WHATEVER HAPPENED TO DYNAMIC REVENUE ANALYSIS IN CALIFORNIA?

by
Jon David Vasché
Director of Economics and Taxation
California Legislative Analyst's Office[1]

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[1] The Legislative Analyst's Office (LAO) is the California Legislature's nonpartisan budgetary and fiscal review office. It is headed by California's Legislative Analyst, Elizabeth G. Hill.

Background and Overview

In 1994, California adopted a requirement that dynamic estimating techniques be used in estimating the state fiscal impact of tax-change proposals. Funds were subsequently appropriated to construct, maintain, and utilize a computable general equilibrium (CGE) model for this purpose, and dynamic revenue estimates were prepared for a number of years. In January 2000, however, the dynamic estimating requirement sunsetted. Although dynamic estimates continued to be prepared for several more years, the requirement was never re-adopted and dynamic estimation is no longer mandated for analyzing California tax-change proposals.

This paper reviews California's experience over the past decade with dynamic estimating, describes the extent to which dynamic factors are still currently considered in California revenue estimating, and discusses some of the issues that the subject of dynamic estimating raises for states.

What Is Dynamic Revenue Analysis?

The term "dynamic revenue analysis" is often spoken of somewhat differently depending on the range and scope of the various effects of tax-law changes that are being assumed or focused on by a policymaker or revenue estimator. At the one extreme, for example, the term is sometimes viewed relatively narrowly as including the revenue-related impacts of only the direct behavioral changes that a tax change causes. Alternatively, at the other extreme, users of the term can be referring to the entire broad range of revenue effects of a tax change, including the various macroeconomic impacts on economic activity that tax changes can produce. Despite this variation in the term's day-to-day usage, tax economists generally subscribe to the latter view and formally define dynamic revenue analyses broadly—that is, as including all of the revenue effects that a tax change can generate.[2]

Under this definition, dynamic revenue analyses take into account not only the *direct* behavioral responses that tax changes produce in taxpayers, but also the various other *indirect* behavioral effects they produce in individuals and businesses as well as the induced *macroeconomic feedback* effects associated with all of the direct and indirect behavioral responses. Thus, for example, in the case of an investment tax credit, a full-blown dynamic analysis would take into account not only the credit's direct impacts on the level and nature of investment expenditures, but also such things as the resulting effects on output, productivity, incomes, consumer spending, and employment throughout the economy, as well as the subsequent feedback effects of these changes on revenues.

Dynamic Analyses by States—Initially Quite Limited

At the time California's requirement was adopted, few states had been involved to any extensive degree with dynamic revenue modeling. Based on a nationwide survey

[2] For example, in *The Encyclopedia of Taxation & Tax Policy* (second edition) published by the Urban Institute Press, the term "dynamic revenue analysis" is defined as "incorporating the effects of policy-induced changes in total economic activity into estimates of the effects of the policy on government budget receipts" (pp. 85-86).

we conducted in 1995, the majority of states reported to us that they generally used static analysis when analyzing tax-law proposals. And, although many states reported occasionally estimating direct behavioral effects, most of these relied for this purpose on ad hoc assumptions or national estimates versus making their own independent estimates of such things as behavioral elasticities. Most states also reported to us that they were skeptical about the ability of their currently available revenue-estimating procedures to reliably estimate the indirect behavioral responses or macroeconomic feedback effects of state tax policies. They commonly attributed this to such factors as data limitations and limited empirical experiences. They also generally shared their view that the dynamic effects of state tax-law changes were probably relatively minor, especially given their balanced budget requirements.[3]

But Interest Grew in the 1990s

Despite this limited early activity by states involving dynamic revenue estimating, interest in the topic grew in the 1990s. For example, more and more articles began appearing on dynamic estimating and its merits in economics journals and tax-related publications as the first half of the decade progressed.[4] At the state level, dynamic revenue estimating developments in Massachusetts (and, to some extent, Minnesota) received special attention.[5] It was in this climate that California's dynamic estimating requirement was adopted.

