

Compendium of Tax Research 1987

Office of Tax Analysis Department of the Treasury • Washington, D.C. 20220



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PREFACE

In the development of tax policy for the Executive Branch of the U.S. Government, the staff of the Office of Tax Analysis (OTA) engages in sophisticated economic research in order to address present and anticipated policy issues. In the case of fundamental tax reform, many policy questions could not be answered by the existing literature; the OTA staff had to develop new models, incorporate more realistic assumptions, and use more comprehensive data than were available elsewhere. The resulting analyses provided more than sufficient material for a compendium volume, and the publication of some of those analyses here help to make such research more widely available. We believe the studies included in this <u>Compendium</u> demonstrate the breadth, depth, and quality that exemplifies the work of the OTA staff.

A number of acknowledgments are in order. First, it was Don Fullerton, former Deputy Assistant Secretary (Tax Analysis), who stressed the advantage of more widely disseminating staff analyses and organized the development of these papers into a single volume. Second, Assistant Secretary J. Roger Mentz strongly supported completion of the <u>Compendium</u> and emphasized its longerterm benefits to the office. Third, Rudie Slaughter was of invaluable assistance to the editors, Don Fullerton and Tom Neubig, in preparing the final manuscript as a single, unified, volume. Finally, the members of the Office of Tax Analysis staff deserve special recognition not simply for the models and studies presented here - which represent only a small portion of their total efforts on behalf of the public they serve - but for the innumerable analyses, testimonies, and briefings that help guide tax policy and, in a most recent case, were crucial to to the development of the Tax Reform Act of 1986.

Finally, it must be stressed that any views expressed in these studies are those of the authors and do not necessarily represent the views of the Treasury Department.

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INTRODUCTION

Don Fullerton

President Reagan's State of the Union address of February 1984 started the Treasury Department's Office of Tax Policy on a major year-long project to prepare and analyze myriad interacting provisions of comprehensive tax reform. This project was undertaken by economists in the Office of Tax Analysis and attorneys on the staffs of the Tax Legislative Counsel and International Tax Counsel. The project resulted in the November 1984 Treasury Department Report to the President Tax Reform for Fairness, Simplicity, and Economic Growth, and the May 1985 President's Tax Proposals to the Congress for Fairness, Growth, and Simplicity. After extensive Congressional deliberation on those and many other proposals, the President signed the Tax Reform Act of 1986. This Act included many of the Treasury Department's original tax reform proposals.

Economic analyses of the various tax reform proposals involved novel and path-breaking approaches to new public policy issues. Economists in the Office of Tax Analysis (OTA) had to analyze hundreds of different tax proposals for their effects on economic efficiency, distribution, and revenue. These analyses required the development of many different economic models and databases. During the development and legislative consideration of this historic tax reform, OTA economists generally did not present their research for wider dissemination.

This <u>Compendium</u> includes eleven papers by OTA staff. The papers provide descriptions of some of the most important quantitative methods and models used at the Office of Tax Analysis. The papers focus on diverse aspects of the domestic and international economy, and they provide new results about the potential effects of the Tax Reform Act of 1986.

Wider dissemination of research results and methodologies is essential to remain at the frontiers of any field. Researchers benefit from critical review and suggestions. Moreover, other economists are interested in the

I would like to thank all of the staff of the Office of Tax Analysis and particularly the authors for help with the summaries of their papers.

research of OTA economists and might use it to do new research that could advance future analyses of tax policy. Indeed, most economists have been concerned almost exclusively with the distributional and efficiency effects of taxes, ignoring methods of revenue estimation that were so crucial to the development of "revenue neutral" tax reform. Other economists can learn from the path-breaking work of Treasury economists, suggest improvements, and push further the frontiers of tax policy analyses. Such an interchange is one purpose of this Compendium.

Wider dissemination of research results and methodologies can also clarify misunderstandings and focus attention on critical issues in need of further research. One example of an important misunderstanding is that critics of revenue estimates accused Treasury economists of using "the assumption that the loophole closings and lower rates will have no effect whatever on the behavior of taxpayers, the growth of taxable income or anything else in the economy" (Wall Street Journal editorial, April 3, 1985). Despite explanations from the Treasury, the belief persisted that "revenue estimates are based on static analyses, which assumes that cutting rates X% will reduce revenues X%. By now everyone knows that this is crudely inaccurate" (Wall Street Journal editorial, August 5, 1986). Disagreements about the assumed degree of behavioral response will remain, but this <u>Compendium</u> should finally debunk the myth of static revenue estimates.

