The components of national income in the macroeconomic models are calibrated to NIPA data. However, national income is different from taxable income as defined in the Internal Revenue Code. Since the Joint Committee staff microsimulation models calculate average and marginal tax rates using taxable income from SOI data, adjustment factors are used to scale the components of national income, as measured in NIPA, to attain components of taxable income in the macroeconomic models that are consistent with those estimated from tax returns that comprise the SOI data. The gap between the components of national income measured in NIPA and observed taxable income can be primarily attributed to the difference between total income and taxable income, imputed income adjustments in the NIPA, and less than 100 percent

reporting of income on the tax returns that comprise the SOI data. For specific sources of income, there are also definitional differences; e.g., S-Corporation profits are included in dividends as measured by NIPA, but not in taxable dividends. For the proposal analyzed here, the adjustment factors for interest and dividends also reflect a definitional clarification in the proposal that would cause some payments currently reported as dividends to be reported as interest. The Joint Committee staff converted NIPA income to taxable income using the following adjustments, derived from staff calculations:

Table 7.–Adjustment Factors: NIPA to SOI

Income Type	Adjustment Factor
Wages	.95
Dividends	.41
Interest	.32
Rents	.18
Proprietors Income	.61

Joint Committee microsimulation tax calculators also are used to help assess the effect of a tax proposal on the cost of capital, which is an important determinant of investment in the macroeconomic models. Tax return data in these models provides the necessary detail on the amount of property placed in service in each of the Modified Accelerated Cost Recovery System ("MACRS") classes each year, which is necessary to evaluate the effects of proposals affecting taxable business income and tax liability. Because some firms are operating at or near a net operating loss position, they may not be able to make full use of proposals such as investment tax credits or shortened tax depreciation lives. The corporate panel provides valuable information about the likely pattern of use of additional deductions for investment, as well as the interaction of this provision with accumulated NOLs and proposals affecting their usage. Thus, the combined use of the corporate tax panel, and tax return information for non-corporate businesses allows for a calculation of the effects of proposals affecting deductions for investment on the cost of capital that takes into account both the complexities of the present law tax code and the current tax positions of businesses in different industries. For example, the simulations presented above are based on the calculation that the combined bonus depreciation and NOL provisions in H.R. 2 would result in the following percentage changes in the net present value of tax depreciation (the change is different for each year because of the temporary nature of the bonus depreciation provisions in present law and in the proposal):

Table 8.–Percentage Increase in Net Present Value of Depreciation Deductions Under H.R. 2 Compared to Present Law

Year	Percent Change from Present law
2003	8.3
2004	9.1
2005	15.4
2006	0.5

Behavioral assumptions

Model structure

The Joint Committee staff uses several different model structures, each of which requires inputting assumptions about taxpayer and institutional behavior. For example, the MEG model can be solved using several alternative assumptions about the short-run transition path of the economy, based on the type of Federal Reserve Board response that is chosen. One possible choice is to assume that the Federal Reserve Board fully offsets short-run deviations of the level of output from full employment by manipulating the interest rate to ensure that demand equals supply in each period. In this mode, the transition path reflects changes in the economy when the economy is assumed to remain in equilibrium throughout the transition period, rather than reflecting the potential disequilibrium transition path. A second configuration assumes that the Federal Reserve Board does not react to offset completely changes in the level of employment from its full-employment potential, thus allowing the transition path of output to deviate from its full employment levels throughout the transition period. However, in the long run, the MEG model allows prices and quantities to adjust so that employment and output levels return to full employment and the economy reaches its equilibrium growth path. The GI simulations have similar short-run features. The OLG model is a general equilibrium perfect foresight model that assumes that all the factors of production are fully employed during the transition period, and that prices of inputs adjust so that all markets clear, and demand always equals supply.

The transition path in the MEG model is determined in part by a lagged adjustment structure that represents an observed tendency of certain prices and quantities to adjust gradually because of market constraints to bring supply and demand into equilibrium. The Federal Reserve Board's interest rate adjustment required to bring supply and demand into equilibrium must be strong enough to overcome these rigidities in the economy's ability to adjust to changing policy. The OLG model's transition path is determined by a quadratic cost adjustment cost function that moderates the speed of adjustment to the new steady state equilibrium because of explicit costs incurred in making these changes. Because the adjustment process is structured differently between MEG and OLG, the two models produce different transition paths, even when the MEG simulations are run in equilibrium mode.

