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

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I. INTRODUCTION

My name is Lindy Paull. As Chief of Staff of the Joint Committee on Taxation, it is my pleasure to present the testimony of the Joint Committee on Taxation ("Joint Committee") staff at this hearing of the Subcommittee on Oversight concerning modeling the economic effects of changes in tax policy.[1]

Under the Congressional Budget and Impoundment Control Act of 1974, the revenue estimates of the Joint Committee are required to be used for purposes of all revenue legislation that is considered or enacted by the Congress. To satisfy this requirement, the Joint Committee staff prepares estimates for Members of Congress on the effects of revenue proposals on budget receipts. These estimates help Members determine whether specific legislation fits within targets set during the budget resolution process.

[1] This document may be cited as follows: Joint Committee on Taxation, *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.

The Joint Committee staff is constantly reviewing and updating the models used to prepare revenue estimates. In addition, since 1995, the Joint Committee staff has been engaged in ongoing and extensive efforts to improve the Joint Committee's revenue estimating capabilities by evaluating the feasibility of incorporating, to the extent appropriate, the macroeconomic effects of tax legislation.[2] Three Joint Committee staff economists have devoted significant amounts of their time to this effort. The Joint Committee staff has utilized the services of economic consultants with macroeconomic expertise. Significant progress has been made, but significant work remains to be done.

This testimony provides a brief overview of the Joint Committee revenue estimating process and discusses the status of the Joint Committee staff's investigation of the possible role of macroeconomic feedback analysis in revenue estimating. This discussion includes a summary of the Joint Committee staff's past research efforts, a description of the macroeconomic models that the Joint Committee staff is currently using, a discussion of the strengths and weaknesses in the current state of the art of macroeconomic analysis, and a description of the Joint Committee staff's plans for future work on macroeconomic analysis.

II. OVERVIEW OF THE REVENUE ESTIMATING PROCESS

In general

Revenue estimates measure the anticipated changes in Federal receipts that result from proposed legislative changes to the Federal tax laws (or other Federal laws). A revenue estimate is simply the measure of revenue projected to be collected if a particular legislative change is enacted compared to the revenue that is projected to be collected under present law. The starting point for a revenue estimate is the estimate of the receipts generated by the affected tax provisions under present law. Estimates of present-law receipts are based on the macroeconomic aggregates and growth rates projected by the Congressional Budget Office ("CBO") as part of its budget forecasts. Estimates of projected revenues under a proposal are calculated based on assumptions about (1) the changes in tax liability intended to occur under the proposal, and (2) likely taxpayer responses to these tax liability changes.

Proposals for which the Joint Committee staff prepares revenue estimates range from those affecting broad groups of taxpayers (e.g., proposals to reduce all individual income tax rates or to provide a tax credit for minor children) to those affecting a narrow class of taxpayers (e.g., proposals to change the excise tax on bows and arrows or to exclude parsonage allowances from gross income). For most estimates of broad proposals, the Joint Committee staff uses large computerized models of the Federal income tax system and the economy. The primary data source for most models is samples of the tax returns filed by individuals, partnerships, corporations, and fiduciaries compiled by the Internal Revenue Service ("IRS") Statistics of Income Division. The models combine the most recently available taxpayer information with forecasts of the aggregate level of national income provided by the CBO. For estimates of

[2] Attachment A to this testimony provides a listing of Joint Committee publications that address issues relating to the revenue estimating process, including publications prior to 1995.

narrow proposals, the Joint Committee staff creates more targeted models based on data from a variety of surveys and other sources.

Efforts to improve the revenue estimating process are guided by certain principles. First, the revenue estimating process should consistently produce accurate estimates on which Members of Congress can rely in making legislative decisions. Second, the revenue estimating process must be viewed as fair and impartial. Third, revenue estimating methodologies should be improved whenever possible to enhance the accuracy of the work product.

History of revenue estimating process

Although the basic formula by which a revenue estimate is calculated has not changed over time, the process of preparing revenue estimates undergoes frequent changes and improvements. These changes and improvements have enabled the Joint Committee staff to produce more accurate and timely estimates of proposals for Members of Congress.

In the mid-1970s, the Joint Committee staff employed 5 economists who were responsible for preparing revenue estimates of all tax legislation; only 2 of these economists had computer training. The Joint Committee bought computer time from the Treasury Department and the Department of Commerce. Most of the revenue estimates prepared by the Joint Committee staff were done on adding machines.

In 1986, when the Congress was considering the Tax Reform Act, the Joint Committee staff relied on a Treasury Department mainframe computer to do large individual tax model runs. A model run to calculate a revenue estimate for a proposal for one year took more than one hour and out year effects were then calculated manually. During 1986, the Joint Committee staff responded to 474 revenue estimate requests.

In 2001-2002, the Joint Committee staff employs 20 professionals involved in preparing revenue estimates: 15 Ph.D. level economists, 3 computer specialists, and 2 statistical analysts. The Joint Committee staff has its own mainframe computer to do individual tax model runs yielding results for each year in the 10-year budget period. Each run can now be completed in less than 3 minutes and multiple runs take advantage of economies to shorten the average time per run. Each Joint Committee staff economist has a desktop computer that is more powerful than the large mainframe computers used in 1986. In 2001, the Joint Committee staff responded to 4,491 revenue estimate requests.

