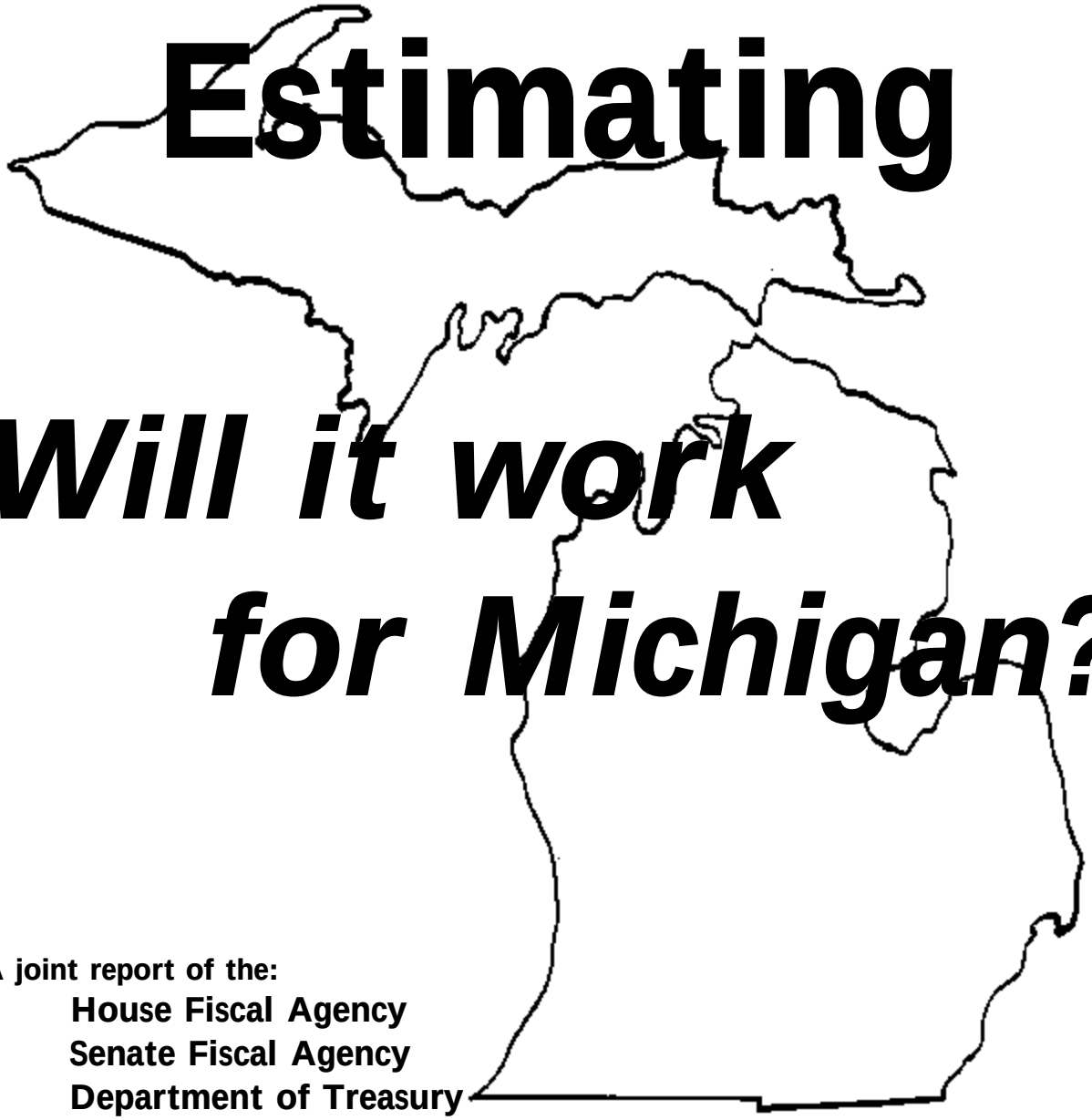
Dynamic Revenue Estimating



Will it work for Michigan?

A joint report of the:

House Fiscal Agency
Senate Fiscal Agency
Department of Treasury

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INTRODUCTION

State policy makers need revenue estimates for two reasons:

- The state budget is based on consensus estimates of General Fund/General Purpose and School Aid Fund revenues.

- State policy makers must be able to assess the impact of proposed state tax policy changes on current and future state revenue collections.

Due to recent changes in technology, a more sophisticated approach to estimating the impact of proposed tax policy changes is available. This approach is usually called "dynamic revenue estimating."

Dynamic revenue estimating incorporates both direct (static) effects and indirect (dynamic) effects of tax policy changes on taxpayer behavior and/or state economic activity through the use of a sophisticated model of the state economy. Traditionally, states have used the static revenue estimating approach (which implicitly assumes that tax law changes have no impact on taxpayer behavior and state economic activity) and have relied on *ad hoc*[1] adjustments based on economic theory and research to capture the effects of changes in taxpayer behavior on state revenues. Recent legislative interest in the prospect of formally incorporating dynamic estimating methods into policy analysis gave impetus to this project to assess the feasibility of using dynamic revenue estimating procedures in Michigan.

In the spring of 1996, as a result of legislative interest in dynamic revenue estimating, the Senate and House Fiscal Agencies and the Michigan Department of Treasury initiated a study. The goal was to

[1] Adjustments that the model is incapable of making due to the static nature of the model.

inventory the use of dynamic forecasting in other states, evaluate the experience of other states in applying the approach, and ascertain whether dynamic estimation methods might prove useful to policy analysis in Michigan. Research was conducted on dynamic forecasting; other states (known to be using dynamic estimation) were contacted; and key staff were interviewed to learn about their experiences with dynamic forecasting. In addition, the 50 states (and the District of Columbia) were surveyed to determine how many states have actually done dynamic analysis, how prevalent these analyses have been, and what types of dynamic and static models states are using. Survey results are reported in Appendix C.