California's Dynamic Analysis Requirement

In response to the mounting interest of policymakers, taxpayer groups, and others, as well as the increased discussion regarding the potential benefits of dynamic estimating amongst economists, tax analysts, and the revenue-estimating community, California's Legislature passed and Governor Pete Wilson (R) signed into law Senate Bill 1893 (Chapter 393, Statutes of 1994). As summarized in Figure 1, the measure:

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[3] For further discussion of these survey findings, see B. Williams, K. Szakaly, and J.D. Vasché, "Dynamic State Revenue Impact Analysis: A View From California," *State Tax Notes*, Volume 9, Number 19, November 6, 1995, pp. 1333-1334.

[4] For a listing of such articles, see the references in B. Williams et. al., op. cit., pages 1331-1337, and J.D. Vasché and H. Nguyen, "The Treatment of Feedback Effects in Revenue Impact Analyses," *Tax Notes*, Volume 65, Number 5, October 31, 1994, pp. 599-618, as well as J. Gravelle, *Dynamic Revenue Estimating*, Congressional Research Service, December 1994, 25 pages.

[5] For a discussions of the Massachusetts model and similar modeling approaches, see, among others: J. Hudder, "Use of Models in Tax Policy and Revenue Analysis: A Great Leap Forward," *State Tax Notes*, May 17, 1993, pp. 1181-1185; A. Clayton-Matthews, "The Massachusetts Dynamic Analysis Model: A Brief Description with Illustrative Examples," Bureau of Economic Analysis, Estimation and Research, Department of Revenue, The Commonwealth of Massachusetts, June 1993, 11 pages; A. Clayton-Matthews, "The Massachusetts Dynamic Analysis Model," *State Tax Notes*, September 20, 1993, pp. 639-644; the following papers presented at the September 1992 Federation of Tax Administrators Conference on Revenue Estimating (E. Cook, "Computable General Equilibrium Modeling and Tax Incidence Analysis;" M. Vlaisavljevich, "Multitax Microsimulation Models: Duel Application as Policy Simulation and Receipts Estimating Tools;" and J. Wooster, T. Neubig, and C. Harmon, "The Massachusetts Multi-Tax Incidence and Dynamic Economic Impact Model"); and S. Ben-David et. al., "A Computable General Equilibrium Model of New Mexico for Policy Analysis," Economics Department, University of New Mexico, June 1994, 73 pages.

- Required the California Department of Finance (DOF) to develop dynamic revenue analyses for tax bills with significant fiscal effects, and the Legislative Analyst's Office (LAO) to do the same for any such measures that were included in the Governor's annual budget proposal.
- Included a statement of intent that these fiscal estimates take into account the probable behavioral responses of taxpayers and businesses, and that dynamic techniques be used in estimating the state fiscal impact of proposals to the extent that data are available.
- Defined "significant" fiscal effects and thus requiring a dynamic analysis as those tax proposals whose static revenue impact was greater than $10 million annually.
- Was to sunset after five years on January 1, 2000, unless otherwise extended.

How California Proceeded

In approaching its dynamic analysis requirement, California chose to use a CGE model. This type of model was selected because it allows for the type of structural detail that is necessary to analyze the effects of different types of tax changes, unlike traditional macroeconomic forecasting models which generally are much more aggregated.[6,7]

California then appropriated funds to contract with a group of economists at the University of California at Berkeley with experience in the field to construct the model, and also to fund some addition staff at the DOF to operate and maintain the model and

[6] Traditional economy-wide macroeconomic forecasting models have other limitations for use at the state level as well. For example, traditional national macroeconomic models that rely on relationships using expenditure-side data from the National Income and Product Accounts (NIPAs) typically encounter problems at the state level in incorporating such things as well-specified consumption functions and investment functions, due to limited state time series expenditure-side data. As a result, state models typical have to work from the income-side of the income accounts, such by building up projections of personal income from predictions about employment and average wages, which limits the effective use of tax-policy levers.