The Office of Tax Analysis staff uses a diverse array of computer models to perform their analyses of the effects of a tax change on economic behavior, government revenue, the distribution of tax burdens, and the efficiency of the economy. The staff works with large samples of individual, corporate and other tax returns, demographic data from the Bureau of the Census, production data from the Bureau of Economic Analysis, consumption data from the Bureau of Labor Statistics, and other data from many sources. These data are combined in various ways using the latest statistical techniques, providing a detailed picture of the sources and uses of income for a large sample of taxpayers and families. Analysts can then "simulate" the effects of changes in a tax, even one that does not exist yet, by calculating the new tax liability and behavioral response of each taxpayer and family in the sample.

The next section of this introduction provides a summary of each of the eleven papers in the <u>Compendium</u>. It describes the nature of the models that are used and the provisions of the Tax Reform Act of 1986 that are analyzed, and it summarizes the results. A final section of the introduction comes back to the issue of model-building. That section discusses the appropriate size and use of different models, interrelationships among models. and how some of the models might be improved.

SUMMARIES OF THE PAPERS

The first paper is "A Guide to Interpreting the Dynamic Elements of Revenue Estimates," by Howard W. Nester. This paper is a good starting point because

it outlines in general terms the process involved in estimating Federal revenue. Such estimates might be provided for legislative proposals or for budget receipts under the existing tax system. The paper includes discussion of the objectives of revenue estimates, different types of behavioral assumptions, issues in their interpretation, and examples of behavioral responses included in Treasury estimates of the Tax Reform Act of 1986.

The main message is that Treasury estimates contain many microeconomic behavioral responses but are constrained within the macroeconomic forecast of the Administration. However, the Administration macroeconomic forecasts themselves often include induced effects such as increases in GNP or investment resulting from tax changes, even though these are not directly attributable to any single tax law provision.

Chapters 2-4 discuss the design and some applications of the Treasury Individual Income Tax Model and Database. The second paper in this volume is "The Treasury Individual Income Tax Simulation Model," by James M. Cilke and Roy A. Wyscarver. This paper explains the motivations of the Treasury in building their largest single model, listing the many diverse uses of the model. Included is a short history and basic outline of the model. The paper goes on to describe in detail the data bases used by the model, how they were merged to provide a comprehensive picture of each household in the sample, how missing items were imputed, how the components were individually "aged" to represent later years, and how the whole data set was extrapolated over the future five-year budget period.

The paper also describes the computer programs for the model, and it provides a description of the tax calculator. It presents a narrative account of how the model was used during the tax reform process, and it includes some basic model tabulations. For example, it shows how tax reform lowers the average (over all taxpayers) of marginal tax rates on wages, interest, dividends, and noncorporate income, while raising that on capital gains. Finally, the paper discusses future modifications to the tax model.

The third paper is "Family Economic Income and Other Income Concepts Used in Analyzing Tax Reform," by Susan C. Nelson. It points out that the apparent distributional consequences of fundamental tax reform depend to a large extent on the way taxpayers are classified, that is, on the income measure used and the unit of analysis chosen. The paper examines the implications of analyzing taxes on the basis of families rather than tax units, of including nonfilers as well as filers in the analysis, and of choosing income measures broader than adjusted gross income (AGI).

In particular, the paper focuses on the concept of economic income, as defined by Haig and Simons. and on attempts by the Treasury Department to measure it for Treasury I and the President's Proposals. Measured "economic income" is compared to personal income in the National Income and Product Accounts, to AGI, and to the measure used recently by the Joint Tax Committee. here termed "modified expanded income" (MEI). The paper discusses some of the difficulties in attempting to quantify the Haig-Simons concept with available

data, most importantly the treatment of pensions, corporate income, and capital gains. Finally, it compares the conclusions that would be drawn about the distributional consequences of the Tax Reform Act of 1986 if the change in taxes is analyzed by AGI of returns, MEI of adult returns, or by "economic income" of families. It finds that the method of classification can substantially affect the apparent distributional consequences of reform.