On September 30, 1996, the Senate Fiscal Agency, House Fiscal Agency, and Department of Treasury sponsored a conference assembling experts from states with experience in dynamic revenue estimating, the private sector, and academia. Speakers discussed the success of these types of analyses and the models employed, and responded to many questions from seminar participants. The seminar was open to all interested parties; 62 people were registered. A list of registrants is included in Appendix B.

Fiscal Agency and Department of Treasury staff were invited to attend a symposium on dynamic revenue estimating hosted by the Joint Committee on Taxation (JCT) in Washington, D.C. on January 17, 1997. During the symposium, results of a year-long study by nine groups of economists who simulated the dynamic effects of three alternative tax systems were presented. A summary of the JTC symposium is presented in this document.

This report:

- summarizes the findings of the research study undertaken in the spring of 1996;

- explains the pros and cons of static versus dynamic analysis;

- contrasts the estimating procedures currently used in Michigan with those in other states using dynamic analysis;

- discusses:

  - current thinking on the magnitude of dynamic effects,
  - status of model development,
  - difficulty of managing the models, and
  - other important issues.

Michigan's options and agency recommendations are presented at the end of the report, as is a selected bibliography.

SEMINAR HIGHLIGHTS AND SUMMARY OF KEY ISSUES

Overview of Static Versus Dynamic Revenue Estimates

A. Two types of revenue estimates are made by state governments:

1. *Baseline Revenue Forecast Estimates:*
   Estimate the amount of revenue that will be generated by a state's tax base over the forecast period, assuming no changes in tax rates, credits, exemptions, or other changes to the tax base. The key input used to estimate baseline revenues is the projected level of economic activity for the forecast period.

2. *Revenue Estimates for Tax Law Changes:*
   Estimate how much revenues will deviate from the baseline estimate, given a specific change in existing tax law.

B. Static and dynamic revenue estimates are two different approaches to estimating the impact of tax law changes on revenue.

1. *Static Revenue Estimates:*
   Estimate the direct impact a tax law change will have on revenue. Implicitly, this approach assumes that tax law changes will have little or no impact on taxpayer behavior or on the overall level of economic activity in various sectors of the economy.

2. *Dynamic Revenue Estimates:*
   Estimate the direct impact a tax law change will have on revenues, as well as the feedback effects that

occur due to changes in taxpayer behavior and overall economic activity. Examples of feedback effects include changes in the level of employment induced by policy changes which, in turn, affect state tax revenues. A dynamic revenue estimate must also factor in the impact of any changes in state expenditures that would occur due to a tax law change.

Procedures Currently Used in Michigan

Michigan analysts currently prepare static revenue estimates and adjust the static estimates for the effects of policy-induced changes in taxpayer behavior. The adjustments are based on standard price and income elasticity[2] estimates. For proposed changes to the Single Business Tax or the Individual Income Tax, micro-simulation models that use a sample of actual taxpayer returns are used to produce a static estimate. When appropriate, static estimates derived from the models are also adjusted for policy-induced changes in taxpayer behavior.

Dynamic Estimation Procedures Used by Other States

A. The following states have developed, or are in the process of developing, various types of models for use in producing dynamic revenue estimates:

California Connecticut Massachusetts Minnesota Utah W ashington West Virginia

[2] Price and income elasticities measure the sensitivity of taxpayer behavior to policy changes that affect personal income and the price of goods and services.

B. In 1995 and 1996, according to an October 1996 survey conducted by the Michigan Department of Treasury, state analysts produced ten dynamic analyses compared to 7,372 static analyses:

	Number of Analyses Produced
Connecticut	3
Minnesota	1
New York	3
Utah	1
West Virginia	2

No other state reported using dynamic analysis of tax-policy proposals.

C. Massachusetts developed a dynamic model in 1992 using an advisory panel consisting of legislative leaders, academic and business economists, and a private consulting firm. The model was built by Price Waterhouse, and the advisory panel provided input and oversight on the project.

The dynamic feedback effects estimated by the Massachusetts model were much lower than expected by some state officials; hence, the initial estimates were heavily criticized and mistrusted. The model is still being used to assess the impact of tax policy changes, but on a much more limited basis than originally envisioned.

D. California is required by a 1994 state law to begin conducting dynamic revenue estimates in 1997 for all proposed tax changes that have a static impact of at least $10 million. The California Department of Finance has developed a model and is currently refining and testing it. Three simulated analyses have been completed to date.

E. In 1993, Minnesota developed a set of micro-simulation models and integrated them with a Regional Economic Models, Inc. (REMI) model to evaluate the dynamic impact of exempting purchases of replacement capital equipment from the 6.5% state sales tax. The micro-simulation models included an individual income tax model, a corporate income tax model, a consumption tax model, and a tax incidence model. The integrated model was part of a one-time, special analysis and has not been used subsequently. The Capital Equipment Advisory Council was formed by the legislature to oversee this project.

Dynamic Feedback Effects of Tax Law Changes

The following information is based on results from simulations done in California, Massachusetts, and Minnesota.

A. *Sales Tax Cuts:*
Consumption tax cuts (sales taxes) appear to have a dynamic feedback effect of 5% to 7%. This means that the direct revenue foregone due to a sales tax reduction will be offset by about 5% to 7% from new tax revenue resulting from the new economic activity generated by the initial tax reduction. For example, a $100 million tax cut would reduce revenues by $93 to $95 million because of dynamic feedback effects.

B. *Income Tax Cuts:*
Individual income tax cuts seem to have a smaller dynamic effect -- approximately 1%.

C. *Capital Investment Tax Cuts:*
Tax cuts on capital (business investment) seem to have the strongest dynamic impacts. Initial measures indicate the dynamic impact is somewhere between 10% and 18%.

These estimates do not account for the impact of the federal deductibility of state and local taxes.

Taking federal deductibility into account would lower the effective tax cut and reduce the dynamic impact to a range of about 7% to 12%. One study suggests that the impact of federal deductibility of state and local taxes "…roughly cuts in half the (potential) value of (state) tax cuts for business…"[3]

It typically takes five years or more before the dynamic economic feedback effects are fully realized. Dynamic models only provide estimates of the net (i.e. final) impact of the policy change. They do not provide estimates during the transition (five or more years) period.