[7] This is not to say that CGE models are not without their own limitations. For example, although good data for certain variables in a CGE model can be difficult to find at the national level, they can be even more challenging at the regional or state level. For this reason, developing reasonable parameters for CGE models is a very important part of the dynamic estimating process, including using appropriate techniques for estimating regional data from national data and identifying parameters that correctly capture how tax changes directly and indirectly influence the outputs and prices in different sectors of state economies. Other problems involve ambiguous empirical evidence regarding the effects of past tax changes, the nature and effects of interstate factor mobility, the inherent difficulty in modeling certain specific types of tax policies (for example, those involving pass-through entities and corporate unitary and apportionment issues), and state balanced-budget requirements. For additional discussion of the nature and limitations of CGE models, especially at the regional or state level, see P. Berck and A. Dabalen, "A CGE Model for California Tax Policy Analysis: A Review of the Literature," Department of Agricultural and Resource Economics, University of California at Berkeley, Summer 1995, 72 pages; and P. Berck, E. Golan, and B. Smith, *Dynamic Revenue Analysis for California*, California Department of Finance, Summer 1996, pp. 6-9.

prepare the dynamic revenue analyses required. Figure 2 summarizes the basic characteristics of the California CGE model that was developed.[8]

Results From California's Dynamic Analyses

Selected Outcomes

Discussed below and summarized in Figure 3 are examples of some of the basic types of findings associated with using California's CGE model (known as the DRAM—Dynamic Revenue Analysis Model).[9]

Example One—Across-the-Board Tax Rate Increase Simulations. Several simulations were conducted in 2000 with an updated DRAM to demonstrate for each of California's three major taxes the feedback effect associated with a $1 billion static revenue increase for each tax due to an across-the-board rate increase. The estimated dynamic revenue feedback effects were:

- ***Corporation Tax.*** About 18 percent, or a partially offsetting revenue reduction of roughly $180 million. This was due to raising the state's corporate tax rate by about 17 percent from 8.835 percent of net taxable corporate income to 10.337 percent, and suggested an estimated reduction of about 11 thousand in state jobs and $479 million in state business investment expenditures.
- ***Personal Income Tax.*** About 4 percent, or a partially offsetting revenue-reduction of roughly $40 million. This was due to raising the state's individual marginal income tax rates by about 4 percent (such as from 9.3 percent to approximately 9.7 percent for the state's highest marginal tax bracket), and suggested an estimated reduction of about 18 thousand in state jobs and $83 million in state business investment expenditures.
- ***Sales and Use Tax.*** About 12 percent, or a partially offsetting revenue-reduction of roughly $120 million. This was due to raising the state's sales and use tax rate by about 5 percent, and suggested an estimated reduction of about 10 thousand in state jobs and $109 million in state business investment expenditures.

Example Two—Reimposition of High-Income Personal Income Tax Brackets. Although California's highest marginal personal income tax rate currently is 9.3 percent, [10]

[8] For a detailed model description, including parameter and variable descriptions, specific equations, and the matrix input file for the model's social accounting matrix, see P. Berck, E. Golan, and B. Smith, op cit, 210 pages. Also, see P. Berck, "A Work Plan for a Dynamic Computable General Equilibrium Model of California," Department of Agricultural and Resource Economics, University of California at Berkeley, August 1995, 18 pages.

[9] The period of time needed for the full long-term dynamic effects to be realized varies by tax and type of tax change. In most cases, most of the ultimate effect appears within the initial five-to-six years, but in some cases can take longer, especially when such things as capital investment and migration responses are significant. In addition, the results above assume that California's state budget is kept in balance and that there are no other structural changes occurring in the economy.

[10] In addition, the state currently levies an additional 1 percent tax rate on the portion of incomes in excess of $1 million.

at one point the state had both a 10 percent and 11 percent bracket for high-income taxpayers. In recent years, there have been a number of proposals to reinstitute these higher rates, generally to help in addressing California's budgetary problems. According to the DOF, the DRAM estimate at the time these changes were being considered was that the permanent adoption of such higher rates would have a feedback effect in the 3 percent range. For example, if the static revenue gain was roughly $1.8 billion, the net increase including partially offsetting revenue reductions from adverse feedback effects on the economy would be around $1.7 billion. In addition, in the long run, the DRAM estimated that there would be reductions in private nonresidential investment in buildings and equipment of at least $110 million and 30,000 in job reductions.