In addition to these tangible measures of improvements in the revenue estimating process, the Joint Committee staff incorporates methodological and technological advances in the study of economics and public finance to further improve the reliability of its revenue estimates. For example, the Joint Committee staff has improved its individual tax model by using a new extrapolation technique based on linear programming that allows for a more precise targeting of future levels of specific variables. This improvement gives the Joint Committee staff better ability to match present-law baseline projections provided by the CBO, which is especially useful in analyzing the out-year effects of a proposal.

Behavioral effects

The extent to which behavioral effects are taken into account in calculating the revenue effects of proposed tax legislation seems to cause the greatest confusion concerning the revenue estimating process. Commentators from time to time incorrectly argue that revenue estimates under existing methodologies are static and fail to incorporate behavioral effects. It is important to understand the differences between the significant behavioral effects that are taken into account under the current revenue estimating methodologies employed by the Joint Committee staff and potential macroeconomic effects.

One of the most significant elements of Joint Committee staff revenue estimates is the assumed effect of a proposal on taxpayer behavior. In general, a revenue estimate prepared for any proposal that changes the treatment of an item of expense or income, or the rate of tax on certain types of income or consumption, will incorporate behavioral effects. For example, some of the common behavioral effects include the following: excise tax increases are assumed to result in lower sales of the taxed items; a reduction in the taxation of sales of capital assets is assumed to increase capital gains realizations; temporary tax cuts are assumed to accelerate some affected taxable transactions; temporary tax increases are assumed to delay some affected taxable transactions; and changes in individual income tax rates are assumed to affect portfolio management decisions. The estimates may also assume that employment and investment may shift among sectors or industries, depending on the nature of the tax proposal. In this sense, Joint Committee revenue estimates are not static, but incorporate many microeconomic behavioral effects. However, under existing revenue estimating methodologies, revenue estimates do not incorporate possible effects of tax law changes on economic aggregates such as gross domestic product and gross national product (i.e., macroeconomic effects).

III. MACROECONOMIC EFFECTS OF TAX LAW CHANGES

It is generally agreed that certain major tax proposals, such as a proposal to eliminate the Federal income tax and replace it with a consumption tax, would not only affect Federal tax receipts, but would also affect certain macroeconomic aggregates, such as gross domestic product. Certain changes in tax policy may be expected, and in some cases may be designed, to affect the strength or growth of the national economy. For such proposals, a standard revenue estimate may not convey the complete picture of the long-term budgetary impacts of the proposal. The Joint Committee staff has been working to analyze the feasibility of incorporating both the long-term growth and short-term cyclical effects of such proposals so that additional analysis of potential macroeconomic effects can be provided along with the revenue estimates of these proposals.

A. History of Joint Committee Staff Work on Macroeconomic Modeling

In January 1995, the Joint Committee staff testified before a joint hearing of the House and Senate Budget Committees on the revenue estimating process. In that testimony,[3] the Joint Committee staff discussed some of the issues that arise in considering whether to modify the revenue estimating methodology to take into account macroeconomic effects. The consensus of

[3] Joint Committee on Taxation, *Written Testimony of the Staff of the Joint Committee on Taxation Regarding the Revenue Estimating Process* (JCX-1-95), January 9, 1995.

the expert economists who testified at the hearing was that economists had not yet developed models of the economy that could predict the timing and magnitude of macroeconomic effects with sufficient accuracy to justify including them in revenue estimates.

In 1996, the Joint Committee staff convened a group of macroeconomic modelers who had used forecasting or simulation models of the U.S. economy 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 sources of variation in their predictions, as well as the strengths of each type of model. This 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 results spanned a wide range of outcomes. They were made public in a symposium held in January 1997.[4]

All of the models used in the 1996 study projected that tax restructuring in the form of a consumption tax ultimately would produce higher economic growth. However, the models produced considerable variation in the magnitude and time path of the growth effects. The variations in the responses arose from both major structural differences in the models and from differences in assumptions about key behavioral parameters.

Some significant factors that explained the differences in modeling results were attributable to assumptions about the strength of behavioral responses to tax incentives, the operations of international financial markets, and the actions of the Federal Reserve Board. Each of these factors significantly influenced the outcomes predicted by the different models. Several less obvious, but equally important factors, also contributed to the differences in model predictions. Because the present-law tax Code is quite complex, the modeling of the present-law tax system was quite different among the models. As a result, the estimation of the 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, 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. Finally, each variation in the tax reform proposal being analyzed required weeks of new modeling effort to accommodate a reasonably accurate representation of that change.

Since the 1997 symposium, the Joint Committee staff (1) has worked to develop a model that could 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 (the model is discussed in more detail below); (2) has conducted a review of existing empirical studies that have estimated the size of behavioral responses to tax policy changes; and (3) is in the process of testing the basic structure and performance of the Joint Committee staff model.