Dynamic Model Development and Operational Management Issues

A. *Credibility and Assumptions:*
Key to the process is the credibility of the methodology and the assumptions incorporated into the model(s) used to perform dynamic analyses.

B. *Timeliness:*
State policy makers are often accustomed to expecting analyses almost instantaneously. Instant analyses that incorporate dynamic effects are not feasible due to the large number of assumptions, the volume of information, and the review processes that are required to set up the model. Hence, the flow of information for the legislative process may be slowed down if dynamic analyses are incorporated.

C. *Appropriateness:*

[3] *STATE POLICY REPORTS*, VOL. 14, ISSUE 16; page 16.

Because of the complexity and time required to perform dynamic analyses, they may only be appropriate for major tax policy changes with significant static revenue impacts.

Other Issues and Observations

A. Overall experience in developing and using dynamic revenue estimating models among the states is very limited. There is still much to be learned in this area.

B. Because it typically takes at least five years for the economic impact of dynamic effects to be fully realized, policy analyses would need to include estimates of both short-term static, and long-term dynamic impacts.

C. A dynamic revenue estimating model does not eliminate the need for static revenue estimates. In fact, more detailed static estimates by taxpayer income groups and business types are required before the dynamic impact can be accurately measured.

D. A number of assumptions (sometimes *ad hoc*) are unavoidable because no model is capable of capturing all the interactions that occur over time when tax policy changes.

E. In addition to revenue estimates, dynamic analysis would provide estimates of the impact of policy changes on employment in various sectors.

F. Developing a good dynamic model requires a significant amount of economic data in order to identify the relationships and responses among and between sectors of the economy as economic activity changes. Most of the problems encountered in building a good dynamic model at a state level are due to the lack of key economic data

and information on how large changes in tax and expenditure policies impact economic behavior.

G. The initial cost of developing a dynamic revenue estimating model is in the range of $250,000 to $350,000. Ongoing costs would also be incurred to maintain and operate the model.

H. An important first step in developing a dynamic revenue estimating model is to improve and expand the ability to make static revenue estimates. In order to enhance Michigan's ability to conduct detailed static estimates, additional micro-simulation models on the sales tax, property tax, and tax incidence will be needed.

I. Who should have access to the model(s)? is a critical question. In Michigan, only the Department of Treasury has access to the state's Income Tax and Single Business Tax micro-simulation models because these models use actual taxpayer records which are protected by confidentiality laws.

J. The Minnesota and California simulations assumed no changes in the rates in other states. However (at least in the long run, and perhaps in the not-so-long run), other states are likely to respond in kind. Hence, the competitive advantage, and at least some of the feedback effects, will be eroded over time, if not immediately, as states compete for business expansions.

SUMMARY OF COMMENTS BY GUEST SPEAKERS

Input from Academia

Dr. George Fulton[4], Research Scientist, University of Michigan, provided a unique perspective to the Dynamic Revenue Estimating Seminar. Dr. Fulton has been involved in forecasting Michigan economic and fiscal activity for over ten years as a member of the Research Seminar in Quantitative Economics (RSQE). He has also worked for a number of years with the Michigan Departments of Commerce, Treasury, and Transportation, and the Jobs Commission, evaluating economic development strategies and conducting policy analysis. In addition, Dr. Fulton is a nationally-recognized expert in using the input/output model of the Michigan economy developed by Regional Economic Models, Inc. (REMI) and has used the REMI model to analyze the economic impacts of auto plant closings in Michigan, Michigan Economic Growth Authority (MEGA) tax incentives, and numerous other economic development plans.

At the seminar, Dr. Fulton discussed the current role of the University of Michigan in the state revenue forecasting and policy analysis process; technical details of the REMI model of the Michigan economy, and examples of how the REMI model has been used thus far; the context of the models used for dynamic revenue estimating; and important issues in making the process operational.

The Role of The University of Michigan

Since 1973, the University of Michigan Research Seminar in

[4] Dr. Fulton received a Ph.D. in Economics from the University of Michigan. He is a research scientist at the Research Seminar in Quantitative Economics (RSQE), University of Michigan. He is also a research scientist at the Institute of Industrial and Labor Relations at the University where he is Director of Labor Market Research and a member of the Institute's executive board. He is also adjunct Professor of Public Policy.

Quantitative Economics (RSQE) has been under contract with the state to provide and maintain an econometric model of the state economy. The RSQE model produces quarterly forecasts of U.S. and Michigan economic activity and major state tax revenues. The forecast horizon is two to three years. The RSQE model is available to the House and Senate Fiscal Agencies and the Department of Treasury via modem. All three agencies have the capability to modify the assumptions of the model and use it extensively in the consensus revenue estimating process.

The RSQE hosts a conference on the economic outlook for the U.S. and Michigan each year. In addition, Dr. Fulton and other members of RSQE present forecasts to the Consensus Revenue Estimating Conference twice each year, the Governor's Economic Round Table once each year, and the State Officers' Compensation Commission on a bi-yearly basis.

Regional Economic Models, Inc. (REMI)

Dr. Fulton also discussed a variety of technical and conceptual issues related to the REMI model. Conceptually, REMI is similar to a standard input/output[5] model because it incorporates buying and selling transactions among industries at a detailed level. The REMI model goes beyond standard input/output models, however, because it also traces the implications of economic actions over time. The model incorporates:

- interindustry transactions and endogenous[6] final demand feedback effects,

[5] This type of model incorporates the fact that the goods/services produced by one industry (output) may be an input to the production process in another industry. Therefore, policies that initially affect one industry may have economy-wide effects.

[6] The way policies that initially affect one industry also impact the rest of the economy.

- substitution among factors of production in response to changes in relative factor costs,

- migration that occurs in response to changes in labor market conditions, and

- changes in state and local shares of the export market due to changes in regional production costs and profitability.

