# SUMMARY OF ECONOMIC MODELS AND ESTIMATING PRACTICES OF THE STAFF OF THE JOINT COMMITTEE ON TAXATION

Prepared by the Staff
of the
JOINT COMMITTEE ON TAXATION

September 19, 2011
JCX-46-11

## CONTENTS

Page

INTRODUCTION ..... 1

I. BACKGROUND ON REVENUE ESTIMATING AND BUDGET ACT REQUIREMENTS ..... 2

A. Overview ..... 2
B. The Budget Period and Presentation of Estimates ..... 3
C. Estimating Mechanics ..... 3
D. Behavioral Effects in Revenue Estimates ..... 4
E. Compliance, Administration and Enforcement Costs ..... 5
F. Indirect Tax Effects ..... 6
G. Estimating Checks and Balances ..... 6
H. Requests for Estimates of Legislative Proposals ..... 7

II. CONVENTIONAL TAX MODELS (MICROSIMULATION MODELS) ..... 8

A. Overview ..... 8
B. The Individual Tax Model ..... 8
C. The Corporate Tax Model ..... 9
D. The Estate and Gift Tax Model ..... 10
E. Additional Models ..... 11
1. Individual panel model ..... 11
2. Excise tax models ..... 11
3. Energy, other models ..... 11

III. MACROECONOMIC MODELING ..... 13

A. Overview ..... 13
B. Macroeconomic Growth Model ("MEG") ..... 13
C. Overlapping Generations Model ("OLG") ..... 14
D. Dynamic Stochastic General Equilibrium Growth Model ("DSGE") ..... 15

APPPENDIX: SELECTED REFERENCES AND BIBLIOGRAPHY OF DOCUMENTS PUBLISHED BY THE STAFF OF THE JOINT COMMITTEE ON TAXATION ..... 16
A. Conventional Analysis ..... 16
B. Macroeconomic Modeling ..... 17
C. Documents Relating to Modeling Published in Academic Journals or by Research Organizations and Authored in Whole or Part by Joint Committee Staff ... 18

## INTRODUCTION

This document,[1] prepared by the staff of the Joint Committee on Taxation ("Joint Committee staff"), provides an overview of the current procedures used in the revenue estimating process. The emphasis is on methodology and issues associated with the preparation of revenue estimates. Part I discusses the role of the budget period and budget baseline and provides an overview of the various behavioral, compliance, and indirect effects modeled as part of any revenue estimate. Part II describes, in brief, the Joint Committee staff's primary conventional microsimulation tax models. Part III describes, in brief, the Joint Committee staff's macroeconomic modeling of proposed changes in tax law. An appendix provides references to other work of the Joint Committee staff describing economic modeling of specific issues in more detail.

[1] This document may be cited as follows: Joint Committee on Taxation, *Summary of Economic Models and Estimating Practices of the Staff of the Joint Committee on Taxation* (JCX-46-11), September 19, 2011. This document can be found on our website at www.jct.gov.

# I. BACKGROUND ON REVENUE ESTIMATING AND BUDGET ACT REQUIREMENTS

## A. Overview

The reference point for a revenue estimate prepared by the Joint Committee staff is the Congressional Budget Office ("CBO") 10-year projection of Federal receipts, referred to as the "revenue baseline." The revenue baseline serves as the benchmark for measuring the effects of proposed tax law changes. The baseline assumes that present law remains unchanged during the 10-year budget period.[2] Thus, the revenue baseline is an estimate of the Federal revenues that will be collected over the next 10 years in the absence of statutory changes.

The Joint Committee staff uses confidential tax return information to prepare revenue estimates. The Statistics of Income Division ("SOI") of the Internal Revenue Service ("IRS") provides large micro-level data sets consisting of statistically sampled and edited tax returns. SOI data provides the primary building block for revenue estimates. In the process of estimating a proposal, other information sources are used frequently. These sources include other government data, survey data, constituent data, and third-party data.

In providing conventional estimates, the Joint Committee staff follows long-standing scorekeeping conventions, observed also by CBO and the Office of Tax Analysis of the Department of Treasury, that a proposal will not change total income. The Joint Committee staff therefore holds Gross National Product ("GNP") fixed.[3] Within this modeling framework, the Joint Committee staff accounts for possible shifts in economic activity across sectors or markets and/or changes in the timing of such activity in response to the proposed tax change, so long as GNP remains unaffected.

The fixed GNP assumption provides that both the "baseline" estimate of receipts under current law (CBO baseline) and estimates of proposed legislation are consistent with the same economic assumptions, so that one may be added to the other to derive a consistent estimate of what total receipts would be if the legislation were enacted. All budget estimates, those concerning outlays as well as receipts, are estimated within a framework of specified economic assumptions relating to the level of major economic variables such as GNP, the average price level, and rate of inflation, interest rates and the unemployment rate.[4] The fixed GNP assumption

---

[2] The baseline with present law remaining unchanged does not imply that the law is the same in subsequent years as it is in the first year. For example, a provision that is scheduled to sunset in the third year of the budget period is assumed to sunset.