The significant challenge in developing a macroeconomic model is to keep the solution mechanisms of the basic macroeconomic model flexible enough to allow for the analysis of

[4] The models, the proposals, and the 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.

several versions of a tax proposal without major recalibration of the model. In addition, the model must be capable of utilizing input from the Joint Committee microsimulation tax models to provide the necessary detail to simulate tax policy proposals within the macroeconomic models. As explained below, the Joint Committee staff has devoted much effort to creating analytic links between Joint Committee microsimulation tax models and the Joint Committee macroeconomic model.

The Joint Committee staff review of existing empirical studies has focused in particular on studies that provide behavioral information about specific types of taxpayers, so that appropriate behavioral assumptions can be applied to each group. The two main growth-related responses that have been estimated by multiple studies, and that are explicitly built into the Joint Committee macroeconomic model, are the decisions by individuals to work more or less, and the decisions by businesses to invest more or less in response to changes in tax policy. In addition, the decision to consume or save, which affects both short-run demand fluctuations and long-term capital growth, is an important behavioral parameter that has been the subject of much study. The Joint Committee staff has attempted to identify near-consensus assumptions and to use those in its modeling efforts.

Finally, the Joint Committee staff has been testing the basic structure and performance of the Joint Committee macroeconomic model by simulating different large tax policy changes, varying key underlying solution equations and behavioral assumptions, and analyzing the results for internal inconsistencies and sensitivity to different assumptions. Several important issues remain to be addressed including the appropriate modeling of the policy of the Federal Reserve Board and international capital flows. These two issues can cause large swings in short-run economic activity and, therefore, the uncertainties surrounding their appropriate treatment lead to a high level of uncertainty in short-run forecasts.

B. Description of Macroeconomic Models Available to the Joint Committee Staff

The Joint Committee staff is developing an in-house model for use in analyzing the macroeconomic effects of tax proposals. This model, the macroeconomic equilibrium growth ("MEG") model, is a computational equilibrium model with neoclassical foundations that can be used to analyze both long-run growth effects and short-run disequilibrium adjustments resulting from proposed tax changes. The Joint Committee staff also subscribes to two commercially marketed econometric models and has access to an intertemporal general equilibrium model with overlapping generations and forward looking agents.[5]

It is important to note that each of the models described below is well designed to examine a set of the issues that are critical to understanding the effects of tax policy changes, but none of the models is designed to address all of the issues that arise in the macroeconomic analysis of tax policy changes. For this reason, the Joint Committee staff employs a variety of

[5] These models are the Washington University Macroeconomic Model ("WUMM"), provided by Macroeconomic Advisers, Inc, and the DRI econometric model, formerly provided by Standard and Poors, Inc., but now provided by Global Insight Inc.

models to gain an understanding of the contributions and limits of current state of the art macroeconomic modeling in tax policy analysis.

Macroeconomic Equilibrium Growth ("MEG") Model

The MEG model has been developed with the help of an outside contractor. 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; and (3) a flexible structure that facilitates running simulations in several different equilibrium modes and to allow short-run disequilibrium adjustments in response to changes in fiscal policy.

Labor supply is determined by taxpayer responses to changes in the average and marginal after-tax wage rates, and by general demographic trends. Capital resources are determined by the stock of undepreciated capital from previous periods plus investment in the current period. Total investment is determined by the responses of domestic savings and international capital flows to tax changes. The amount of domestic investment in the current period is responsive to proposed tax changes through the effect of the changes on the after-tax rate of return on investment. The amount of international investment is responsive to changes in demand for imports. The Joint Committee staff uses its microsimulation individual and corporate income tax models to determine the effects of a tax proposal on changes in effective and marginal tax rates on the following sources of income: wages, dividends, interest, rent, and capital gains. This information is used as input into the behavioral equations in the MEG model. Behavioral parameters in these equations are drawn from empirical economic literature.

The MEG model is designed to simulate the transition path to the long run equilibrium in the economy using several different solution methods. Equilibrium solution methods require that all markets clear during each period in the transition from the initial steady state to the new long run steady state. Equilibrium solutions for simulations of changes in tax policy require mechanisms to negate any changes in aggregate demand that the tax change could be expected to stimulate. One such mechanism is to model an "omniscient" Federal Reserve monetary policy, which changes interest rates each period to offset changes in demand. Another such mechanism is to balance any net change in tax revenues with an offsetting lump sum change in government expenditure (set at levels designed to neutralize the "balanced budget" multiplier effect). These two equilibrium approaches yield different implications for the interim growth effects of a given tax proposal. A third approach requires the model to use "potential" output rather than actual output in deriving investment responses to tax changes, which mitigates the short-run disequilibrium movements of variables in the model, and thus can be used to isolate supply side growth effects.