The REMI model is composed of output and industry demand equations for 49 private, non-farm industries; three government sectors; the farm sector; and consumption equations by industry based on real disposable income received by consumers. Real disposable income equations describe:

- wage and salary income,
- other labor income,
- property income,
- personal contributions to social insurance, and
- transfer payments.

The model also includes three types of investment equations: residential investment, nonresidential investment, and equipment investment. Government spending equations predict government spending for six components: federal civilian, military, and state and local expenditures for education, health and welfare, public safety, and miscellaneous[7].

Examples of how the state REMI model has already been used include: economic impact of the K.I. Sawyer military base closing, the economic/revenue impacts of announced General Motors plant closings, impacts of higher oil prices on Michigan, and the impacts of

[7] For an extensive description of the REMI model see; Treyz George I., Dan S. Rickman and Gang Shao; The REMI Economic-Demographic Forecasting and Simulation Model; *International Regional Science Review*, Vol 14, No. 3, pp. 221-253, 1992.

the Mitsubishi plant location decision, among others.

Issues in Making the Process Operational

Dr. Fulton raised a number of important points about making the proposed process (of generating dynamic estimates of tax policy changes) operational. Incorporating more sophisticated modeling into the process may necessitate changing the procedure for making requests for bill analyses to allow a longer lead time to perform an analysis.

Any dynamic model will require maintenance and testing on an ongoing basis. The technical work will require a great deal of sophistication and a thorough understanding of the issues. Important questions for consideration include:

- Who should do the technical work?
- Should the work be done in-house, or should some arrangement be made with academia or the private sector?
- If the work is done in-house, is the permanency of staff an issue?
- If the work were done to some extent in an academic setting, would that environment be compatible with the requirements of the process?

Dr. Fulton also stressed the importance of the "credibility of message and the messenger" to the whole process.

Private Sector Experience

Michael Vlaisavljevich[8], Managing Director of the Barents Group, KPMG Peat Marwick, gave a presentation titled, *Dynamic Revenue Estimating: Meeting The Challenge.* Mr. Vlaisavljevich noted that both economic theory and research indicate that taxes influence behavior through a variety of complex interactions that typically include successive rounds of impacts. Although the long-term magnitude and direction of these "feedback effects" are debatable, he suggested that these effects should be incorporated, to the extent technically feasible, into fiscal impact and revenue estimates.

The Dynamic Revenue Estimating Process:

Mr. Vlaisavljevich used the diagram shown in Figure 1 to explain the dynamic revenue estimating process. The process involves the following major steps:

1. *Baseline Economic Forecast:*
   The first step in the process is to prepare a forecast of economic activity. This "baseline" forecast assumes that no changes in tax policy occur for the forecast period.

2. *Direct (Static) Revenue estimates of the Proposed Tax Change:*
   Using a micro-simulation model, or some other method, the direct or static revenue impact of a tax change is estimated. The static estimate is predicated

[8] For the past 9 years, Mr. Vlaisavljevich has directed consulting projects in over 20 states including business tax competitiveness model projects for North Carolina and Kentucky; tax policy simulation models projects for Rhode Island, Arizona, Kansas, Iowa, Kentucky, Minnesota, and Pennsylvania; and a multi-year budgeting project for North Carolina. He has also managed projects to produce a forecasting model for Guam; and economic impact analyses for the Department of Defense, Intel, and Argonne National Laboratory. Prior to becoming a consultant, Mr. Vlaisavljevich was Tax Policy Director for the Wisconsin Department of Revenue for eight years and Senior Fiscal Analyst with the Wisconsin Legislative Fiscal Bureau for five years.

on the baseline economic forecast.

3. *Dynamic Economic Impact Model:*
   The static revenue impact is then fed into the dynamic economic impact model to estimate the effects the tax policy change will have on economic activity. This model estimates the change in economic activity by estimating the impact the tax policy change will have on key factors such as taxpayer behavior, employment, and business investment.

4. *Revised Revenue Estimates:*
   The revised economic forecast that incorporates the changes in economic activity predicted by the dynamic model is then used to estimate the dynamic revenue impact of the proposed tax change. This new estimate is called a dynamic estimate because it reflects both the direct (static) effect and the secondary (dynamic) effect of the tax policy change.

Managing the Process:

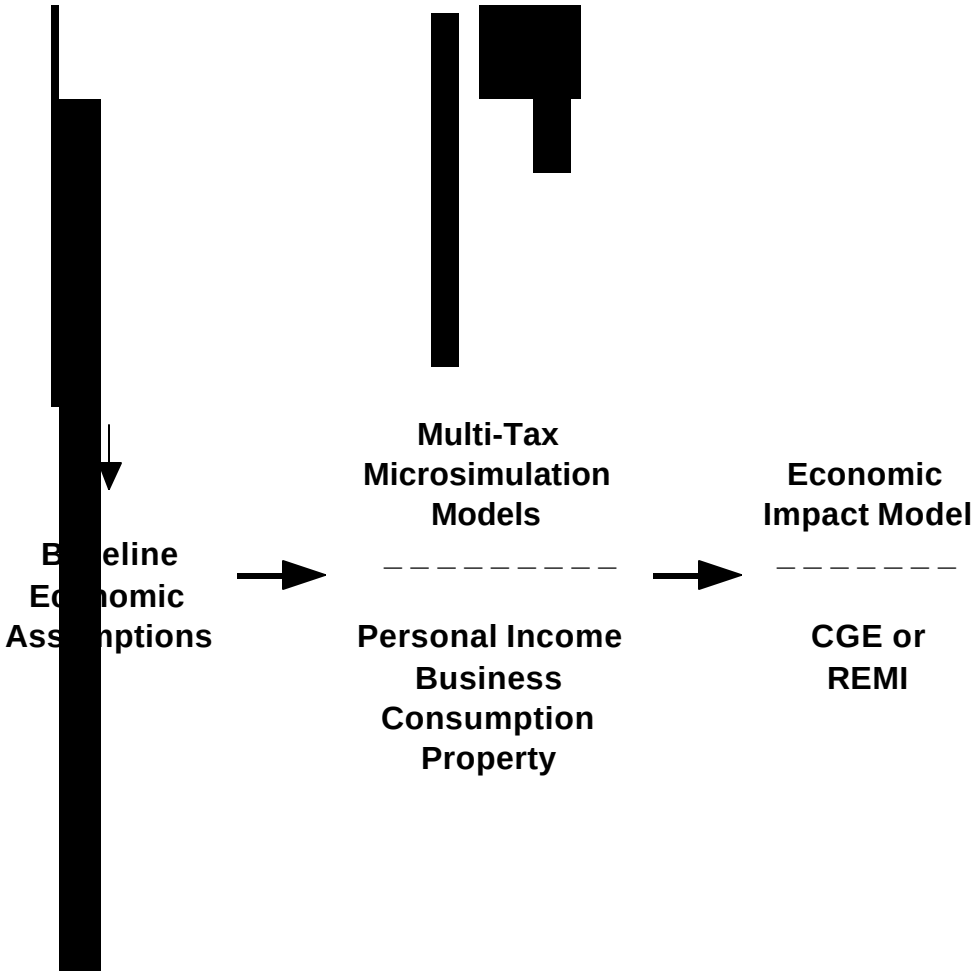
Mr. Vlaisavljevich also discussed how the process of incorporating dynamic analysis into the current methodology might best be managed. Key to the process is the credibility of the methodology and the assumptions incorporated into the model(s) that would be required to perform dynamic analysis. He also suggested that this type of analysis should be reserved for major tax policy changes.