Another source of variation in the model structures is the assumption on how consumers' and producers' form expectations about the future of the economy. In the MEG model, individuals and firms are "myopic" in that they make decisions based on the assumption that all future prices will equal current prices. Individuals and firms in the OLG model have perfect foresight about future prices and the path of the economy. The forward-looking nature of individual behavior requires that unsustainable increases in the growth of government debt must be offset by either a decrease in government spending or an increase in taxes at some point in the future. Myopic expectations and perfect foresight are the two extreme assumptions that most likely bound the actual individual decision making process.

Consumption and savings response

The key behavioral assumption that determines the magnitude of the savings response in the MEG and OLG models is the intertemporal elasticity of substitution. This parameter determines the willingness of individuals to substitute present consumption for future consumption in response to changes in the relative price of consumption across time periods, thus determining the responsiveness of saving to changes in the after-tax rate of return on capital. These models depict the consumption/saving decision by individuals as a choice to maximize their utility, or sense of well-being, from their lifetime consumption of goods and leisure. The higher the value of this parameter the more willing individuals are to substitute present consumption for future consumption. The assumed rate of time preference is also important in determining an individual's saving response.[31] A positive rate of time preference indicates how strongly individuals desire to consume now rather than later assuming no changes in underlying economic conditions, and thus plays a role in determining the individual's decision to spread consumption over his lifetime. In general, a higher value of the rate of time preference would reduce saving holding all else constant.

These parameters are presented in Table 9.

Table 9.–Savings-related parameters in MEG and OLG

Parameter Type	MEG	OLG
Intertemporal substitution elasticity	.25	.25
Rate of time preference	.015	.005

The parameter values used to calibrate the consumption function in MEG are derived so that the marginal propensities to consume out of income and wealth are approximately 0.7 and 0.05, respectively. The MEG model is calibrated using characteristics of an individual who is 45 years old and planning to retire at age 62 in order to yield an aggregate consumption function

[31] Other parameters and factors that determine the savings response in OLG and MEG include the nature and existence of the bequest motive (how individuals determine how much wealth to leave to future generations) and the share of income that is disposable income. Uncertainty about future wage income or life expectancy also has a major impact on the saving response, but it is not included in either current version of MEG or OLG.

that approximates the average consumption pattern of all working age individuals. The parameters that determine the responsiveness of saving to the after-tax rate of return in the MEG model are the same as those used in the OLG model.

International capital flows

There is an international trade, or open economy, feature in the MEG model. In MEG, international capital flows are determined by changes in demand for imports, as well as changes in demand for investment capital. Exchange rates gradually adjust to balance demand and supply for U.S. dollars. The result is that changes in the rate of return on capital induce some change in the inflow of foreign capital, but not so much as would be produced in a small, open economy model. In a small, open economy model, U.S. market activities would not be large enough to alter world prices, and thus inflows and outflows of foreign capital would result in constant after-tax interest rates in the U.S. economy. The GI model has an international sector similar to that in the MEG model. The OLG model assumes a closed economy, in which there is no foreign trade, a limiting factor of this model.

Labor supply

In the MEG model, labor supply is determined by responses of individuals to changes in their after-tax wages, which depend on tax policy and on endogenously generated changes in the wage rate. Responses are modeled separately for four different groups in the MEG model: low income primary earners, other primary earners, low income secondary earners, and other secondary earners. Primary earners are all filers of single, head of household, and married filing separate returns, as well as the higher wage earners on joint returns. Secondary earners are the lower wage earners on joint returns. The relative sizes of the groups in the MEG model are weighted by their wages, as measured using the Joint Committee staff microsimulation model. An individual's willingness to increase labor hours is expected to increase with an increase in average tax rates, and increase with a decrease in marginal tax rates. The former effect is represented in the model by the "income elasticity," which is a measure of the percent change in hours of labor supplied for every percent change in after tax average wage rates. The latter is represented by the "substitution elasticity," which is a measure of the percent change in hours of labor supplied for every percent change in after tax marginal wage rates.

For proposals that primarily affect taxation of individual wage income, the assumed size of the labor supply elasticity can have a large impact on the amount of growth predicted by the model. For such proposals, it is desirable to run simulations under different assumptions about labor supply elasticities. The Joint Committee staff performs this sensitivity analysis by varying the substitution elasticity in the MEG simulations. The income and substitution elasticities for each group are presented below in Table 10. Because most of the tax changes in H.R. 2 analyzed above did not have a large impact on wage taxes, those simulations were run using only one set of labor supply elasticities - those in columns (a) and (b) in Table 10.