Example Three—Elimination of the Vehicle License Fee (VLF). In the early 2000s, the DOF used the DRAM to examine a proposal to eliminate the state's VLF and to reimburse localities for their associated revenue losses with state sales and use tax monies. The DOF concluded that the positive revenue feedback effect would be about 10 percent of the static loss to the state, due to the net economic stimulus from the reduced VLF paid by households and businesses. In addition, an additional $375 million in investment expenditures and 30,000 new jobs were estimated.

Conclusion. Taken together, the DOF's various analyses using the DRAM seem to suggest that the dynamic revenue feedback effects for California tax changes, while definitely present and visible, are generally relatively modest.[11]

It should also be noted that experiments with the model have shown that its results are very sensitive to the values used for many of the various elasticities contained in it, especially those relating to such things as population migration and trade flows. Because the true values of these elasticities are often not know with certainty, especially at the state level, educated guesses and assumptions about them often have to be made, and errors in this regard can significantly reduce the model's reliability.

How Dynamic Revenue Estimates Have Been Used

Reporting. Once the DOF developed its dynamic revenues analyses for a given tax-change proposal using the CGE model, a brief write-up of the findings was typically prepared for the DOF's associated bill analysis. Such write-ups usually included a comparison of the static and dynamic long-run revenue estimates for the measure and the percentage size of the dynamic revenue effect, a description of the source of the dynamic revenue effect, and an estimate of the induced change expected in investment

[11] The DRAM has also been used to analyze certain issues other than the feedback effects on state tax revenues of basic changes in California tax laws. For example, in the late 1990s, the DOF used the DRAM to examine the effect of raising the federal cap on California's allowable volume of federally tax-exempt private activity bonds, from the $50 per capita limit that had been set for each state under the 1996 Federal Tax Reform Act. This analysis concluded that the net cost to the federal government of increasing the cap would be only 10 percent of the static cost, because roughly 90 percent of the federal revenues that would be lost due to higher California tax-exempt income would be offset by additional federal revenues from the increased California economy activity induced by the use of more bonds, such as housing activity and business investments. See *Private Activity Bonds in California: An Economic Analysis by the California Department of Finance*, California Department of Finance, January 1998, 8 pages.

and employment. The extent to which the dynamic information was discussed in legislative committee hearings once the bills were heard varied.

Budgetary Scoring. The dynamic revenue effects, although estimated and reported, were not incorporated into the budget.

Current Status of Dynamic Analysis in California

No Requirement Currently Exists

When January 1, 2000 arrived, the state's dynamic revenue analysis requirement went out of effect as it had not been renewed. Although the DOF did continue to routinely produce dynamic revenue analyses for several years, this has since ceased. And, while proposals have been introduced to continue or reimpose the dynamic revenue estimating requirement, none ever become law. Thus, at present, California has no requirement that dynamic revenue analysis be conducted.

But Various Behavioral Effects Nevertheless Are Considered

Despite the lack of a current requirement that California conduct dynamic revenue analyses, the state does currently consider various direct and indirect behavioral effects when doing its revenue estimates, depending on their nature and the proposal—just as it did prior to the adoption of the dynamic estimating requirement. For example, when cigarette tax changes are evaluated, the state's revenue estimates do incorporate assumptions regarding changes in cigarette consumption, based on price elasticity of demand assumptions. What is not incorporated, however, are the effects on revenues of the various economic feedback effects that tax changes cause and that characterize dynamic analyses.

Is the DRAM Still In Use?

California's CGE model still does exist, is periodically updated, and gets some use for purposes other then revenue estimating. For example, both the California Air Resources Board and Energy Commission utilize the model to varying degrees in analyzing various policy proposals and changes in the environmental area.

Current and Future Issues Regarding Dynamic Analysis

Figure 4 summarizes a number of current and future issues involving dynamic analysis that California and other states face. These include the reliability and acceptability of the results, the issue of how the results should be used, and whether conducting dynamic analyses make sense from a benefit-cost perspective.