Important issues with respect to managing the process were discussed as well. State policy makers are often accustomed to receiving analyses almost instantaneously. Since instant analyses that incorporate dynamic effects are not feasible due to model set-up and review requirements, the legislative process

may be slowed down if dynamic analyses are incorporated. As with any new technology, it is important to guard against unrealistic client (i.e., policy-maker) expectations and maintain credibility. Mr. Vlaisavljevich suggested that there may be a need to obtain outside assessments of the models/technology to verify that models are state-of-the-art, and are being used by competent professionals. It will also be important to ensure that model applications and objectives are credible.

Figure 1

Dynamic Revenue Estimating Model System


Multi-Tax
Microsimulation
Models
Economic
Impact Model
Personal Income
Business
Consumption
Property
CGE or
REMI

The California Experience

Dr. Bruce Smith[9], California Department of Finance, presented an overview of Computable General Equilibrium (CGE) models and discussed the California experience. In August 1994, the State of California adopted legislation that requires the California Department of Finance to incorporate the effects of the dynamic responses of economic agents when evaluating the fiscal effects of changes in tax policy. In September 1995, Dr. Smith was hired to build, maintain, and operate the California CGE model.

Computable General Equilibrium (CGE) Models:

In his first presentation, *Computable General Equilibrium Models,* Dr. Smith discussed what CGE models are, what the good and bad aspects of CGE models are, and the process California used to build a CGE model of the California economy. Computable General Equilibrium models are the most recent contribution to the field of applied economic modeling. While the basic economic theory underlying CGE models has been part of the professional literature for some time, implementation of the theory required the advent of sophisticated computer software and technology.

In its most basic form, a CGE model is a description of the relationship between and among producers, households, government, and the rest of the world. In order to capture the "dynamic effects" of tax-policy changes on an economy, the model must do a number of things simultaneously. It must track the income of individuals and firms (because this is the basis of income taxation) and it must track the sale of the goods and services that serve as the basis of excise taxes. In order to be

[9] Dr. Smith received a Ph.D. in Economics in 1993, from the University of Texas at Austin. His dissertation topic was *Optimal Regional Economic Policies from Computable General Equilibrium Models*. He taught briefly at San Antonio College. On September 1, 1995, Dr. Smith began working for the California Department of Finance, designing and building a CGE model of the California Economy to be used for tax policy analysis.

dynamic, it must also track the effects of taxation on the economy's use of labor and capital, as well as other economic reactions to state fiscal policy.

California's Dynamic Model:

No model can account for every interaction in the economy; hence, the model must aggregate sectors of the economy. The California model divides the economy into 75 sectors: 28 industrial sectors, two factor sectors (capital and labor), seven household sectors (by household income), one investment sector, 36 government sectors (seven federal, 21 state, and eight local), and one sector that represents the rest of the world.

The biggest problem with modeling various sectors of the economy is a lack of accurate data. For example, in order to model the California economy, data for the industrial sectors had to be estimated using national industrial data collected by the Bureau of Economic Analysis in 1987. The data were "scaled-down" to the state level and "adjusted" to approximate economic conditions in California in 1995-96.

It is also important to note that although California has a working Computable General Equilibrium model and has been testing the model by simulating certain tax policy changes, the California Department of Finance has not yet presented any estimates of the dynamic effects of actual legislation to the California Legislature. The reaction of policy makers and the way these estimates stand up to further scrutiny remain to be seen.

The Minnesota Experience

Dr. Robert Cline[10], Director of Tax Policy Research, Minnesota Department of Revenue, gave a presentation titled, *Minnesota's Experience with Dynamic Revenue Estimating*. Whereas the California Legislature mandated that a dynamic model be developed and used to estimate the dynamic effects of all substantial tax policy proposals, the Minnesota Legislature asked the Office of Tax Policy Research to analyze the dynamic effects of only one major proposal: exempting capital purchases from the state sales tax. Minnesota's experience is important in that the results of the analysis, the model, and the process were all deemed credible by both state policy makers and industry representatives.

The process started in 1993 when the Capital Equipment Advisory Council (consisting of 14 members appointed by the Governor, the Senate, and the House) was created and charged with evaluating the proposal. The Tax Research Division was assigned the responsibility of doing the actual dynamic estimates. The Council also established a technical group consisting of private sector tax specialists, economists, and state agency staff. This group met frequently for a period of five months to discuss methodology, data, and model results. Hence, although specialists within state government developed the model and generated the estimates, industry representatives and specialists in the private sector had the opportunity to provide input and monitor the process. In Dr. Cline's view, the openness of the process mitigated potential controversy over the final estimates produced by the model.