The MEG model can also simulate the transition path to the new long run equilibrium using a short run disequilibrium system that converges to a long run equilibrium that is consistent with neoclassical growth theory. A lag structure is in place for most of the behavioral decisions so that movements toward desired levels of investment, labor supply, and output take place over periods of several quarters. Several different Federal Reserve monetary reaction functions can be incorporated into these disequilibrium simulations. In addition to providing

information on the range of short run responses the economy may have to specific tax proposals, this analytic framework is useful for comparing MEG results to results from commercial econometric models.

As part of the Joint Committee's ongoing work to refine the MEG model, the Joint Committee staff has used the model to simulate the effects of various tax proposals to analyze the model's performance. These simulations have revealed areas in which the model has needed substantial alteration. As a result, the MEG model is still in development in a number of areas. The Joint Committee staff is in the process of expanding the number of labor supply and investment income equations in the MEG model in order to improve the linkages between this model and the detailed microsimulation models used by the Joint Committee staff. Measures of taxpayer response to tax changes within the MEG model continue to be the subject of substantial scrutiny and ongoing research. There is also substantial uncertainty as to the appropriate modeling of monetary policy of the Federal Reserve Board and the likely responsiveness of international capital markets to U.S. tax changes.

Intertemporal model

The Joint Committee staff has access to an intertemporal general equilibrium model with forward looking agents (that is, consumers and firm managers who make decisions based on their expectations about the future). Individual behavior is modeled using an overlapping generations framework that consists of fifty-five cohorts, denoted by ages that range from zero to 54, as the model's individual life span is known (with certainty) to be 55 years. Each generation is represented by a single individual, who has an economic life span of fifty-five years, works for the first forty-five of those years, and is retired for the last ten. Consistent with the life-cycle theory, the model assumes that individuals borrow money in the early years of life, pay back their debts and save for retirement in their prime working years, and draw down their savings during retirement. Under this theory, an individual's lifetime consumption path is flatter than his lifetime earnings pattern. In addition, the model includes the following features: tax deferred savings, a simple bequest motive, a model of the Social Security system, payroll taxes, and progressive tax rates on wages. The income tax is modeled as a progressive tax on labor income coupled with flat rate taxes on capital income. Capital income is taxed at flat rates on dividends, on interest, and on capital gains. The tax rate on capital gains is an effective annual accrual rate, taking into account the benefits of deferral of tax until gains are realized and tax exemption of gains transferred at death.

On the production side, the model assumes that firm managers act to maximize the value of the firm in a perfectly competitive environment in the absence of uncertainty. The approach utilized is based on Tobin's "q" theory of investment, as extended to include adjustment costs.[6] It is similar to the firm modeling approaches used by several others.[7] The economy has a single

[6] Hayashi, F., "Tobin's Marginal q and Average q: A Neoclassical Interpretation," *Econometrica 50* (1982), pp. 213-224.

[7] See, for example, Auerbach, A. and Kotlikoff, L. (1987). *Dynamic Fiscal Policy*, Cambridge, MA: Harvard University Press; and Goulder, L. and Summers, L., "Tax Policy, Asset Prices, and Growth," *39 Journal of Public Economics* (1989), pp. 265-296.

production sector in which firm values are calculated explicitly. Firms finance new investment through retained earnings, issuing debt and issuing new shares of equity. Firms pay dividends equal to constant fraction of after-tax profits net of economic depreciation, and new debt issues are a constant fraction of net investment. For tax purposes firms are allowed to depreciate capital more rapidly than the economic rate of depreciation. The model distinguishes between the present value of depreciation deductions on existing and future capital. In addition, the model includes a quadratic adjustment cost function that increases the cost of investing in and installing new capital goods.

The model assumes that the resources in the economy are fully employed in each year and therefore does not account for short-run disequilibria (i.e., cyclical movements in the economy) in the markets for labor, capital, or other goods that would occur during transition periods.

Other models

The Joint Committee staff subscribes to two commercially available macroeconomic models (WUMM and DRI) to provide a range of possible transition scenarios in analyzing the effects of proposed tax changes. The models simulate the effects of proposals assuming different Federal Reserve Board and international responses. Because of the uncertainty inherent in making such assumptions, these types of simulations are best used to provide information about the possible range of outcomes and the degree of sensitivity of the estimated ranges to the assumptions used. A general description of the WUMM model is provided in the following paragraphs. The DRI model is similar to the WUMM model.

WUMM is a large-scale structural macroeconometric model. In the long run, the equilibrium is determined by equations that are derived from neoclassical microeconomic foundations. The long-run level of output depends on prevailing tax rates since long-run output is determined by the stock of capital and labor supply and households and firms decisions depend explicitly on after-tax prices and rates of return. In the short run, the resources in the economy are less than fully employed as prices and wages adjust slowly to their equilibrium values. Model parameters and behavioral responses are estimated using post-war quarterly data.

WUMM's consumption function is based on the life-cycle theory of consumption. Consumer spending depends on the average age of the consuming population, labor income, asset income, transfer payments and net worth. Business fixed investment in equipment and structures is derived using the neoclassical theory developed by Jorgenson. The demand for capital is derived from a production function with a unitary elasticity of substitution between labor and capital. Housing demand depends on demographics, disposable income, and the user cost of housing. The real exchange rate and the relative price of domestic and foreign goods determine net exports. Government spending is exogenous except for interest payments on the national debt.