Reliability and Acceptability. Despite the best efforts of economists to develop dynamic estimates that are as accurate as possible, limitations in terms of regional data and reliable assumptions about exactly how different types of tax provisions affect state economies do exist. This tends to inherently limit the acceptance and usefulness of dynamic estimates. Thus, making improvements in these areas is an important requirement if dynamic modeling is to become more reliable and widely accepted.

Use of the Results. The big issue here is whether the results of dynamic revenue analyses should find their way into state budget calculations through the adoption of dynamic scoring.

Although dynamic scoring is not a new issue, it continues to be much debated, not only at the state level, but nationally as well. A variety of opinions exist regarding dynamic scoring, and arguments can be made on both sides of the fence. For example:

- *On the pro side*, arguments include that dynamic scoring makes use of all possible information, failure to do so is at odds with empirical evidence, and advances in technology and understanding of economic relationships makes scoring more defensible.
- *On the con side*, the arguments include that dynamic scoring must rely on many assumptions and can be subject to political pressures, expenditure-side changes would have to be included, computing a budget baseline is difficult when many policy changes must be integrated, and assumptions are needed about how tax and expenditure changes are financed.

Regardless of one's own views on the subject of dynamic scoring and how the topic is ultimately dealt with, it seems likely that, given the various challenges associated with it, the issue will remain unresolved in the near term and continue to be debated for some time.[12,13]

Benefit-Cost Considerations. This issue involves the extent to which it makes sense from a dollars-and-cents standpoint to devote scarce state resources to developing, maintaining, and utilizing comprehensive dynamic revenue estimating models. Well-specified models that use good data and reliable parameters and coefficients are not cheap, and require ongoing updating and modifications. One key question is whether

[12] For discussion relating to the dynamic scoring issue, see, among others: A. Auerbach, "Dynamic Scoring: An Introduction to the Issues," *Papers and Proceedings of the 107th Annual Meeting of the American Economic Association*, May 2005, pp. 421-425.

[13] This view is captured in recent comments by Rudolph Penner (currently at the Urban Institute and a former director of the Congressional Budget Office) regarding the dynamic scoring issue at the federal level. These are of particular interest here given that the challenges of state-level dynamic revenue estimating and scoring can be even greater than the federal ones, due to such factors as data problems and migration and trade flows. With reference to tax reductions, Penner notes: "Advocates for pro-growth tax cuts are frustrated … because formal revenue loss estimates used by Congress during the budget process ignore revenues recouped from the increase in economic activity which occurs as a result … but those who are frustrated and want the error corrected should be cautious … The fact of the matter is that economists differ significantly in their assessment of the effects of tax cuts … there are important conceptual, political, and logistical reasons why a more complete analysis would be difficult, if not impossible … Dynamic scoring would force analysts to make many more judgment calls than they do today. Quality control would be difficult, and that implies a high risk that ideological biases will pollute the analysis … There may come a day when there is sufficient agreement about dynamic effects to automate the process … But we are many decades from such a technology. So, for a very long time, the Congress will have to be satisfied with static scoring. That is not so bad. The CBO's dynamic analysis suggests that static scoring is usually pretty accurate." (See R. Penner, "Dynamic Scoring: Not So Fast!" Web site publication summary, Tax Policy Center, a Joint Venture of the Urban Institute and Brookings Institution, April 21, 2006.

the added value of such comprehensive models is justified by their revenue-estimating benefits—especially given their apparent relatively modest dynamic feedback effects in California's case—compared to simply using various rule-of-thumb approaches and other less-costly methodologies, or simply sticking with static estimates adjusted for the effects of major direct and indirect behavioral responses that can be specifically researched.

So, What's the Bottom Line?

California's experience with dynamic revenue estimating yields a mixed picture. As noted in Figure 5, dynamic estimating has provided California with new and useful insights and qualitative information regarding how tax changes affect the state's economy and the revenues that it produces. On the other hand, dynamic state revenue models inherently face many data and specification problems which make their quantitative outputs subject to limitation, some debate, and very sensitive to their underlying assumptions.