Minnesota's Dynamic Model:

The dynamic model used in the Minnesota analysis incorporated an economic forecasting model developed by Regional Economic

[10] Dr. Cline received a Ph.D. in Economics from the University of Michigan. He has served as the Director of Tax Policy Research, Minnesota Department of Revenue, since 1989, and is currently managing the Pennsylvania Tax Blueprint Project for Price Waterhouse in Washington, D.C. Dr. Cline was Director of the Office of Revenue and Tax Analysis, Michigan Department of Management and Budget, in 1984-86; has held research positions at the U.S. Advisory Commission on Intergovernmental Relations and the Urban Institute; and has taught at the University of Michigan, Georgia State University, the University of Minnesota, Hope College, and Manchester College.

Models, Inc. (REMI). The REMI model is an input/output model composed of aggregate demand equations for consumption, investment, government spending, and exports from Minnesota that determine total spending in the Minnesota economy. A set of equations determines the shares of Minnesota and U.S. purchases supplied by Minnesota firms, and models how state/U.S. shares respond to relative business costs -- including the cost of capital. The REMI model was used in conjunction with a cadre of micro-simulation models developed by the Tax Research Division.

Model Assumptions:

Dr. Cline's discussion demonstrated that, in analyses of this type, a number of important (and sometimes *ad hoc*) assumptions are unavoidable because no model is capable of capturing all the interactions that occur over time when tax policy changes. For example: What should be assumed about the behavior of other states?

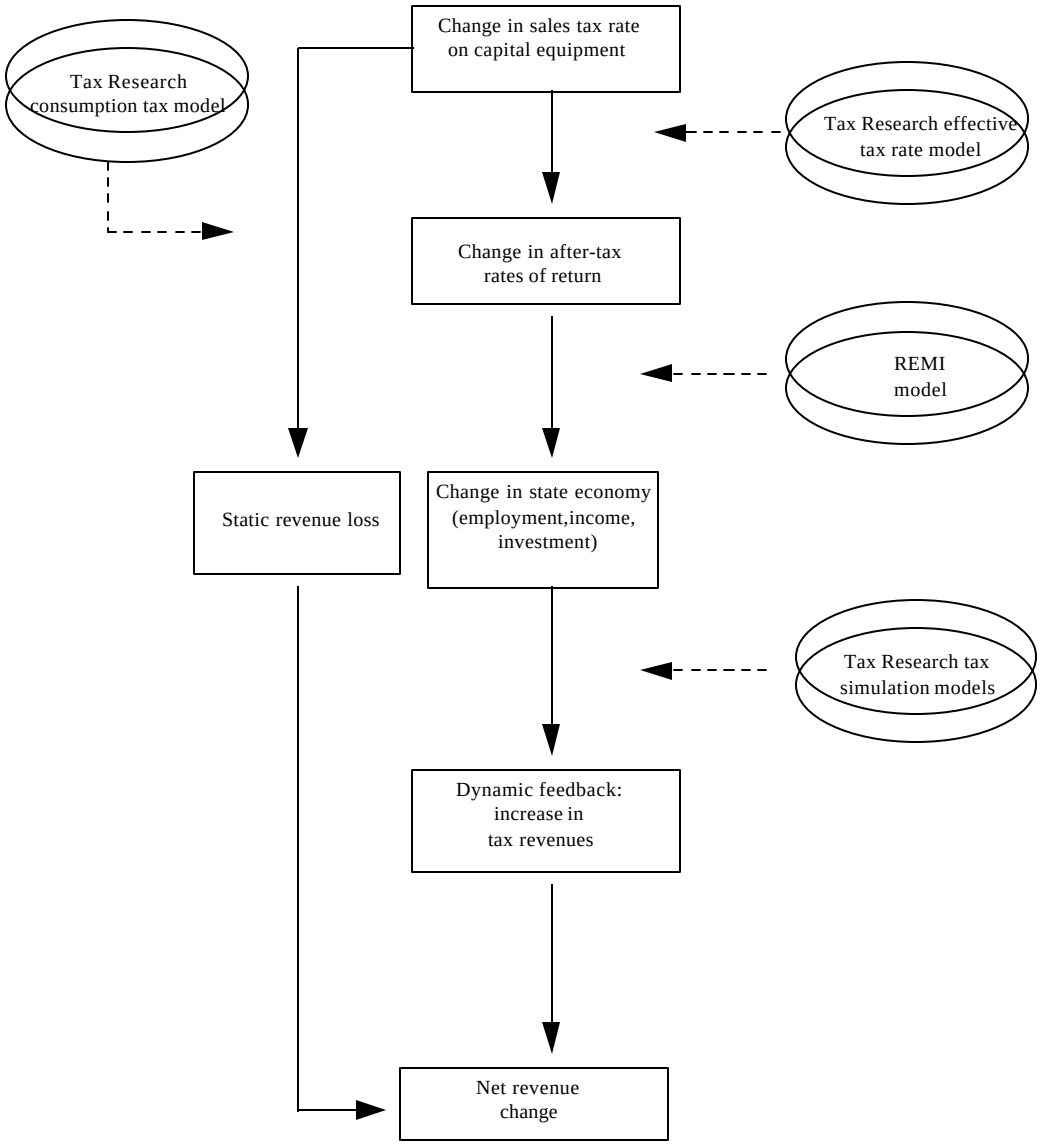
Tax incidence analysis[11] of the relative effect of a state tax rate demonstrates that taxes on capital are germane. We also know that states actively compete and respond to changes in competitor states. The Minnesota and California simulations assumed no changes in the tax rates of other states. However (at least in the long run, and perhaps in the not-so-long run), other states are likely to respond in kind. Hence, the competitive advantage, which causes at least some of the feedback effects, will be eroded over time.

[11] The analysis of which individuals/firms bear the ultimate burden of taxes.