Table 10.–Disaggregated Labor Supply Elasticities

Disaggregated Labor Supply Elasticities	(a) Income	(b) Substitution	(c) Low Elasticity Substitution
Low income primary	-0.1	0.2	0.15
Other primary	-0.1	0.1	0.1
Low income secondary	-0.3	0.8	0.4
Other secondary	-0.2	0.6	0.3
Wage-weighted population average with baseline rates	-0.13	0.18	0.13

In the OLG model, the key parameters that determine the responsiveness of labor supply to changes in the after tax-wage rate are the intratemporal elasticity of substitution and the ratio of hours of leisure to hours available for work. The intratemporal elasticity of substitution determines the willingness of individuals to substitute between leisure and consumption of goods and services in response to changes in the after-tax wage rate. The higher the intratemporal elasticity of substitution the more willing individuals are to substitute between consumption of goods and services and leisure, and thus the individual's labor supply is more responsive to changes in the after tax wage rate. The ratio of an individual's leisure time to the total number of hours available for work (the individuals time endowment) is an indicator of the amount of time that could be substituted from leisure to labor supply. As this ratio decreases, the individuals' labor supply responses are reduced since they have fewer hours that could be shifted from leisure to work. The value of the intratemporal elasticity of substitution is assumed to be equal to 0.5 and the ratio of hours of leisure to hours available for work is assumed to be 0.3. This yields an elasticity of labor supply with respect to the after-tax wage approximately equal to 0.15 percent.

Long-run growth and production functions

In general, the rate of population growth, combined with the rate of increase in labor productivity, or technological growth rate, determines the underlying, steady state growth capacity for the economy. In the MEG model, growth in the working age population is drawn from the middle series of the U.S. Census population projections by age. The assumed rate of labor augmenting technological growth, which determines the growth of labor productivity, is equal to 2.25 percent per year. In the OLG model, the rates of change of population and technological growth are each equal to one percent per year.

The factors described above would provide a model of economic growth assuming nothing happens to disturb the steady growth path. In order to analyze the effects of perturbations, such as changes in tax policy, on the economy, it is necessary to model the effects of changes in the supply of labor and capital, including the response of these factors of production to changes in policy, and the ability of firms to substitute between them in response to changes in their relative availability. These effects are modeled through a production function. In the MEG and OLG models, production in each sector is characterized by a constant elasticity of scale production function. The substitution elasticities govern the ability of firms to substitute capital and labor in production in response to changing factor prices and effective tax rates. Table 11 shows the values for these parameters used in recent simulations.

Table 11.–Elasticity of Substitution Between Capital and Labor

MEG	
Private business sector	1.0
Housing sector	1.0
OLG	
Private business sector	0.5
Housing sector	0.7

The value of the substitution elasticity in the MEG model is equal to one for the simulations presented in this report, and thus the substitution between capital and labor is likely to be overstated relative to existing estimates of the substitution between capital and labor. If the value of this parameter is different from one a trend is introduced in the model, which prevents the model from arriving at a long-run steady state solution. The Joint Committee staff has run several sensitivity analyses of various substitution elasticities to examine the impact of this parameter within the budget window. For a variety of proposals and values of the substitution elasticities it was determined that this parameter is not crucial in determining the short-run (within the ten-year budget estimating period) results of the model.

To analyze the effects of policies that have differential effects on capital in different sectors, it is also necessary to specify assumptions about how much capital is used relative to labor in each sector. The capital share parameters, which determine capital's share of income in the housing and non-housing production sectors, and the debt to capital ratio in each of the models are shown in Table 12.

Table 12.–Capital share in production in MEG and OLG (Percent)

MEG	
Equipment share in business output	17
Structure share in business output	12
Capital share in residential housing	100
Debt to capital in business sector	43
OLG	
Capital share in non-housing output	27
Capital share in housing output	98
Debt to capital in housing and non-housing sectors	35

Finally, when modeling the response of the economy to policy changes, it is desirable to take into account the fact that adjustments may not be costless, and thus responses are likely to occur over a period of time, rather than instantaneously. The adjustment cost parameter determines the size of adjustment costs for increasing the rate of investment above the steady state rate of investment, which is set equal to the replacement rate of old capital and the steady state growth rate. In MEG, the rate of adjustment towards the desired level of a variety of variables is determined by exogenously determined adjustment parameters. A partial list of these parameters is presented in Table 13 for the important economic variables. In OLG, deviations in

the ratio of investment to capital from the steady state level incur adjustment costs that increase according to a quadratic adjustment cost function. In particular, an increase in the ratio of investment to the capital stock of one percent would increase the cost of installing new investment by five percent.