[3] GNP and Gross Domestic Product ("GDP") are measures of U.S. production. GDP refers to production taking place in the United States and, as such, covers the goods and services produced by factors of production (labor and property) located in the United States. GNP includes those goods and services produced anywhere in the world by factors of production supplied or controlled by U.S. residents.

[4] As noted in the text, this framework is followed also by CBO and the Office of Tax Analysis of the Department of Treasury. However, Treasury estimates and estimates of the Joint Committee staff and the CBO use

also facilitates policy comparison between policies that have changes in tax law as a component with policies that change outlays or would adopt a regulatory approach. In large legislative packages, there may be tax provisions, and outlay provisions, that would have offsetting effects on macroeconomic aggregates. The fixed GNP assumption also allows modeling of microeconomic behavior without predicting current or future actions of the Federal Reserve with respect to monetary policy or future actions of the Congress with respect to fiscal policy (changes in expenditures or taxes), both of which would affect macroeconomic aggregates, which would affect receipts.

Some commentators mistakenly refer to conventional revenue estimates reported by the Joint Committee staff for budget reporting purposes as "static estimates," implying that the estimates assume that taxpayers do not alter their economic decisions in response to changes in tax policy. This implication is incorrect. The Joint Committee staff has long modeled taxpayer behavior as part of each conventional estimate reported by the Joint Committee staff. Part II.D., below, provides an overview of behavioral effects in conventional revenue estimates. Part III of this document outlines the models and types of taxpayer economic behavior the Joint Committee staff analyzes when assuming the possible macroeconomic effects that may result from changes in tax policy. However, such macroeconomic analysis is not included for budget reporting purposes. Some commentators refer to the results of macroeconomic analysis as "dynamic estimates." This descriptive document will generally refer to conventional revenue estimates and macroeconomic analysis.

### B. The Budget Period and Presentation of Estimates

Budget rules require the Joint Committee staff to present revenue estimates as point estimates (that is, to present a single dollar figure rather than a range of possibilities) calculated in nominal dollars. Revenue estimates for each year within the budget period are fiscal year estimates.[5] Budget resolutions require revenue estimates to be expressed in nominal dollars over a fixed period. The budget period, sometimes referred to as the "budget window," is generally 10 years.

### C. Estimating Mechanics

The Joint Committee staff is required to use the CBO revenue baseline in their revenue estimates. Underlying the baseline revenue forecast is a 10-year forecast of macroeconomic conditions, which CBO produces at the beginning of each calendar year, and updates each August.[6] Revenue estimates produced by the Joint Committee staff generally incorporate as

---

different sets of economic assumptions. Treasury estimates start from the macroeconomic baseline of the Office of Management and the Budget.

[5] The Federal fiscal year runs from October 1 through September 30. For example, fiscal year 2012 starts on October 1, 2011 and ends September 30, 2012.

[6] The revenue baseline is a component of the budget baseline prepared by CBO, which includes expenditures as well as receipts. Although the CBO issues a mid-year revision of its forecast, the "official" forecast

underlying assumptions relevant parts of the CBO baseline macroeconomic forecast, including total output, investment, inflation and interest rates, and growth rates for specific income flows such as corporate profits and wages. The CBO baseline provides the anchor but not the many details necessary for analyses of Member requests. For this reason, the Joint Committee staff develops most of its own detailed baselines and models.[7] The use of fixed economic assumptions does not prevent the Joint Committee staff from taking into account possible shifts in economic activity across sectors or markets and/or changes in the timing of such activity in response to the proposed tax change, so long as the CBO forecasted GNP baseline is assumed to remain unaffected.

Although conventional revenue estimates assume that a proposal will not affect macroeconomic projections, the estimates anticipate and take into account the behavioral and other microeconomic effects of the proposal. In estimating behavioral responses, Joint Committee economists rely on economic research by themselves and others. In addition, the tax lawyers and accountants on the Joint Committee staff help the economists interpret statutory language and provide feedback regarding some of the ways in which taxpayers may respond to a particular proposal.

### D. Behavioral Effects in Revenue Estimates

Commentators sometimes mistakenly refer to conventional revenue estimates as "static." In fact, for more than 30 years, Joint Committee staff revenue estimates have taken into account taxpayers' likely behavioral responses to proposed changes in tax law. Behavioral effects can be broadly characterized as shifts in the timing of transactions and income recognition, shifts between business sectors and entity forms, shifts in portfolio holdings, shifts in consumption, and tax planning and avoidance strategies. The following paragraphs briefly present a few specific examples of the issues the Joint Committee staff considers when accounting for behavioral effects in revenue estimates.

Probably the best known example of timing shifts included in revenue estimates is the realization rate for capital gains. When estimating the effect of changes to the capital gains tax rate (or of other aspects of the tax law that may affect the incentive to realize capital gains), the Joint Committee staff assumes that taxpayers will respond by changing the timing of their decisions to realize capital gains or losses out of their accrued gains or losses. For instance, in response to the lower preferential rates on capital gains that were enacted in 2003, the Joint Committee staff assumed that there would be a relatively large short-term increase in realizations, followed by a somewhat smaller long-term increase. The additional revenues estimated resulting from this dynamic response in realization behavior offset roughly 70 percent

---

remains the one specified in the conference report accompanying the budget resolution and is the one used in revenue estimates. Generally that has been the January baseline.