The fourth paper in the <u>Compendium</u> is "Tabulations from the Treasury Tax Reform Data Base," by James R. Nunns. The Treasury tax reform data base is a microdata file that contains 198,000 "records." Each record represents a tax return (or potential tax return) and contains a large number of tax and nontax variables. Also, each is associated with other tax returns (of filers and nonfilers) in its family unit. Tax returns are appropriately weighted so that the file represents the entire U.S. population. All data items are at 1983 levels. Earlier papers in this <u>Compendium</u> show how the data base is constructed, how it is used, and how income is defined.

The tabulations presented here supplement these earlier papers, showing major tax and nontax items in the data base. The tabulations are divided into two sets. The first set covers major tax variables under 1983 law and posttax reform law (1988 law). for tax returns of filers classified by adjusted gross income. Separate tables are shown for all returns, joint returns, all returns that itemize deductions, and joint returns that itemize. These tables are designed to show the major impacts of the Tax Reform Act of 1986 in a format useful to state tax analysts and others working with tax return data. The second set of tabulations is aimed at analysts interested in the relationship between adjusted gross income and economic income. This set, which consists of a single table, shows the major items in economic income for families, by economic income class.

The remaining chapters describe models dealing with various aspects of the taxation of business income. The fifth paper is "Investment Incentives Under the Tax Reform Act of 1986," by Don Fullerton, Robert Gillette, and James Mackie. The paper begins by noting that the Tax Reform Act of 1986 contains multiple changes to the taxation of income from capital. The Act substantially lowers the top statutory marginal rate on corporate income as well as personal tax rates on interest and dividend income. In contrast, the Act would eliminate the 60 percent capital gains exclusion and thus raise the effective personal rate on realized capital gains. The Act also changes capital cost recovery provisions by repealing the investment tax credit and replacing ACRS with a system of 8 recovery classes ranging in length from 3 to 31.5 years. In addition, the Act increases the number of costs that must be capitalized into the basis of self-constructed property (including inventory), rather than expensed.

This paper analyzes the combined effect of these changes on marginal investment incentives. It uses the cost of capital framework introduced by Hall and Jorgenson but extends existing work by (a) including the effect of accounting rule changes on the taxation of self-constructed assets. (b) using

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a more disaggregated capital stock matrix, and (c) incorporating detailed calculations of weighted-average personal marginal tax rates from the Treasury individual tax model. Sensitivity analysis indicates that the actual final effect of TRA on aggregate investment incentives is uncertain. For most cases the paper finds that aggregate investment incentives are somewhat reduced, but variations in effective tax rates across assets and sectors are also reduced.

The sixth paper is "Investment Allocation and Growth Under the Tax Reform Act of 1986," by Don Fullerton, Yolanda K. Henderson, and James Mackie. It makes use of the cost of capital framework further developed in the previous paper. This type of analysis played an important role in evaluating the effects of tax reform proposals, but it is traditionally partial equilibrium in nature. For example, the previous paper notes that the Tax Reform Act of 1986 may slightly reduce overall investment incentives, and thus reduce investment, but that it also reduces the variance in the effective tax rates across assets and thus encourages more efficient utilization of existing capital. The net effect is ambiguous.

To assess the likely net effect, this paper uses a general equilibrium model developed by Fullerton and Henderson. It integrates disaggregate marginal cost of capital analysis with the computable general equilibrium model for tax policy developed by Fullerton, John Shoven, and John Whalley. General results suggest that the capital income provisions of the Act have a positive net effect, despite reduced aggregate investment and saving incentives. That is, the efficiency gains from more neutral taxation more than offset the adverse effects of reduced investment incentives. Again, however, sensitivity analysis indicates that the results vary across different parameter assumptions.

The seventh paper is "The Treasury Depreciation Model," by Geraldine Gerardi, Hudson Milner, Leslie Whitaker, and Roy Wyscarver. While the previous two papers concern the effects of capital cost provisions over the life of each asset under broad sets of conditions, this paper describes the data and model used for calculating budget-period revenue estimates for changes in depreciation rules. These revenue estimates played a major role in determining the degree of corporate rate reduction that could be achieved through tax reform. The depreciation model calculates deductions and investment tax credits on the basis of investment estimates by type of asset for a set of industries. Tentative deductions and credits are adjusted to reflect those that must be carried back or forward as a result of inadequate taxable income. Thus, the model operates between the macro level (where investment can be forecast) and the micro level of the firm (where detail is adequate to evaluate alternative proposals). This paper describes the sources of the data and the operation of the model. It also discusses the results of simulations that evaluate the depreciation changes and repeal of the investment tax credit contained in the Tax Reform Act of 1986.