Table 13.–Adjustment Parameters in MEG and OLG

MEG: portion of adjustment per quarter	
Actual towards equilibrium stock of equipment	0.05
Actual towards equilibrium stock of non-residential structures	0.05
Actual towards equilibrium stock of housing	0.05
Actual towards equilibrium labor force participation rate	0.25
OLG	
Adjustment cost parameter in housing and non-housing sectors	5.0

Use of the Global Insight econometric model

In analyzing H.R. 2, the Joint Committee staff also ran a simulation using the commercially available GI model. Because this model was used in order to provide an additional perspective, the staff made minimal changes to the model. The fiscal sector - government spending at both the State and local and the Federal level - was adjusted to conform more closely to government spending and transfers in the CBO baseline. Adjustment factors were added to the tax equations, as with the other models used in this report, to align taxable income with the CBO baseline. The Federal personal income tax revenue equation was divided between dividends and other revenues to allow for a more exact modeling of the dividend exclusion.

Planned modeling enhancements

The Joint Committee staff continues to work on improving its macroeconomic modeling capacity. This work includes both the enhancement of the models currently in use, and the investigation of additional models that may be better suited for analysis of certain types of proposals. Several near-term projects are described in this section.

Enhancements to the MEG model

Three near-term improvements are planned for the MEG model. The most straightforward is separation of the business sector into a corporate and a non-corporate sector, to facilitate analysis of differential changes between corporate and non-corporate tax policy. An extension of this enhancement would be to add additional business sectors that may be subject to differential tax treatment. In addition, the Joint Committee staff is investigating the possibility of incorporating some form of forward-looking expectations into the MEG model, for the purpose of improving the analysis of tax proposals that include explicitly temporarily effective provisions. Finally, the most challenging enhancement is developing an alternative version of the MEG model that would preserve its structural equilibrium feature while allowing for initialization of the model to an economy that is assumed not be in equilibrium - that is, for an

economy that may currently be operating significantly below or above its generally sustainable productive capacity. This change would allow for an improved analysis of the potential short-run effects of proposals on the business cycle.

Use of additional models

As described above, the Joint Committee staff has experimented with the use of two commercially available econometric models to supplement its analysis. A drawback to using these models is that there is a limit in the extent to which these models can be modified to permit the simulation of specific proposals in a manner that is both internally consistent with the structure of the models and reflective of theoretical issues that may arise in analyzing proposed tax policy changes that affect income flows not separately delineated in these models. Nevertheless, econometric models provide a valuable additional insight into the behavior of the economy. Joint Committee staff is currently exploring the possibility of working with a different econometric model that could be more readily adapted to use in tax policy analysis.

The Joint Committee staff recognizes that the three types of models it currently uses for the macroeconomic analysis of tax policy are not the only types of models currently available or in development for this purpose. Moreover, none of them is perfectly suited to the analysis of every type of proposal the staff may be asked to analyze. For this reason, the Joint Committee staff continues to explore various other models and additional modeling improvements.

APPENDIX A – MEMBERS OF THE BLUE RIBBON ADVISORY PANEL FOR THE JOINT COMMITTEE ON TAXATION

Alan J. Auerbach, Robert De. Burch Professor Economics and Law, University of California at Berkeley

William Beach, Director, Center for Data Analysis, Heritage Foundation

Alan Blinder, Professor of Economics, Princeton University

David F. Bradford, Professor of Economics, Princeton University

Leonard E. Burman, Co-Director, Urban-Brookings Tax Policy Center

Eric M. Engen, Resident Scholar, American Enterprise Institute

Stephen J. Entin, Executive Director and Chief Economist, Institute for Research on the Economics of Taxation

Ray C. Fair, Professor, Cowles Foundation, Department of Economics, Yale University

Martin Feldstein, Professor of Economics, Harvard University

William G. Gale, Senior Fellow, Economic Studies, Brookings Institution

Jane G. Gravelle, Senior Specialist in Economic Policy, Congressional Research Service

Kevin A. Hassett, Resident Scholar, American Enterprise Institute

Dale Jorgenson, Professor of Economics, Harvard University

Laurence J. Kotlikoff, Professor of Economics, Boston University

David Malpass, Chief Global Economist, Bear, Stearns & Co.

N. Gregory Mankiw, Professor of Economics, Harvard University

Rudolph G. Penner, Senior Fellow, Urban Institute

Robert D. Reischauer, President, Urban Institute

Alice M. Rivlin, Senior Fellow, The Brookings Institution

Gary Robbins, President, Fiscal Associates, and John M. Olin Senior Fellow for the Institute for Policy Innovation

John Karl Scholz, Professor of Economics, University of Wisconsin at Madison

Kent Smetters, Assistant Professor of Insurance and Risk Management, Wharton Business School, University of Pennsylvania

C. Eugene Steuerle, Senior Fellow, Urban Institute