[7] For example, the CBO provides a baseline for investment in equipment but not for investment in transportation equipment. Thus, the Joint Committee staff must develop its own baseline to analyze proposals that affect transportation equipment.

of the loss in revenues that would have resulted from applying the rate change to a static forecast of capital gains realizations. The magnitude of the response of capital gains realizations to changes in tax rates has been a topic of considerable debate.

Another behavioral response that has received significant attention from public finance economists is the response of individuals to changes in marginal tax rates. When estimating the effect of changes to marginal tax rates, the Joint Committee staff assumes that taxpayers will respond by changing the form and, in some cases, the timing, of their income. For example, in response to an anticipated tax rate increase, taxpayers may shift some future compensation into the current period prior to the rate increase and subsequent to the rate increase take more of their compensation as non-taxable (or deferred-taxable) fringe benefits. Taxpayers may shift their portfolios in the direction of less-taxed sources of income, such as tax-exempt bonds, and towards activities that result in itemized deductions. At the same time, businesses may shift organizational form between C corporations and S corporations.

The Joint Committee staff applies behavioral response measures that are based on the empirical estimates available from the extant economics literature and in-house research. However, direct application of empirical evidence from the academic literature is often difficult. Sometimes there is little consensus in the economic literature on the size of a behavioral response. Even where there is some agreement on the magnitude of the response, it is not always straightforward to apply published empirical estimates for a number of reasons. The estimates are often measured using tax law changes that are of a different scale than the proposals being considered. The behavioral responses may have been estimated based on large tax changes whereas the proposals are small, or vice versa. Some of the larger behavioral responses have been measured when tax rate changes were part of tax legislation that included other provisions that may have affected income shifting. The application of these empirical estimates is problematic given the fixed GNP convention used in Joint Committee staff estimates and requires that the staff reinterpret the estimates before it can apply them. Finally, empirical estimates from the academic literature sometimes apply to more simplified forms of tax policy changes than the types of proposals that are actually under consideration by Congress.

### E. Compliance, Administration and Enforcement Costs

As part of the process of understanding how a proposal would operate, the Joint Committee staff attorneys, accountants, and economists work as a team to examine compliance, administration, and enforcement issues that could affect the timing or amounts of revenues collected. When these issues are important to a proposal, the Joint Committee staff accounts for their effects in the revenue estimate.

The Joint Committee staff uses a variety of sources to determine how compliance, administration, and enforcement issues might affect revenue. IRS compliance studies provide information for issues involving individual taxpayers. The Joint Committee staff also uses information provided by the IRS about their examination, enforcement, appeal, and litigation activities. In some areas, such as tax shelters, the Joint Committee staff is frequently briefed by Treasury Department and IRS personnel. Information provided at these meetings helps the Joint Committee staff gauge the likely compliance, administrative, and enforcement effects of particular proposals.

## F. Indirect Tax Effects

In estimating the revenue effects of proposed changes to tax law, the Joint Committee staff incorporates the behavioral responses of taxpayers (within the fixed-GNP convention) and any secondary tax effects associated with that behavior. Indirect and secondary tax effects may arise from non-tax legislation, however. Non-tax legislation, either by design or not, may cause changes in taxable income and thereby impact Federal tax receipts.

In general, the CBO has responsibility for estimating the budget effects of non-tax legislation. Over time the Joint Committee staff and the CBO have developed general guidelines for when indirect tax effects are estimated and by whom. (When the CBO makes such estimates it is often in consultation with the Joint Committee staff). Regardless of whether CBO or the Joint Committee staff estimates the indirect tax effects, to the extent that these effects are accounted for, they are included with the estimate of the bill.[8]

## G. Estimating Checks and Balances

There are a number of checks and balances in the revenue estimating process. The Joint Committee staff, working as a team, provides internal checks of revenue estimates through a formal review process that includes attorneys and accountants who work on the relevant topic, the Deputy Chief of Staff, and the Chief of Staff. The Joint Committee staff uses a computerized document management system to keep track of requests, work in progress, the formal review process, and the ultimate processing of responses to Members.

The Joint Committee staff has published several documents explaining the economic models used in revenue estimating and solicited comments from outside experts.[9] Joint Committee staff economists also have presented modeling analyses at professional conferences such as those sponsored by the American Economic Association, the National Tax Association, and the National Bureau of Economic Research.

Treasury, CBO, State estimators, academics, and private sector contacts often contribute to the dialogue before and after an estimate is provided, subject to confidentiality rules. Sometimes a proposal will exist for many years before it becomes law. For example, the proposals creating empowerment zones took almost 10 years to be enacted, and thus the economists had time to iteratively refine the models used to estimate the evolving proposals.

Although there is no formal process for the revisiting of estimates over time, each economist updates his or her revenue estimating models each year in conjunction with updating assumptions to the new CBO baseline. To the extent that additional information has become available since the prior year baseline, it is incorporated into the updated model. The Joint

---

[8] For example, bankruptcy reform altered the priority of tax debts in certain bankruptcies, and the Joint Committee staff estimated a change in receipts as part of CBO's analysis of that legislation.