The eighth paper is "The Impact of the Tax Reform Act of 1986 on Trade and Capital Flows," by Harry Grubert and John Mutti. This paper uses a four-

sector, two-country general equilibrium model of the U.S. and the rest of the world to assess some of the international implications of tax reform. The model includes (a) the basic changes in corporate and personal taxation, (b) the changes in the U.S. tax on international investment income, and (c) the change in export tax incentives. The last of these includes both the reduced effect of Foreign Sales Corporations and the interaction of the source rules with the large increase in the number of firms in excess foreign tax credit positions. An attempt is also made in some simulations to introduce the impact of the passive loss rule, the corporate alternative minimum tax, and the uniform cost capitalization rules.

The domestic changes increase the cost of import-competing goods and non-traded goods relative to export goods, so incentives to export increase. Results indicate that both exports and imports will increase in the long run, but the changes in trade and sectoral output are small. Also, some investment will flow abroad because the U.S. tax on foreign investment income declines relative to the tax on domestic income. In the short run, this capital outflow causes an improvement in the trade balance; in the long run the increased net investment income from abroad offsets the increased capital outflows and leaves the trade balance virtually unchanged. In summary, the international dimensions of the Tax Reform Act of 1986 are not dramatic. The simulations also suggest that changes in the merchandise trade balance are not a good indicator of U.S. welfare or of sectoral outputs.

The ninth paper is "Impact of the Corporate Alternative Minimum Tax: A Monte Carlo Simulation Study," by Lowell Dworin. Complicated minimum tax provisions are often omitted altogether from cost of capital analyses such as those discussed above. Revenue estimates include these provisions, but they typically take a sample of firms and project forward on the basis of fixed economy-wide forecasts. Yet a firm's exposure to the alternative minimum tax (AMT) depends upon variations in its gross profit margin, its rate of growth, and its financial leverage. This paper develops a Monte Carlo simulation model of corporations based on the Hayashi model of the firm, incorporating random variations in gross profit margins. By parameterizing the firm's investment and financial decisions, the model calculates endogenously the firm's chosen growth rate and degree of financial leverage under alternative tax policy options.

This model is used to examine the impact of the AMT under both uniform and stochastic economic conditions. It is shown that the firm's frequency of exposure to the AMT may be significantly greater under stochastic conditions. It is also shown that when the response of the firm to its tax environment is endogenous, the impact of the AMT on the firm's tax payments is much greater than when the response is ignored. However, the results are somewhat ambiguous regarding the importance of incorporating stochastic modeling in the revenue estimation process.

The tenth paper is "The Effect of the Tax Reform Act of 1986 on Commercial Banks," by Thomas S. Neubig and Martin A. Sullivan. This paper deals with

another area where the standard corporate data and model might not be adequate to evaluate the Tax Reform Act of 1986. Base-broadening provisions specific to banks include the repeal of the bad debt reserve method, the recapture of existing bad debt reserves, and the disallowance of interest costs used to carry tax-exempt securities. Especially for banks, therefore, corporate tax return data do not include all of the information on loans. book income, and receipts of tax-exempt interest that is necessary to model tax reform proposals. This paper describes the banking tax model that employs an extrapolated cross-section time-series regulatory accounting database to simulate alternative tax reform proposals.

These bank-specific provisions and the alternative minimum tax are commonly highlighted when assessing the effects of tax reform on banks. However, this paper shows that the added Federal tax liability attributable to these provisions is almost entirely offset by rate reduction. Although banks as a whole pay more taxes over the 1987-91 period, after-tax incomes may actually increase because additional interest income is earned when banks shift their portfolios from tax-exempt to taxable securities. The paper goes on to compare large and small banks, to evaluate alternative loan-loss scenarios, and to consider future extensions of the model.