Figure 2

Minnesota's Dynamic Model

Methodology for Simulating Feedback Effects from
Reducing the Sales Tax on Capital Equipment



The Massachusetts Experience

Scott Jordan[12], Deputy Director, Office of Tax Policy Analysis, Massachusetts, discussed Massachusetts' experience with dynamic estimates. Massachusetts developed a dynamic model in 1992. Model development was overseen by an advisory panel consisting of legislative leaders, academic and business economists, and a private consulting firm. The model was built by Price Waterhouse. The advisory panel provided input and oversight on the project.

The model produced much lower dynamic feedback effects than were expected by some state officials. Because of this, the initial results were heavily criticized, mistrusted, and largely ignored by the Legislature. The model is still being used by staff to assess the impact of tax policy changes, but on a more limited basis than originally envisioned. To date, three analyses have been completed and presented to the Legislature. The Office of Tax Policy Analysis has recently hired an economist with CGE experience, and is in the process of developing a new CGE model of the state economy.

[12] Mr. Jordan earned a bachelor's degree in economics in 1989 from the University of Massachusetts at Amherst. He served as a staff research analyst for three years, was named manager of the Tax Policy Analysis Unit in 1993, and Deputy Director of the Office of Tax Policy Analysis in 1995.

SUMMARY OF A SYMPOSIUM
SPONSORED BY THE JOINT COMMITTEE ON TAXATION

On January 17, 1997 the Joint Committee on Taxation, U.S. Congress (JCT) sponsored a symposium entitled "Modeling the Macroeconomic Consequences of Tax Policy." At the symposium, economists noted for their work in developing models of the U.S. economy presented the results of a year-long modeling experiment. Responding to a request from JCT staff, nine groups of economists simulated the dynamic effects of three alternative tax systems:

- a flat-rate unified income tax,
- a flat-rate consumption tax with transition rules[13], and
- a flat-rate consumption tax without transition rules.

During two morning sessions, representatives from nine groups of economists[14] described the key features of their respective models and the predictions that their models produced. Discussions in these sessions focused on behavioral assumptions and mechanisms within the models which capture the effects of tax policy changes on consumers' and firms' behavior in various markets. Session participants also discussed how the different models linked changes in taxes to changes in economic activity.

During the afternoon session, a panel of experts[15] not directly

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[13] Transition rules refer to changes in tax law that are phased in over a number of years. Any significant policy change produces winners and losers. The purpose of transition rules is to ameliorate the negative effects of policy changes.

[14] Participating groups included economic modelers and discussants from the Congressional Budget Office; the Federal Reserve Board; the University of Texas at Austin; Michigan State University; the Joint Committee on Taxation; Macroeconomic Advisors, LLC; Fiscal Associates, Inc.; DRI Inc./McGraw-Hill; Congressional Research Service; and Coopers & Lybrand, LLC.

[15] This group consisted of Michael J. Boskin, Hoover Institute, Stanford University; Robert Reischauer, Brookings Institution; Harvey Rosen, Princeton University; and Joel Slemrod, University of

involved in the modeling experiment itself discussed the short-term and long-term prospects for incorporating dynamic analysis into the process of estimating the revenue impact of proposed tax policy changes. The panel discussed:

- the degree of consensus that exists on various behavioral results,
- the feasibility of incorporating macroeconomic effects[16] into year-by-year revenue estimates,
- the feasibility of developing rules for identifying the types of tax policy proposals for which dynamic estimates should be included,
- incorporating short-run disequilibrium effects[17] in revenue estimates, and
- the prudence of incorporating dynamic effects in isolation from direct and indirect budget outlay effects.

Strengths and Weaknesses of Models Currently Available

Strengths:

- Some of the models do a fairly good job of modeling a particular sector of the economy (such as consumers, businesses, and capital formation), and are able to estimate how the particular sector will react to a given

Michigan.

[16] For example: the effects of policy changes on GDP growth, inflation, interest rates.

[17] These are the economic effects that occur during the transition period when the economy is still adjusting to the effects of tax policy changes.

tax change.

' Given the tax change scenarios that each model tested, many of the models had very similar estimated macroeconomic effects.

Weaknesses:

' The models do not incorporate the intricacies of the federal tax code, and therefore are useful only for broad, yet uncomplicated tax changes.

' The models are not able to measure the impact tax changes will have on tax simplification or administrative costs.

' While some of the models have a fairly detailed model of a particular sector of the economy, none of the models excel at two or more sectors.

' None of the models are particularly good at capturing the labor supply and savings rate responses to major tax changes.

' In reality, any major tax change is going to include short-term transition rules to help prevent abrupt changes in tax liabilities. Therefore, short-term impacts may be very different from long-term impacts, but these short-term impacts are particularly difficult to estimate.

' Almost all of the models ignore state and local governments and their possible responses to federal tax reform. In reality, reactions by state and local governments to federal tax reform could negate some of the macroeconomic impacts these models are estimating.

' A particular model can provide very different

macroeconomic effects to a given tax policy change with a different set of “reasonable” assumptions.

Conclusions

- These models are not yet ready for formal use, due to the numerous weaknesses in existing models.

- It is not realistic to measure the dynamic effects of every tax proposal. Once an adequate model is developed, guidelines will be needed to determine which tax bills should be analyzed.

- Work should continue on further improvement of these models. The goal should be to develop a model that is good at disaggregating the impact by income level and age for consumers, and by type of industry for businesses.

- These dynamic models should reflect an open economy; however, a trade sector is very difficult to model.

- In order for a model to be useable, it must include federal, state, and local governments.

- In order to help sort out the best models, reasonableness tests should be conducted on the assumptions used and the elasticities implied by the results.

WHAT ARE THE OPTIONS?

For Michigan, there are five main options for estimating the impact of tax policy changes:

1. Continue to analyze tax policy proposals using the micro-simulation models already in place at the Department of Treasury and, when appropriate, make adjustments for taxpayer behavior. The current system has provided timely and accurate short-run analyses of a wide array of tax policy proposals.

2. Build a sales tax model, a property tax model, and a tax incidence model. These would clearly enhance current capabilities of state agencies to provide accurate short-run analyses.