[9] See Appendix.

Committee staff often uses this occasion to consult recent academic literature and to research modeling issues with colleagues and outside experts.

Comprehensive retrospective examinations are extremely difficult for a number of analytical reasons. One reason is that it is impossible to tell what revenue collections would have occurred in the absence of a specific proposal, as receipts are affected by general economic conditions as well as other subsequently enacted legislation. In addition, proposals that become law are typically enacted as parts of large tax bills that contain many interacting provisions. Identifying the impact of a specific provision is at best problematic, and often impossible. Revisiting the estimate of an entire tax bill, as opposed to individual provisions in the bill, also presents difficulties. Most large legislative packages can be expected to result in behavioral effects that have allocative or sectoral consequences and may generate macroeconomic effects. Teasing out the portion of the economic changes caused by a specific tax law change is a challenging task. While the Joint Committee staff has the expertise to engage in such econometric analyses, the analyses require a considerable investment of staff time, and the results are always subject to debate.

### H. Requests for Estimates of Legislative Proposals

Any Member of Congress may request a revenue estimate for a tax proposal or solicit the Joint Committee staff's help in crafting tax legislation.[10] The Joint Committee staff asks that the Member provide as much detail describing his or her proposal as possible. Legislative language often helps provide detail, but the Joint Committee staff appreciates that often a Member's policy development will start from an outline of concepts and that the Member seeks initial input about economic and legal effects before further developing a proposal.

The Joint Committee staff treats all requests as confidential unless otherwise stipulated. A response to a request is released only to the Member making the request and the response remains confidential unless the Member decides to make the information public. Confidentiality allows the Member to explore options that the Member may ultimately decide are inappropriate policy. Also confidentiality reflects the Joint Committee staff's nonpartisan role.

When a revenue estimate has been included in a publicly available document (*e.g.*, a revenue table summarizing a markup proposal or the result of a reported bill), the estimate is posted to the Joint Committee website and publicly released. An estimate is also posted in circumstances where the information is of widespread and immediate interest to the Members of Congress (*e.g.*, a tax bill about to be voted upon by the full House or the full Senate).

[10] The Joint Committee staff also receives requests for distributional, legal, and data analyses.

## II. CONVENTIONAL TAX MODELS (MICROSIMULATION MODELS)

### A. Overview

The Joint Committee staff uses several highly developed microsimulation tax models to estimate the revenue impact of changes in tax laws. These include the Individual Tax model, the Corporate Tax model, and the Estate and Gift Tax model. In addition, the staff uses individual panel-based models. The primary source of tax data for the models comes from tax return data compiled by the SOI division of the IRS.

Some of the tax models use large micro-data files, while others are smaller and spreadsheet based. Some models reside on a desktop computer, while others reside on "servers" and are simultaneously available to several staff members. The complexity and scope of a model are determined by several factors including the amount and type of data available and the level of complexity associated with the questions being asked of the model.

### B. The Individual Tax Model

The largest model used by the Joint Committee staff is the Individual Tax model. This model is a microsimulation model based on a stratified sample of individual tax returns filed with the IRS. A tax model simulation works by applying current tax laws and parameters to each return on the sample to recreate that return's Federal individual income tax liability for a given year. The model calculates regular tax liabilities and alternative minimum tax liabilities when appropriate. In addition, the model calculates liabilities from Federal Insurance Contributions Act ("FICA") and Self-Employment Contributions Act ("SECA") taxes. The model generally assumes that taxpayers make optimal choices regarding such decisions as claiming itemized deductions or claiming credits. A proposed change in tax law is simulated by changing rules or parameters reflected by a tax proposal, each return's liability is recalculated. This produces an estimated change in liability for that proposal.

The current version of the Individual Tax model is based on the 2007 Individual and Sole Proprietorship file produced by SOI. The stratified sample contains approximately 336,000 individual tax returns that, when weighted, represent the 153.6 million individual tax returns filed with the IRS.

Each record in the sample contains nearly all of the information from a return's Form 1040 and any accompanying forms and schedules. Added to each record are several additional data items. The year-of-birth and gender for each taxpayer and dependent is obtained from an exact match to data from the Social Security Administration. The staff augments the data with exact links to several information return types. The most important of these links is to W-2 Information Returns. In addition to W-2s, the Individual Tax model contains Social Security benefits received by individuals from an exact link to SSA-1099 and RRB-1099 Information Returns. Information on IRA accounts is obtained from links to 5498 Information Returns. Links to other information return types are possible and are performed when needed.

The Individual Tax model contains, through statistical imputations, several additional pieces of information. The tax data are augmented with statistically matched data from the Current Population Survey ("CPS") collected by the Bureau of the Census, as well as the

household portion of the Medical Expenditure Panel Survey ("MEPS").[11] In particular, the statistical match to the MEPS provides data on health insurance coverage. The match to the CPS provides data on income or benefits from non-taxable sources and other demographic information. In addition, non-filers are imputed to the model using data from various information returns (*e.g.*, W2s, 1099-INTs) that are filed with the IRS but are not associated with an individual income tax return. Statistical imputations based on other tax records are also used to impute information which appears on only some individuals' tax returns. For example, itemized expenses only appear on returns that claimed itemized deductions on Schedule A, and these expenses are imputed to non-itemizers. The staff also imputes expenses for higher education and amounts for IRA contributions that would be made under alternative limits. Finally, the data (tax and non-tax) are extrapolated to reflect forecasted income and expenses during the budget period (currently 2012 to 2021).