The eleventh and final paper in this volume is "The Use and Abuse of Rental Project Models," by Leonard E. Burman, Thomas S. Neubig, and D. Gordon Wilson. Using techniques much like those in the cost of capital analysis described above, "rental project models" consider the entire life of a hypothetical marginal investment in residential or commercial rental property. Assuming certain economic conditions, these models can calculate the rent that would have to be charged to provide a predetermined "required rate of return" to an investor with specific tax characteristics. During tax reform, rental project models were used frequently to support both sides of debates about the proper tax treatment of rental property.

This paper first documents the Treasury rental project model and its improvements over existing analyses. More importantly, the paper shows why existing rental project models produce very disparate results. These models use different assumptions about the marginal investor, for example, and thus generate different required rent levels. The results show incentives for particular individuals or institutions to buy or sell each type of rental property, but the results for any one investor do not necessarily indicate what will happen to market equilibrium rents. The paper thus provides some useful guidelines for understanding and critically evaluating rental project model analyses. Despite their limitations, rental project models can provide valuable insights about how tax policies can affect individual investors' behavior and how current and future subsidies are capitalized into land values. As examples, the paper examines the effects of various provisions of the Tax Reform Act of 1986 on holding periods and asset values under various parameter assumptions.

DISCUSSION

The papers provide interesting analyses of many diverse effects on the economy of changes to individual, corporate, domestic, and international tax rules in the Tax Reform Act of 1986. Accordingly, they are very useful. An overall evaluation of the Act would not be warranted here, however, because (a) these eleven papers do not cover many other economic effects of tax reform, (b) results are sensitive to alternative assumptions, (c) observers will legitimately differ on the desirability of particular effects, and (d) these papers do not attempt to incorporate noneconomic objectives and effects of tax reform. Summary judgment about tax reform can be made only by combining results here with those of other studies, and with subjective beliefs.

Instead, these papers are primarily about research developments. The Tax Reform Act provides a highly relevant set of tax changes for the application of these analytical techniques. Therefore, a more appropriate form of summary discussion involves the state of the art available for analyzing tax policy, and how it might be improved.

Most of the papers include some discussion of specific changes that might improve the use of the relevant model. It is always possible, for example, to search out more and better sources of data, to incorporate more detailed features of tax law and economic decisionmaking, to better estimate the behavioral reactions, and to perform more sensitivity analysis. There is always more work to be done on disaggregation, the effects of uncertainty, and interactions with other markets. The rest of this introduction will raise a few more fundamental questions about the nature of the model-building process.

A first fundamental question is the degree to which economic models are useful. Indeed, the effects of tax policy cannot even be discussed without an implicit or explicit model of empirical magnitudes, economic behavior, and logical consequences. The advantages of an explicit economic model include the care in establishing empirical magnitudes, the rigor in defining behavioral reactions, and the confidence in avoiding logical errors by writing down and solving the model. It cannot predict the future, but an economic model can clarify which assumptions are most important, whether some qualitative results can be stated with confidence, and what range of empirical outcomes is most likely.

A second question involves the appropriate size of the model. The Treasury's individual tax model is described in the paper by Cilke and Wyscarver, used in the paper by Nelson, and tabulated in the paper by Nunns. It includes 198,000 tax returns and takes a half-hour of computer time to solve. It requires several staffers to maintain and to set up runs. For most calculations, in fact, the results are not significantly affected by adding the last few thousand tax returns or making the last few hours of refinements to the model. It is a general purpose model, however. There is some advantage in using the same model to answer a series of different questions, some of which might involve narrowly defined types of income. It may take 198,000 returns to find enough of that income in each bracket to have sufficient confidence in the distributional results of changing its tax treatment. Still, it is legitimate to ask when the detail provides an improvement; estimates of behavioral parameters vary by large orders of often magnitude, or even by sign. Results can depend on the assumed parameter in a small model the same way they do in a large model.

A third and related question is when to stop expanding one model and start building another. The economist must always make a judgment about the marginal benefits of continuing to improve the answers from one model, a choice that necessarily means accepting a given framework and set of assumptions, compared to the benefits of starting with a new framework but less detail. An example is given by the large corporate model that has thousands of tax returns and projects over the budget period for each corporation by using economy-wide forecasts. This model gives highly detailed answers and is essential to address particular aspects of corporate income and activity. Its use necessarily involves accepting its assumptions. Nevertheless, the economist must choose which questions are most important to address and which assumptions are key to the answers obtained. Dworin's paper describes a small model used to investigate the assumption of uniform profits and growth. This model essentially takes a set of examples and cannot be used by itself to estimate economy-wide effects on revenue or corporate income, but it is a tremendous aid to the use and interpretation of results from the corporate model.