In general, the price level is modeled as a markup over smoothed labor costs. In the short run, the markup equation and the relationship between unemployment and inflation determine prices. In the short run, the real interest rate is determined by the supply and demand for money

or by a function that describes the Federal Reserve Board's monetary policy. In the long run, the real interest rate is equal to the value that equates savings and investment.

C. Issues and Problems With the Use of Macroeconomic Analysis in Revenue Estimates

While substantial progress has been made to develop a model that will assess the potential macroeconomic effects of tax law changes, difficult problems remain to be solved. In theory, the incorporation of macroeconomic feedback effects in revenue estimates would provide year-by-year estimates of changes in revenues resulting from the influence of tax policy on national economic aggregates like business profits, wages and interest rates. However, to achieve this goal would require the modeling of the effects of tax policy changes to decide on a single set of assumptions with respect to (1) the effects of short-run, or business cycle, fluctuations in the economy, (2) changes in Federal Reserve Board policies, (3) the reactions of international capital markets, and (4) budgetary scoring conventions on the expenditure side. As detailed below, these issues present significant challenges that remain to be resolved.

1. Sources of uncertainty

Effects of business cycle fluctuations

Business cycle fluctuations lend uncertainty to any attempt to measure the macroeconomic effects of a tax change. A net cut in taxes should stimulate consumption and investment in the short-run, resulting in an increase in aggregate demand. The ultimate effect of this increase in demand on the economy will depend on facts such as whether resources in the economy would otherwise be in full use at the time of the tax reduction, on the response of the Federal Reserve Board to the policy, and on the responses of international capital flows. Short-run fluctuations are also critical to accurate assessment of the effects of tax proposals on long-term growth, because of the interactions of these cyclical effects and the rate of business investment, which can affect the growth capacity of the economy for a period of years.

When the economy is doing very well, at a "peak" stage of the business cycle, virtually everyone who wants to be employed 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 a growth in 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 in both cases the increase in demand would be likely to result in a temporary increase in tax receipts for the Federal government, this 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.

Assessing whether or not the economy will be operating near a peak in the business cycle at the time a proposed tax cut is actually enacted and the tax savings in the hands of the taxpayers is a notoriously uncertain task. Because economic forecasting models generally rely most heavily on the more recent characteristics of the economy, they are not well suited to predicting the exact timing of a change in the direction of the economy.

Actions of the Federal Reserve Board and international capital flows

Another major source of uncertainty is the reaction of the Federal Reserve Board to fiscal policy changes. If the Federal Reserve Board believes there is a significant risk of inflation associated with an expansionary fiscal policy, then it may raise interest rates to reduce the risk of inflation. An increase in interest rates reduces consumer purchases of durable goods and business investment, and thus would slow the growth of the economy. In addition, since the exchange rate and the U.S. interest rate are positively related, an increase in the interest rate would reduce net exports. This occurs because an increase in the exchange rate makes U.S. goods relatively more expensive to foreigners and imports relatively cheaper to consumers in the United States. These reductions counter-act the growth effects of an expansionary fiscal policy and thus could render dynamic revenue estimates less reliable if the Federal Reserve Board's actions are not predicted accurately. Existing macroeconomic models use an array of monetary policy rules to describe the actions of the Federal Reserve Board; however, there is no way to be certain of how the Federal Reserve Board will act in the future. Furthermore, there is an unknown lag associated with monetary or fiscal policy that contributes to the uncertainty of determining how the Federal Reserve Board actions would affect the path of the economy.

It is also unclear how international capital markets will react to either a change in tax policy or a change in Federal Reserve Board policy. Some macroeconomic models assume that an increase in the returns on business investment will induce increased international as well as domestic investment, and some do not. The amount of international investment induced by a tax change can affect the amount of total investment, the size of the capital stock and net economic growth it induces. The independent actions of the Federal Reserve Board and foreign banks introduce a high degree of uncertainty in macroeconomic forecasting. It is unclear at this time that there is any way to reduce these sources of uncertainty through modeling improvements and, therefore, to make accurate year-by-year macroeconomic predictions.

Effects of changes in the Federal budget deficit on the interest rate

Conventional economic theory suggests that a relationship exists between interest rates and the size of the Federal deficit, through its potential effect on the supply of loanable funds. Specifically, conventional economic theory predicts that an increase (decrease) in the Federal budget deficit would decrease (increase) the supply of loanable funds, causing an increase (decrease) in interest rates, and thus, decrease (increase) consumer purchases of durable goods and business investment. This relationship between the size of the Federal deficit and the interest rate implies that larger budget deficits would be associated with a smaller stock of capital and a lower rate of growth in the economy. Changes in the pattern of business capital

accumulation can affect the economy's growth capacity for a sustained period of time. This effect would tend to offset positive economic growth induced by the positive behavioral incentives in some tax cuts.