The estimation of a proposed change in Federal individual income taxes usually starts with the Individual Tax model. Proposed changes in tax parameters or changes to the tax code are incorporated in the Individual Tax model's calculators. The tax calculators are able to trace through the complex rules and interactions of the tax code to produce a "static" change in Federal income tax liability for each return on the model. If, under the proposed changes, an itemizing taxpayer finds he would be better off by claiming a standard deduction, the Individual Tax model will switch that itemizer into a non-itemizer. If the proposed changes cause some taxpayers to become subject to the alternative minimum tax ("AMT"), then the Individual Tax model will add the appropriate amount of AMT liabilities to those taxpayers. The economist will then make adjustments to the Individual Tax model or results from the model to account for the expected behavioral responses of taxpayers. Finally, the economist will convert the estimated changes in calendar year liabilities produced by the model into potential changes in fiscal year receipts.

### C. The Corporate Tax Model

The Corporate Tax model is a microsimulation model that models taxable income, income tax liability, tax credits, and the alternative minimum tax for all corporations. The data used in the model are derived from the SOI corporate files that include information from all types of corporate income tax filings including S corporations, regulated investment companies ("RICs") and real estate investment trusts ("REITs"). The sample is a stratified sample statistically derived to represent the overall corporate sector when weighted. The sampling rate increases with asset size and reaches 100 percent for corporations with assets in excess of $10

[11] The MEPS data are also collected by the Bureau of the Census. Tax proposals often require information about the population that is not reported on tax returns. For example, to estimate a tax proposal designed to enhance health insurance coverage would require information on health insurance currently being purchased or obtained. One common method for dealing with this "missing" information is statistical matching. This procedure involves taking records on the base data file (*e.g.*, the sample of tax returns) and statistically linking or matching them to records on another data file that contains the desired information (*e.g.*, MEPS data). The income and demographic information common to both files is used to do the linking.

million. The current sample size is approximately 105,000 returns and is drawn from returns filed for 2008.

The Corporate Tax model is similar in design and structure to the Individual Tax model. The model simulates the corporate income tax by calculating present law and proposed law corporate liabilities across a sample of tax returns. Unlike the Individual Tax model, the Corporate Tax model can be run on either a full cross-section of sampled returns or on a panel of corporate returns for any combination of tax years from the period 1987 to 2008.[12] The panel aspect of the model is important for capturing the inter-temporal nature of the corporate income tax. For example, the panel model can capture amounts of net operating losses that are carried forward or carried back across multiple years and the interaction with other tax provisions in the effected years.

Many changes that affect corporate taxation also affect other forms of business entities. For example, changes in depreciation rules can affect all forms of business. As a result, the Corporate Tax model is supplemented with a variety of modules and databases. The supplemental sources include a depreciation model, a file of partnership returns, and data sets on sole proprietors and farmers.

Revenue estimates based on Corporate Tax model simulations include behavioral effects. The behavioral effects include possible changes in: (1) corporate dividends and retained earnings; (2) the corporate capital structure; (3) corporate equity valuations; (4) repatriations of deferred foreign income; and (5) business entity choice. In the broader context of tax reform, these behavioral changes will fluctuate as the tax base is modified and the relation between individual and corporate tax rates changes. In all cases, the behavioral effects are estimated within the fixed GNP constraint.

### D. The Estate and Gift Tax Model

The Estate and Gift Tax model consists of an estate tax calculator applied to a sample of estate and gift tax returns. The estate and gift tax returns, provided by SOI, represent the population of those returns filed in 2008 and 2009, respectively. The estate tax returns report primarily on estates of decedents who died during 2006 and 2007; the gift tax returns report primarily on gifts given in 2008. The returns are adjusted each year in the budget period to track demographic profiles and wealth targets for the expected estate tax filing population. The stratified sample contains approximately 12,000 estate tax returns that, when weighted, represent the approximately 38,000 estate tax returns filed with the IRS in their 2008 processing year. Each record in the sample contains nearly all of the items reported on the estate tax return. The approximately 7,000 gift returns in the current sample represent about 235,000 gift tax returns filed in 2009.

[12] The results from a corporate panel simulation are extrapolated to reflect forecasted amounts for the current budget period (2012 to 2021).

As with the Individual Tax model, the Estate and Gift Tax calculator produces "static" changes in the tax liability of each return on the model. The economist will make adjustments to the model to incorporate the expected behavioral responses of the taxpayers. For example, in analyzing a proposal to provide a preferential estate tax rate to certain types of assets, the economist accounts for the potential of taxpayers to shift their wealth into these tax-favored assets.