A fourth question is whether two or more models can or should be linked together. The endogenous financial and other behavior of Dworin's model could be incorporated into the detailed calculations of the corporate model. For that matter, they could be linked simultaneously with the bank model described in the paper by Neubig and Sullivan or with the corporate part of the depreciation model described in the paper by Gerardi, Milner, Whitaker, and Wyscarver. Again it is a judgment, but often such linkages are unwise; bigger is not necessarily better. Even if two models appear to cover some of the same tax laws or taxpayers, they may deal with separable economic phenomena. Little may be gained if one phenomenon is not directly influenced by the other, and much may be lost in terms of the ease of model use, interpretation, and tractability.

To take another example, the depreciation model obviously deals with many of the same provisions as the cost of capital model in the paper by Fullerton, Gillette, and Mackie. That model calculates present values of depreciation deductions for many diverse assets, averaging over the economy to get overall investment incentives. It therefore uses similar data on asset use by industry. There might at least be some advantage to the consistency of using the depreciation model to calculate these present values. However, the goals of the two models are different. The depreciation model is concerned with measuring actual tax revenue over the next five years only. using Administration forecasts of interest rates, inflation rates, and other macroeconomic variables. It uses gross investment forecasts, and it is sometimes concerned

with changes in narrow asset categories. In contrast, the cost of capital model is concerned with incentives for capital formation in general. It requires depreciation over the life of each asset and weights given by capital stocks rather than gross investment. Moreover, part of the point of the cost of capital model is to see how incentives vary with changes in the interest rate, inflation rate, or other macroeconomic variables. Often qualitative results are robust to variations in these parameters, but when quantitative results vary significantly with a single unknown parameter like the future interest rate, there may be little point to further refinements in the detail of depreciation deductions in narrow asset categories.

Finally, perhaps the most important question involves the use and interpretation of model results. In particular, policymakers generally use a single point estimate rather than qualitative results or a range of answers. It is sometimes difficult for the economist to convey a sense for the degree of confidence to place in the results. For example, the paper by Nester describes how revenue estimators make judgments about the relevant elasticity parameters when including behavioral effects. They know that results vary with these assumptions, and they perform sensitivity analysis, but the Budget requires point estimates for receipts and outlays. One point of the paper about rental project models, by Burman, Neubig, and Wilson, is that this kind of model can generate virtually any kind of result desired, by adept variations in key parameters.

Sensitivity analysis is particularly important for general equilibrium models such as in the paper by Grubert and Mutti or by Fullerton, Henderson, and Mackie, because of the sheer number of behavioral parameters that must be assumed for demand and for supply of each good in each market. Both of those papers include considerable sensitivity analysis, but it is hard perhaps for the reader to know that the authors have in fact sufficiently varied the parameters that are most important. Also, as discussed above, the results may be sensitive to model form in a way that is difficult to vary.

All of these questions provide topics for further research. Future developments will undoubtedly provide further detail in existing models, investigation of new models, and formal or informal linkages among models. Informal linkages might involve using the results of one model as an input to another model. It might be fairly straightforward, for example, to take new relative prices from a general equilibrium model and insert them into a revenue estimating model. A further refinement would take the subsequent results of the revenue estimating model and insert them back into the general equilibrium model. Formal linkages might involve simultaneous solution through iteration. The problems are formidable, however. Even the direction of price changes in general equilibrium models can be sensitive to modeling choices, and it may be unwise to accept a single set of choices for point estimates. Also, such linkages can easily become unwieldy. For operational purposes, the decision to fix some relative prices in revenue estimating models has its advantages. Informal linkages might best insert only the price changes that are known with confidence.

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Recognizing the uncertainty about economic effects of tax proposals makes enacting any reform more difficult. There is no easy solution to this problem. This volume, however, will help clarify some of the problems encountered by economists when analyzing alternative tax policies, and the advanced nature of the methods available currently to address these problems.