However, even though this view is considered the conventional theory in the economic literature, a less widely held, but nonetheless important, view of the economy questions the validity of the conventional theory. The empirical literature on this subject fails to provide conclusive evidence supporting either view.[8] The relationship between changing Federal government deficits and the interest rate is commonly included in structural macroeconometric models that focus on short run forecasting. It is usually not included in general equilibrium simulation models, which typically assume "balanced budget" tax changes to simplify model solutions. This inconsistency between classes of models makes efforts to isolate "supply side" effects from general macroeconomic effects an important component of dynamic analysis.

Sensitivity of results to behavioral assumptions and model structure

The effects of tax policy changes on the long-term growth of the economy depend on how the tax policy affects after-tax returns to labor and capital, and on how the suppliers of this labor and capital respond to these changes. The way a model treats costs of labor and capital varies significantly across different types of models. Some models incorporate these effects through simple elasticities incorporated in labor supply, savings, and investment equations. In other models, these responses are embedded within more complex sets of equations that attempt to capture multiple feedback interactions between labor, capital, consumers, and financial markets. In either case, the results generated can vary significantly depending on the parameters selected and the functional forms and solution criteria for the equations used. While empirical studies provide some information about reasonable ranges and assumptions for some of these assumptions, there are many different views as to which approach is the "most correct."

2. Small magnitude of macroeconomic effects of most proposals

Most revenue proposals are likely to have little or no macroeconomic consequences since many of these proposals are of limited scope or represent changes that are subject to modest or offsetting influences from a macroeconomic perspective. For example, a proposal to encourage investment in a targeted area may simply shift investment away from alternative areas in the economy. Such a shift may achieve the desired effect within the targeted area, but may not have a net effect on the economy as a whole.

Revenue proposals also may be subject to opposing incentive effects. For example, a reduction in marginal tax rates will increase the after-tax return on additional labor and saving and thereby encourage additional work and savings effort. However, a reduction in marginal tax rates is typically accompanied by an increase in after-tax income as well. This "income effect" tends to work in the opposite direction from the positive incentive effects, lessening the need to work or save to achieve a desired level of consumption. The net effect depends upon the relative

[8] For more on this issue see Elmendorf, D. and Mankiw, N. Gregory, "Government Debt," *National Bureau of Economic Research Working Paper 6470* (1998).

importance of these two potentially offsetting factors and the relative sensitivity to the two factors among affected taxpayers.

Other proposals, such as cuts in capital gains taxes and accelerated depreciation, that increase the after-tax profitability of business investment, may be expected to affect the long-run growth of the economy through a build up in the amount of productive plant and equipment. However, it is likely that this capital build up will develop gradually, with most of the budgetary consequences occurring outside the near-term budget horizon. Even a ten-year forecasting period may not be long enough for the full effects of increased productivity resulting from increased capital to be fully manifested.

3. Baseline assumptions

The reference point for Joint Committee revenue estimates is the CBO ten-year projection of Federal receipts, referred to as the revenue baseline.[9] The revenue baseline serves as the benchmark for measuring the effects of proposed law changes. The baseline assumes that present law remains unchanged during the ten-year budget period. Thus, the revenue baseline is an estimate of the Federal revenues that will be collected over the next ten years in the absence of statutory changes.

The revenue baseline is based upon CBO forecasts of macroeconomic variables such as the annual rate of growth of nominal gross domestic product, inflation rates, interest rates, and employment levels.[10] For modeling purposes, a number of elements of the CBO forecast are disaggregated to match specific tax-related variables. For example, the aggregate forecast of wages and salaries paid is statistically matched to various types of taxpayers by income class.

Some argue against using the present-law revenue and expenditure baselines as the benchmark for measuring the effects of proposed law changes on the grounds that changes in revenues may have an induced effect on government spending behavior. They suggest that the effects of a proposed tax cut should be measured relative to the effects of an offsetting expenditure change, rather than relative to present law. However, the public availability of the present-law baseline is an important feature of the current revenue estimating process that may be more difficult to achieve if some other reference point were adopted; it serves as an objective and observable reference point for measuring all budget proposals, including spending proposals.

4. Budget symmetry

The argument in favor of providing macroeconomic analysis for certain revenue proposals is essentially an argument in favor of expanding the scope and accuracy of the information used in the budget process. This argument, however, is not limited either to the

[9] The revenue baseline is a component of the budget baseline prepared by the CBO, which includes expenditures as well as receipts.

[10] For a detailed discussion of the methodologies employed by the CBO to forecast Federal revenues, see Congressional Budget Office, *Description of CBO's Models and Methods for Projecting Federal Revenues,* May 2001.

revenue effects of a tax proposal, or to proposals affecting revenues. The most direct example of the desirability of including some outlay analysis is the relationship between net changes in tax revenues and Federal debt service expenses. A proposed tax increase that would result in a net reduction in the deficit would also result in a net reduction in public debt. The decrease in public debt would result in a reduction in Federal outlays to service the debt.