## E. Additional Models

### 1. Individual panel model

To facilitate estimating certain inter-temporal aspects of individual tax laws and changes to those laws, the Joint Committee staff uses an individual income tax panel model. The current model consists of a panel of tax returns from 1999 to 2008 developed by SOI. The panel started with approximately 83,000 non-dependent returns filed for tax year 1999. SOI then sought to capture the individual tax returns, if any, filed by these same taxpayers in 2000 and in every subsequent tax year through 2008. SOI has started to build a new panel of individual tax returns beginning with the 2007 tax year.

### 2. Excise tax models

The Joint Committee staff develops separate models of the markets that may be affected by various excise tax proposals. Among present law Federal excise taxes are excise taxes on tobacco products, alcoholic beverages, motor fuels, and air transportation services. Virtually all of the models start from information regarding actual Federal receipts. These models include behavioral parameters to account for consumer behavior that may arise from the changes in market prices that changes in excise taxes may engender. The values for each parameter are specified differentially between the short-term, covering the first few months or years after the tax change is effective, and the long-term, concerned with later years.

Where appropriate, the staff of the Joint Committee supplements the basic Federal excise tax receipts information with data for both historical periods and for future years from Federal agencies, especially the Energy Information Administration; the Congressional Budget Office; trade associations; and special industry studies provided by outside analysts. The special studies are usually conducted either as part of an annual or periodic activity, or, on occasion, as a one-time exercise at the request of the Joint Committee.

### 3. Energy, other models

The Joint Committee staff relies on several simulation models to analyze the revenue impacts of energy proposals. These models are generally based on detailed tax information from SOI that includes individual and corporate data. The models generally incorporate estimates of the impact of the proposal on the cost of capital, the potential shifting of investment between competing technologies, or changes in consumer demand due to tax incentives.

Other models the Joint Committee staff relies upon include the National Energy Model System ("NEMS") maintained by the Department of Energy Information Administration ("EIA"). Results of these models are used to develop baseline estimates of renewable electricity

generating capacity and production, investment in distributed generation technology (such as microturbines and combined heat and power systems), and sales of alternative fuel vehicles. In addition, simulation results from NEMS are often used in determining the impact of proposals such as the extension of the Internal Revenue Code Section 45 renewable electricity production tax credit. The Joint Committee staff also incorporates information produced by models at the Environmental Protection Agency and the Congressional Budget Office. For example, carbon price variables are instrumental in Joint Committee staff models used to determine the indirect tax effects of climate change proposals.

## III. MACROECONOMIC MODELING

### A. Overview

The Joint Committee staff is required by House Rule XIII(3)(h)(2) to provide a macroeconomic impact analysis of all tax legislation reported by the Ways and Means Committee. For many tax bills, the expected macroeconomic effects are so small that a brief statement is all that is required. But some legislation requires more detailed analysis. The Joint Committee staff has invested a considerable amount of time and effort in developing a capacity to analyze the macroeconomic effects of major tax proposals. In order to account for the sensitivity of the analysis to different modeling assumptions, and different modeling frameworks, the Joint Committee staff has used several different models to simulate the macroeconomic effects of changes to tax policy. The Joint Committee staff contracts for the use of two econometric models to inform our analysis, in particular, of short-run economic responses: Macroeconomic Advisers and IHS Global Insight. In addition, the Joint Committee staff has used three different general equilibrium models: the Joint Committee macroeconomic equilibrium growth model ("MEG"), an overlapping generations model ("OLG"),[13] and a dynamic stochastic general equilibrium growth model with infinitely lived agents ("DSGE").

### B. Macroeconomic Growth Model ("MEG")

The MEG model is based on the standard, neoclassical assumption that the amount of output is determined by the availability of labor and capital, and in the long run, prices adjust so that demand equals supply. Individuals are assumed to make decisions based on observed characteristics of the economy, including current period wages, prices, interest rates, tax rates, and government spending levels. Consumption in MEG is determined according to the life-cycle theory, which implies that individuals attempt to even out their consumption patterns during their lifetimes. Business production and housing production are modeled separately, and may substitute for each other. The model is an open economy model, allowing international capital flows to affect investment and net exports to affect U.S. consumption. Key behavioral parameters in the MEG model are the elasticity of labor supply in response to the after-tax wage rate, the elasticity of household saving to changes in the after-tax return to saving, and the elasticity of investment to changes in the user cost of capital.

The supply of labor to the economy over time is determined by the size of the working age population and that population's willingness to work in response to changes in after-tax wages. Population and age profile projections are calibrated to the Census Bureau middle-series projections. Labor supply responses are separately modeled for four different groups: high-income primary and secondary earners, and low-income primary and secondary earners. Projected Federal government expenditures on the two largest transfer payment programs, Social Security and Medicare, are calibrated to be between the low and intermediate projections in the

[13] The Joint Committee staff currently leases a version of this model from Tax Policy Advisors, LLC.

Congressional Budget Office forecast in the most recent edition of *The Long-Term Budget Outlook*.

Individuals in the MEG model do not anticipate changes in the economy or government finances; thus, this type of model is often referred to as a "myopic" behavior model. This feature of the MEG model allows the simulation of tax and government expenditure policy that may result in an unsustainable growth path. Specifically, policies that result in the Federal debt increasing or decreasing at a faster rate than the growth of GNP can be modeled. This feature allows the MEG model to incorporate in its simulations a baseline fiscal policy that is consistent with present law for periods beyond the 10-year budget planning period.