Given this, it is unclear at this point whether California's policymakers will at some point in the future reestablish a formal dynamic revenue estimating requirement. Regardless, however, it does make sense for revenue estimators in California and other states to continue strive to more fully understand exactly how tax changes affect revenues.

In approaching this task, it seems this should, at a minimum, include arriving at more reliable understandings of the direct and indirect behavioral effects that tax changes induce and that strongly influence whatever dynamic feedback effects eventually materialize. This would include improving the data available on such behavioral effects. In contrast, the priority given to full-blown dynamic modeling will likely end up depending on the significance of the associated feedback effects and the extent to which the current shortcomings and limitations of dynamic modeling can be addressed.

It should also be noted that one alternative to imposing a broad-based dynamic revenue estimating requirement is using a more targeted or case-study approach, where such analyses are requested only for those specific tax measures for which behavioral and dynamic effects are of particular interest to policymakers and/or can realistically be identified, at least to some degree. This more targeted approach may prove to be more fruitful from a practical standpoint in approaching the dynamic issue, especially given that, in light of the current state of the discipline, much is still unknown regarding the exact impacts that individual state tax policies have on taxpayer behavior and state economies generally.[14]

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[14] As examples of such studies that have been requested and produced in California in recent years, see: *An Overview of California's Manufacturers' Investment Credit*, Legislative Analyst's Office, October 2002, 23 pages; *An Overview of California's Research and Development Credit*, Legislative Analyst's Office, November 2003, 30 pages; *An Overview of California's Enterprise Zone Hiring Credit*, Legislative Analyst's Office, December 2003, 14 pages; and *Out-of-State Purchases: California's Taxation of Vessels, Vehicles, and Aircraft*, Legislative Analyst's Office, April 2006, 26 pages.

Figure 1

Key Provisions of California's Dynamic Estimating Requirement

- ✓ Required the California Department of Finance to develop dynamic revenue analyses for tax bills with significant fiscal effects.
- ✓ Also required the California Legislative Analyst's Office to do the same for any such tax measures that were included in the Governor's annual budget proposal.
- ✓ Specified that these fiscal estimates take into account the probable behavioral responses of taxpayers and businesses, and that dynamic techniques be used in estimating the state fiscal impact of proposals to the extent that data are available.
- ✓ Required that such dynamic analyses be done for those tax proposals whose static revenue impact was greater than $10 million annually.
- ✓ Was to sunset after five years on January 1, 2000, unless otherwise extended.

Figure 2

Basic Characteristics of California's CGE Model

- ***Size.*** The California Dynamic Revenue Analysis Model (DRAM) is comprised of approximately 1,100 equations, exclusive of definitions.
- ***Interrelationships.*** These equations describe the relationships between and amongst California's producers, California's households, California's governments, and the rest of the world.
- ***Sector Disaggregation.*** It divides the California economy into 75 distinct sectors—including 28 industrial sectors; 2 factor sectors (labor and capital, that enter into a constant elasticity-of-substitution production function in each industry); 7 household sectors (each of which consumes 9 composite commodities); 1 investment sector; 36 government sectors (7 federal—of which 5 are revenue and 2 are expenditure, 18 state—including 11 revenue and 7 expenditure, and 11 local—including 5 revenue and 6 expenditure); and 1 sector representing the rest of the world. Also included are 30 individual market-clearing price variables of various types that help to equilibrate supply and demand in each of the individual sectors.
- ***Data Sources.*** A variety are used. For example, the industrial sector relies largely on national data originated with the Bureau of Economic Analysis of the U.S. Department of Commerce, based on the Census of Business. These national data are then converted to California data using Impact Analysis for Planning (IMPLAN), a program that primarily utilizes state-level employment data to scale national-level industrial data down to the size of a state. These sector results are adjusted to be current using forecasted aggregate data developed using the Department of Finance's time-series macroeconomic forecasting models.
- ***Dynamic Adjustments Take Time.*** Like other computable general equilibrium (CGE) models, the DRAM itself is not really a forecasting model. Rather, it is calibrated to produce economic results for a given base year and then, for changes in underlying economic assumptions and policy variables, calculates differences from that base scenario that will eventually result once all of the economy's sectors have had a chance to get back into equilibrium, such as through changes in output prices, labor costs, capital costs, employment levels, investment outlays, and other factors. This process takes years to complete.
- ***Projected Time Paths.*** Macroeconomic forecasting models, which themselves do not have sufficient sector detail to examine dynamic tax effects like CGE models can, are typically used to adjust the model's final aggregate output levels and also the time paths of moving to their new equilibriums.