Many argue that direct changes in some Federal spending programs should be subjected to macroeconomic feedback analysis. A proposal that would expand the nation's infrastructure, or improve education, can have similar macroeconomic effects to revenue proposals. Providing macroeconomic analysis on the revenue side of the budget, but not developing similar analysis on the outlay side of the budget, raises the possibility of biasing the consideration of competing revenue and outlay proposals.

The capacity of macroeconomic analysis to expand the scope and accuracy of revenue analysis has been debated over a period of years and remains a subject of controversy. This controversy also applies to the feedback effects of outlay proposals. Although the general implications of certain improvements to public infrastructure on national production are clear in theory, efforts to quantify these implications are problematic.

5. Coordination with CBO baseline and budget reconciliation analysis

To the extent that macroeconomic feedback effects would eventually be incorporated into revenue estimates for budget scoring purposes, issues of consistency and coordination may arise. For example, the effects of a tax cut on changes in Federal debt service expenses may be incorporated in the reconciliation process itself, through the budget projections provided by the CBO. These net budget effects can extend beyond the mechanical change in debt service to underlying effects on national savings, interest rates, and private capital formation. This was the case, for example, in the 1997 Deficit Reduction Act, for which CBO estimated an explicit net budget effect attributed to moving the budget onto balanced budget path. The fact that the scoring of tax legislation may differ from proposal to proposal depending on the manner in which policy initiatives are considered raises possibility of including inconsistent, or double-counted general fiscal effects. In addition, it would be problematic for the scoring of revenue proposals to incorporate these short-run macroeconomic feedback effects if scoring of expenditure proposals does not include them as well. An important component of the development of Joint Committee's macroeconomic analysis of revenue proposals is coordination with CBO's budget scoring. Coordination between the Joint Committee staff and the CBO staff would be necessary.

IV. CONCLUSION

Summary of significant issues

The Joint Committee staff has made substantial progress since 1995 in the development of a macroeconomic model that would analyze the potential effects on the economy of a major change in tax policy. The Joint Committee staff has also obtained several other types of macroeconomic models to insure that a wide variety of tools would be available to analyze changes in tax policy.

An important point to keep in mind is that the vast majority of the revenue estimates produced by the Joint Committee staff each year relate to relatively narrow or modest changes in Federal tax laws. Such changes would not be expected to have any measurable effect on the economy. In addition, some major tax legislation may have proposals with opposing incentive effects so that the net effect of the legislation on the economy may be quite small. Thus, for the vast majority of Joint Committee revenue estimates, no measurable macroeconomic effects would be identified.

Revenue estimates are provided, under the existing budget rules, for a relatively short time period (at most 10 years). Forecasting the timing and magnitude of the effects of a change in tax policy on the economy is the aspect of macroeconomic modeling that is associated with the greatest amount of uncertainty. There are a variety of issues giving rise to this uncertainty and each issue raises serious problems with respect to the reliability of estimates of the timing and magnitude of any potential macroeconomic effect. The validity and utility of any estimates of macroeconomic effects remain subject to question until these issues are addressed.

The major issues that remain to be resolved can be summarized as follows:

(1) Predicting the effects of business cycle fluctuations.--One of the most difficult aspects of economic modeling is the prediction of when the economy is likely to change direction, either to slow down during a period of growth, or to begin recovering during a period of recession. The effect of a tax change on real, near-term economic growth depends on the state of the economy at the time of the change. If the economy is near capacity, inflationary pressures may reduce the net positive effect of tax changes on the economy.

(2) Predicting the potential response of the Federal Reserve Board to fiscal policy changes.--The Federal Reserve Board's policies on interest rates affect the rate of growth of the economy and, thus, affect the potential macroeconomic effects of a major tax policy change. Absent some definitive information, such as a statement from the Federal Reserve Board with respect to its expected policies, it is impossible to predict with any precision how the Federal Reserve Board will react to a change in tax policy. It could be assumed that there would be no change in Federal Reserve Board policies, but such an assumption would undoubtedly be incorrect. Within the budget forecasting period, such effects can overwhelm any impacts on long-term growth that might result from a particular policy change.

(3) Predicting how the macroeconomic effects of tax policy changes would influence different types of individual and corporate income and international capital flows.--The predicted size of the effects of any given proposal on individual and corporate income and international capital flows can vary significantly depending on the structure of the model and various assumptions about the strength of behavioral responses built into the model. Ultimately, the importance of these types of responses would have to be determined from existing empirical economic evidence. The Joint Committee staff is continuing to enhance these components of the MEG model, and to experiment with other modeling approaches.

(4) Sensitivity of results to behavioral assumptions and model structure.--The effects of tax policy changes on the long-term growth of the economy depend on how the tax policy affects after-tax returns to labor and capital, and on how the suppliers of this labor and capital respond to these changes. The way a model treats costs of labor and capital varies significantly across different types of models and can result in significant disparities in the results.

(5) Consistency of treatment between revenue and spending proposals.--If macroeconomic effects are accounted for with respect to revenue proposals, it can be argued that a similar approach is necessary with respect to spending proposals. If the issues of consistency of treatment for Federal budget scorekeeping purposes are not addressed, then two equivalent policies would have different projected effects on the economy depending upon whether the policies were achieved through the tax system or through Federal spending. It would be necessary to coordinate with the CBO staff to address these possible issues of consistency.