### C. Overlapping Generations Model ("OLG")

In the OLG model, individuals are assumed to make consumption and labor supply decisions in order to maximize their lifetime well-being given the resources they anticipate will be available to them. They are assumed to have complete information, or "perfect foresight," about economic conditions, such as wages, prices, interest rates, tax rates, and government spending, over their lifetimes. The economic decisions are modeled separately for each of 55 adult-age cohorts. As in the MEG model, key behavioral parameters in the OLG model are the elasticity of labor supply in response to the after-tax wage rate, the elasticity of household saving, the after-tax return to saving, and the elasticity of investment to changes in the user cost of capital. Because the OLG model is a 55-generation, forward-looking model, another key behavioral parameter is the sensitivity of individuals to expected future after-tax rates of return.

The OLG model has separate production sectors for business and housing. This feature allows for an analysis of the effects of the different policies on the allocation of investment between housing and business. Unlike the MEG model, the OLG model assumes that prices adjust to any changes in economic conditions (such as a change in fiscal policy) so that supply equals demand in every period and resources are always fully utilized, after accounting for the cost of adjusting the capital stock. Therefore, the model does not allow for unemployment, but does account for adjustment costs that would be related to changes in the rate of investment and the movement of assets between sectors during the transition. There is no explicit modeling of international trade in goods and services, but international capital flows are modeled through interest rate adjustments.

In general, the overlapping generations and perfect foresight features of the OLG model make it difficult to model changing age profiles of the population and a fluctuating path of Federal government debt, or long-run fiscal instability created by the rapid growth in Federal government debt. Therefore, the OLG model simulations do not incorporate a long-run increase in government debt due to policy changes, as the MEG model simulations do. The estimating baseline and proposals must be modeled as following long-run sustainable fiscal paths. That is, over time government debt cannot grow faster than GDP, as that would result in unsustainable crowding out of private economic activity.

Currently, this requires making counter-factual assumptions about both current law and some proposals.

### D. Dynamic Stochastic General Equilibrium Growth Model ("DSGE")

The DSGE model has microeconomic foundations, based on the neoclassical growth framework. Similar to the OLG model, the DSGE model assumes that the economy operates at full employment each period, and therefore it does not model involuntary unemployment or the effects of policy on unemployment. In contrast to the MEG and OLG models, in the DSGE model, the amount of foresight people have about future fiscal policy can vary; foresight may be myopic or perfect, or somewhere in between. The model is a closed, real economy. That is, the model does forecast inflation and there is no international trade or cross-border investment.

The model distinguishes between two types of people: those who save ("savers") and those who do not ("spenders"). Savers decide how much to save by optimizing their consumption utility over time subject to a budget constraint. They own the entire capital stock of the economy and also hold government debt. Spenders consume all disposable income each period; they do not own capital and therefore cannot lend capital. In equilibrium, neither savers nor spenders borrow to finance consumption or investment. Generally consistent with empirical evidence, spenders are assumed to be those in the lower portion of the income distribution. The Joint Committee staff assumes in the model that spenders are those in the bottom 40th percentile of filers with positive labor income. This partitioning between spenders and savers allows for an analysis of the differential effects of proposals on relatively low- and high-increase income households.

Government in the model can operate at permanently increasing debt levels due to a tax cut as long as the economy grows at a faster rate than the debt, thus maintaining fiscal solvency.

The model has one production sector; no distinction is made between residential capital and production capital. There is one effective capital income tax rate, which is computed as the income-weighted average of effective tax rates on income from corporate and non-corporate capital as derived from the Joint Committee staff individual income tax and corporate income tax microsimulation models. As with the OLG model, the DSGE model requires the assumption of long-run fiscal stability in both the baseline and the proposal in order to complete a simulation that will produce analytic results.

## APPPENDIX: SELECTED REFERENCES AND BIBLIOGRAPHY OF DOCUMENTS PUBLISHED BY THE STAFF OF THE JOINT COMMITTEE ON TAXATION

### A. Conventional Analysis[14]


*The JCT Revenue Estimating Process,* January 19, 2011.

*Modeling the Federal Revenue Effects of Proposed Changes in Cigarette Excise Taxes* (JCX-101-07), October 19, 2007.

*Estimating the Revenue Effects of the Administration's Fiscal Year 2008 Proposal Providing a Standard Deduction for Health Insurance: Modeling and Assumptions,* (JCX-17-07), March 20, 2007.

*Background Information about the Dynamic Stochastic General Equilibrium Model Used by the Staff of the Joint Committee on Taxation in the Macroeconomic Analysis of Tax Policy* (JCX-52-06), December 14, 2006.

*Overview of Revenue Estimating Procedures and Methodologies Used by the Staff of the Joint Committee on Taxation* (JCX-1-05), February 5, 2005.

*Written Testimony of the Staff of the Joint Committee on Taxation at a Hearing of the Subcommittee on Oversight of the House Committee on Ways and Means Concerning Modeling the Economic Effects of Changes in Tax Policy* (JCX-36-02), May 6, 2002.