3. First: Build a sales tax model, a property tax model, and a tax incidence model.

   Second: Modify and integrate the State's REMI model with the micro-simulation models to produce dynamic estimates for major tax policy initiatives. This is one way to produce both static and dynamic estimates.

4. Build a sales tax model, a property tax model, a tax incidence model, and a CGE model of the state economy. Integrate the CGE model with the micro-simulation models to produce dynamic estimates for major tax policy initiatives. This is another way to produce both static and dynamic estimates.

5. Use what we already know about the potential magnitude of dynamic effects to make adjustments to static analysis

produced by micro-simulation models.

RECOMMENDATIONS

The Senate Fiscal Agency, House Fiscal Agency, and the Department of Treasury agree that the following recommendations comprise a prudent and reasonable approach to improving the tools that are currently available for estimating the fiscal impact of proposed tax law changes.

Recommendation #1:

Improve and expand the micro-simulation models available for estimating the direct (static) revenue impacts of tax law changes.

Accurate and detailed estimates of the direct impact of the tax law change are essential when analyzing the fiscal impact of proposed tax law changes. Accurate static estimates are also a critical input to a dynamic revenue estimating model because the first step in preparing a dynamic analysis of a tax law change is to estimate the direct or static impact on state tax revenue. A dynamic model can then estimate the extent and magnitude to which this direct impact will generate additional indirect or secondary impacts.

Currently, the Department of Treasury has micro-simulation models designed to analyze the individual income tax and the single business tax. We recommend that micro-simulation models be developed to analyze proposed changes to the sales tax and property taxes.

In addition, we recommend that models be developed to analyze the incidence of tax changes among individuals in various income groups and among businesses by size of business and by

business sector. We believe that these additional models would provide valuable input to the entire analysis process. These models should be developed jointly by the three agencies, and each agency should have access to the use of the models. However, it is imperative that taxpayer confidentiality be maintained throughout the process. In particular, access to the single business tax model may need to be restricted due to concerns about taxpayer confidentiality.

Recommendation #2:

Once the additional micro-simulation models have been developed, staff should review the progress of dynamic modeling in other states and determine when the time is right to develop a dynamic revenue estimating model for Michigan.

The Dynamic Revenue Estimating Seminar and the survey of the states demonstrated that, although it is technically feasible to produce dynamic estimates with an appropriate model, there is still very limited experience with developing and operating a dynamic revenue estimating model. No states are currently conducting dynamic analyses on a regular basis (although California will start to do so this year), and only three or four states have any experience in building and operating these types of models.

In addition, the symposium that the Joint Committee on Taxation, U.S. Congress hosted demonstrated that state-of-the-art in dynamic analysis is not yet at the place where reliable long-run estimates of the impact of dynamic feedback effects on revenue are feasible. However, experts are continuing to refine and expand the models and are likely to

resolve these problems in the near future.

Therefore, we believe that it would be advantageous for Michigan to focus initially on expanding the number of micro-simulation models currently available for use. This approach will allow Michigan to monitor the progress of other states and gain valuable insight and experience from other states' successes and failures. Information of this type will be extremely useful when we determine that the time is right to develop our own model.

In conclusion, we believe that models developed jointly by the Department of Treasury, Senate Fiscal Agency, and House Fiscal Agency in a systematic, open process would enhance our ability to accurately estimate the revenue impact of tax law changes. However, it must be understood that because dynamic revenue estimating models are not simple, easy-to-use models, they cannot provide accurate instant analyses. Because of the complexity and time required to perform dynamic analyses, the models may only be appropriate for major tax policy changes with significant static revenue impacts.

APPENDIX A

APPENDIX B
CONFERENCE REGISTRANTS

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Appendix B, continued

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APPENDIX C
SURVEY OF THE STATES
FOR YEARS 1995 AND 1996

State	Analyses Using Micro-simulation Model	Micro-simulation Model Used	Analyses Using Dynamic Feedback Model	Dynamic Model Used
Alabama	280	Inc/Bus/Sales/Prop	0	None
Alaska				
Arizona	150	Income	0	None
Arkansas				
California	608	Income, Business	0	CGE
Colorado	80	Gaming	0	None
Connecticut	150	Income, Cigarette	3	REMI
Delaware	50	Income, Business	0	None
Florida	196	None	0	None
Georgia	0	None	0	None
Hawaii	50	Income, Sales	0	None
Idaho	29	Inc/Bus/Sales/Prop	0	None
Ilinois	40	NA	0	None
Indiana	0	None	0	None
Iowa	225	Income	0	None
Kansas				
Kentucky	15	Income	0	None
Louisiana	30	Income, Business	0	None
Maine	200	Income	0	None
Maryland				
Massachusetts	30	Income, Business	2	REMI
Michigan	500	Income, Business	0	None
Minnesota	375	Inc/Bus/Prop/TaxInc	1	REMI
Mississippi				
Missouri				
Montana	Unknown	Income, Sales	0	None
Nebraska	150	Income, Business	0	None
Nevada				

State	Analyses Using Micro-simulation Model	Micro-simulation Model Used	Analyses Using Dynamic Feedback Model	Dynamic Model Used
New Hampshire	25	On-line taxpayer model	0	None
New Jersey	50	Income	0	None
New Mexico				
New York	400	Income, Bus., Prop.	3	None
North Carolina				
North Dakota	50	Income, Sales	0	None
Ohio	20	Income	0	None
Oklahoma	200	Income	0	None
Oregon				
Pennsylvania	No Estimate	None	0	None
Rhode Island				
South Carolina	280	None	0	None
South Dakota				
Tennessee	150	Income, Business	0	None
Texas	1,250	Income, Business	0	None
Utah	250	Income	1	Other
Vermont				
Virginia	350	Income	0	None
Washington	609	None	0	CGE
West Virginia	160	None	2	Input/Output
Wisconsin	350	Income, Business	0	None
Wyoming				
New York City	100	Income, Business	0	None
Washington D.C.	1	None	0	None
Total	**7,402**	**None**	**12**	**None**
Average	195		0	

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