Future plans

The goal of the Joint Committee staff efforts is to improve the quality and accuracy of the revenue estimating process. Because of the sources of uncertainty and differences in modeling outlook with respect to the issues that have been identified, Ways and Means Chairman Bill Thomas and the Joint Committee staff have invited a "blue ribbon" panel of macroeconomic modeling experts to review the Joint Committee's work and make suggestions both for modeling improvements and for the type of information that should be included in these analyses.

In the near term, the objective of the Joint Committee macroeconomic modeling project is to provide background information about the range of likely economic feedback effects of major tax proposals, including an explanation of the areas of greater and lesser uncertainty. The Joint Committee staff has identified several areas for improving modeling capacity, particularly in improving the links between the Joint Committee microeconomic tax simulation models and macroeconomic models. Work is underway on several specific enhancements to labor supply and consumption modeling within the MEG model to improve this linkage.

In addition, the Joint Committee staff is in the process of soliciting input from other macroeconomic modeling groups on the MEG model and suggestions for future directions for modeling improvement. This process would include discussions with the CBO on baseline assumptions and appropriate expenditure interactions. Another component of this process will involve producing a series of working papers describing key technical features of the MEG model and using the model to estimate the longer-run macroeconomic growth effects of several types of tax proposals. The papers will be circulated to other tax and macroeconomists for purposes of stimulating discussion on the validity of the Joint Committee analysis, which will be used to inform further refinements to the model.

In the near future, the Joint Committee staff expect to be able to produce comparative analyses of the long-term growth and associated revenue feedback effects of major tax proposals, and to attach "macroeconomic feedback notes" containing this analysis to revenue estimates of those proposals for which such a note is clearly indicated. This analysis would include a

description of the major assumptions used to produce the analysis, as well as a discussion of the degree of certainty associated with the results.

Conclusion

It is important to reiterate a point that was made at the beginning of this testimony. The revenue estimating process should provide Members with consistently accurate estimates of their proposals. The difficult issues presented in developing the ability to incorporate macroeconomic effects in revenue estimates should not be minimized. While the Joint Committee staff remains committed to improving the revenue estimating process by assessing the potential macroeconomic effects of major tax legislation, these issues must be addressed in a manner that is accepted by expert economists. To do otherwise would undermine the integrity of the revenue estimating process and could reduce, rather than enhance, the accuracy of the Joint Committee staff revenue estimates.

Attachment A -- Selected List of Revenue Estimating Methodological Publications of the Joint Committee on Taxation (1990-2001)

Joint Committee on Taxation, *Explanation of Methodology Used to Estimate Proposals Affecting The Taxation of Income From Capital Gains* (JCS-12-90), March 27, 1990.

Joint Committee on Taxation, *Tax Policy and the Macroeconomy: Stabilization, Growth, and Income Distribution Scheduled for Hearings Before the House Committee on Ways and Means on December 17-18, 1991* (JCS-18-91), December 12, 1991.

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

Joint Committee on Taxation, *Discussion of Revenue Estimation Methodology and Process* (JCX-31-92), August 4, 1992.

Joint Committee on Taxation, *Methodology and Issues in Measuring Changes in the Distribution of Tax Burdens* (JCS-7-93), June 14, 1993.

Joint Committee on Taxation, *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 9, 1995.

Joint Committee on Taxation, *Methodology and Issues in the Revenue Estimating Process Scheduled for a Hearing Before the Senate Committee on Finance on January 24, 1995* (JCX-2-95), January 23, 1995.

Joint Committee on Taxation, *Membership of the Joint Committee on Taxation Revenue Estimating Advisory Board* (JCX-29-95), June 29, 1995.

Joint Committee on Taxation, *Description and Analysis of Tax Proposals Relating to Savings and Investment (Capital Gains, IRAs, and Estate and Gift Tax) Scheduled for a Public Hearing Before the House Committee on Ways and Means on March 19, 1997* (JCX-5-97), March 18, 1997.

Joint Committee on Taxation, *Joint Committee on Taxation Tax Modeling Project and 1997 Tax Symposium Papers* (JCS-21-97), November 20, 1997.

Joint Committee on Taxation, *Background Information Relating to the Joint Committee on Taxation* (JCX-4-99), February 3, 1999.

Joint Committee on Taxation, *Testimony of The Staff of The Joint Committee on Taxation Before the Committee on Ways and Means* (JCX-82-99), November 10, 1999.

Joint Committee on Taxation, *Appendix I to JCX-82-99: NIPA and Federal Income Tax Receipts Data* (JCX-83-99), November 10, 1999.

Joint Committee on Taxation, *Background Information Relating to the Joint Committee on Taxation* (JCX-1-00), January 12, 2000.

Joint Committee on Taxation, *Background Information Relating to the Joint Committee on Taxation* (JCX-24-01), April 10, 2001.