*Written Testimony of the Staff of the Joint Committee on Taxation Regarding the Revenue Estimating Process for the Joint Hearing of the House and Senate Budget Committees of the 104th Congress on January 10, 1995* (JCX-1-95), January 10, 1995.

*Methodology and Issues in the Revenue Estimating Process* (JCX-2-95), January 23, 1995.

*Discussion of Revenue Estimation Methodology and Process* **(**JCS-14-92), August 13, 1992.

*Explanation of Methodology Used to Estimate Proposals Affecting the Taxation of Income from Capital Gains* (JCS-12-90), March 27, 1990.

*Statement of Ronald A. Pearlman Chief of Staff Joint Committee on Taxation before the Senate Committee on Finance,* March 14, 1989 (JCX-3-89), March 14, 1989.


[14] These documents can be found on the Joint Committee on Taxation website at www.jct.gov. Click on the "Revenue Estimating Methodology" tab.

## B. Macroeconomic Modeling[15]

"Macroeconomic Analysis of H.R. 3200, the America's Affordable Health Choices Act of 2009,'" Excerpt from *House Report 111-299, Part 2*, October 14, 2009, 530-538.

"Macroeconomic Analysis of H.R. 598, the American Recovery and Reinvestment Tax Act of 2009,'" Excerpt from *House Report 111-8, Part 1*, January 27, 2009, 234-240.

*Macroeconomic Analysis of a Proposal to Broaden the Individual Income Tax Base and Lower Individual Income Tax Rates* (JCX-53-06), December 14, 2006.

*Background Information about the Dynamic Stochastic General Equilibrium Model Used by the Staff of the Joint Committee on Taxation in the Macroeconomic Analysis of Tax Policy* (JCX-52-06), December 14, 2006.

*Exploring Issues in the Development of Macroeconomic Models for Use in Tax Policy Analysis* (JCX-19-06), June 16, 2006.

*Macroeconomic Analysis of Various Proposals to Provide $500 Billion in Tax Relief* (JCX-4-05), March 1, 2005.

*Overview of the 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.

"Macroeconomic Analysis of H.R. 2, the 'Jobs and Growth Reconciliation tax Act of 2003,' Prepared by the Staff of the Joint Committee on Taxation," *Congressional Record*, May 8, 2003, H3829-32.

*Joint Committee on Taxation Tax Modeling Project and 1997 Symposium Papers* (JCS-21-97), November 30, 1997.

[15] These documents can be found on the Joint Committee on Taxation website at www.jct.gov. Click on the "Macroeconomics" tab.

## C. Documents Relating to Modeling Published in Academic Journals or by Research Organizations and Authored in Whole or Part by Joint Committee Staff


Altshuler, Rosanne, Nicholas Bull, John Diamond, Tim Dowd, and Pamela Moomau, "The Role of Dynamic Scoring in the Federal Budget Process: Closing the Gap between Theory and Practice," *American Economic Review* volume 95, number 2, May 2005, 432-436.

Auerbach, David, J., Janet Holtzblatt, Paul Jacobs, Alexandra Minicozzi, Pamela Moomau, and Chapin White, "Will Health Insurance Mandates Increase Coverage? Synthesizing Perspectives from Health Tax, and Behavioral Economics," *National Tax Journal*, Volume LXIII, number 4, December 2010, 659-679.

Bull, Nicholas, and Timothy Dowd, "Use of Fiscal Policy Reaction Function in Analyzing the Macroeconomic Effects of Tax Policy," *National Tax Journal*, Volume LVIII, number 3, September 2005, 373-390.

Bull, Nicholas, and Timothy Dowd, "Long-Run Tax Rates and Long-Run Growth: Macroeconomic Effects of the Aging Baby Boomers and of the Changing Federal Tax System," *National Tax Journal*, Volume LIX, number 3, September 2006, 359-368.

Bull, Nicholas, Timothy Dowd, and Pamela Moomau, "Corporate Tax Reform: A Macroeconomic Perspective," *National Tax Journal*, forthcoming December 2011.

Cook, Eric W. and John F. O'Hare, "Issues Relating to the Taxation of Capital Gains," *National Tax Journal*, Volume XL, number 3, September 1987, 473-488.

Diamond, John W. and Pamela H. Moomau, "Issues Analyzing the Macroeconomic Effects of Tax Policy," *National Tax Journal*, Volume LVI, number 3, September, 2003, 447-462.

Dowd, Timothy, "Distinguishing Between Short-Term and Long-Term Recipients of the Earned Income Credit," *National Tax Journal*, Volume, LVIII, number 4, December 2005, 807-828.

Driessen, Patrick A., "Net Imports and the U.S. Corporate Tax Base," *National Tax Journal*, Volume XLIV, number 3, September 1991, 315-324.

Koenig, Gary and Harvey, Robert, "Utilization of the Saver's Credit: An Analysis of the First Year," *National Tax Journal*, Volume, LVIII, number 4, December, 2005, 787-806.

Leeper, Eric M., and Shu-Chun Susan Yang, "Dynamic Scoring: Alternative Financing Schemes," National Bureau of Economic Research, Working Paper, No. 12103, March, 2006.