Figure 3

General Findings From California's Dynamic Revenue Analyses

- ***Magnitude of Effects.*** Generally, the feedback revenue effects generated by California's computable general equilibrium (CGE) model, while definitely present and identifiable, are relatively modest.
- ***Self-Financing Capability.*** There is no evidence from the model that tax rate reductions changes can in general "pay for themselves," as some parties have in the past claimed.
- ***Variability of Effects.*** The specific feedback effects vary, depending on the tax involved and specific tax-law changes being considered.
- ***Investment Impacts.*** The long-term feedback effects for broad-based tax rate changes tend to be greatest for the corporate tax, due to their impacts on investment expenditures and productivity.
- ***Role of Leakages and Migration.*** The partially offsetting dynamic revenue effects from state personal income tax changes are influenced by both the deductibility of state income taxes on federal income tax returns and the high savings propensities of upper-income individuals. Thus, for example, some of the benefits to individuals from a state tax-rate reduction will not enter the state's spending stream due to the resulting higher federal taxes and personal savings. However, the benefits to economic performance such as job growth still can be significant, partly due to the interstate population in-flows that will be induced.
- ***Sensitivity to Assumptions.*** The CGE model's results are very sensitive to the values used for many of the various elasticities contained in it, especially those relating to such things as population migration and trade flows. Because the true values of these elasticities are often not know with certainty, especially at the state level, educated guesses and assumptions about them often have to be made, and errors in this regard can significantly reduce the model's reliability.

Figure 4

Issues States Face Regarding Dynamic Analysis

- ***Reliability and Acceptability.*** Given the limitations of the data and underlying relationships incorporated in dynamic models at the regional and state levels, can such models and their outputs be improved sufficiently to make them reliable in the eyes of policymakers that rely on them for making decisions about tax policies?
- ***Use of Results—Including the Dynamic Scoring Quandary.*** How should the results of dynamic revenue estimating be used? In particular, should they be incorporated into state budget calculations, and if so, how should issues be addressed involving how tax changes are to be financed, the consistent treatment of revenues and expenditures in the dynamic context, and the integration of multiple revenue and expenditure policy changes?
- ***Benefit-Cost Considerations.*** Is the cost of developing, maintaining, and utilizing dynamic revenue estimating models justified by the benefits, especially given the magnitude of the feedback effects identified thus far and the various issues associated with their reliability and acceptability?

Figure 5

What's in the Future for Dynamic Revenue Estimating?

- ✓ California's dynamic modeling capabilities have provided new and useful insights into the potential effects of tax changes on both the economy and state budget.
- ✓ Despite the fact that the *quantitative* findings from dynamic analysis can frequently be subject to disagreement—due to data limitations, methodological issues, and their dependency on and sensitivity to key modeling assumptions—the *qualitative* results of such analysis are often useful in thinking about the various potential ramifications of tax changes.
- ✓ The sensitivity tests that such analysis can provide can be especially interesting, although they too can be controversial and are highly dependent on key assumptions.
- ✓ As additional and/or improved economic and fiscal data and estimating methodologies become available over time, these can be incorporated into state dynamic analysis models. It remains to be seen, however, whether such improvements will result in the findings from such analyses becoming generally accepted as reliable.
- ✓ Incorporation of dynamic *revenue* estimating results in "scoring" for budgetary purposes will also require recognition that similar dynamic scoring also must be done on the *expenditure* side of the budget, given that the two are intertwined.
- ✓ Even if states do not choose to routinely undertake full-blown dynamic revenue analyses, they still can greatly benefit from improving their understanding of the direct and indirect behavioral effects of tax changes. They also can focus their resources on targeting for special review those specific tax proposals whose behavioral and dynamic effects are of particular interest.