MEMORANDUM

Pew

To: Montana Modernization & Risk Analysis Committee
From: The Pew Charitable Trusts
Date: October 17, 2023
Subject: Modeling the revenue impacts of tax policy changes

Introduction

States use a variety of methods to estimate the revenue impact of tax policy changes. They vary in complexity, resource demands, data requirements, and their ability to handle nuanced or novel tax policy changes (e.g., taxes on very narrow sectors of economic activity). This memo outlines a few broad classes of approaches, provides some discussion of their advantages and limitations, and highlights some resources.

Microsimulation Models

Microsimulation models are a class of models that estimate tax revenue from the bottom up by calculating the tax liability of individual taxpayers. For example, a personal income tax (PIT) microsimulation model is essentially made of two parts: a large database of individual taxpayers (anonymized), and a tax liability calculator that mirrors the state's tax forms and laws. The calculator computes each taxpayer's liability separately and sums them to arrive at total tax revenue. The tax laws in the calculator can be adjusted to estimate the revenue impact of a policy change (for example, changing tax rates or the standard deduction).

Advantages:

- Taxpayer-level data allows for accurate distributional analysis by income group or other characteristics.
- The bottom-up approach of microsimulation allows it to handle relatively complex or nuanced policy changes. For example, microsimulation models are able to account for complicated interactions among tax provisions driven by "tax form behavior" of taxpayers—i.e. choices made to minimize their tax liability at the time of tax filing, such as the choice between claiming itemized deductions or the standard deduction.

Limitations:

- Developing and maintaining a model is resource intensive.

- Microsimulation requires high quality data at the level of the individual taxpayer. Ideally, this means it would directly use the full population of tax returns from a state's revenue department. However, if that data is not accessible, a database that is statistically representative of the state's population would need to be constructed from publicly available (often national) data sources, adding a significant challenge and time investment.
- Even the revenue department's full tax return database might not have the information needed to estimate some policy changes, for example adding a new deduction for specific consumer purchases. These cases could require estimating the relevant information for each taxpayer in the database from external data sources.
- Some revenue sources are more suited to "bottom-up" microsimulation modeling. Personal income taxes are a common application for microsimulation. Property taxes may also be amenable to microsimulation, especially if analysts can access parcel level property tax records. In contrast, there is no source of individual-level tax payment data for sales taxes, making microsimulation less appropriate and practical. States often turn to estimating taxable and non-taxable sales at some more aggregated level (see "Ad Hoc Tax Base Estimates" below).

Resources and examples:

- Many states, including the Montana Department of Revenue,[1] maintain their own proprietary PIT microsimulation models. Other states include Minnesota;[2] New York (for PIT and corporate tax);[3] and Pennsylvania.[4]
- There are some third-party microsimulation models available for purchase, such as Chainbridge's PolicyLinks software.[5] Examples of states that have used Chainbridge tax models include Virginia,[6] Maine,[7] and Vermont.[8]
- There are at least two national research organizations that have developed state-level microsimulation models. The Institute on Taxation and Economic Policy (ITEP) microsimulation model includes personal income taxes, consumption taxes (i.e. sales and excise), and property taxes.[9] The Urban-Brookings Tax Policy Center (TPC) maintains a federal and state personal income tax microsimulation model.[10] Because these organizations do not have access to state tax return data, they must use a range of publicly available microdata datasets to construct a population of taxpayers that is approximately representative of each state's population. While these models may have the ability to estimate the revenue effects of state tax changes, to our knowledge they are not available to states for custom analysis.

Ad Hoc Tax Base Estimates

Standing in contrast to the bottom-up approach of microsimulation models are methods that generally estimate the effects of tax policy changes starting from *aggregated* economic or tax data. While microsimulation is a specific general-purpose method, these "ad hoc" methods vary depending on the particulars of the policy change and the available data. These models are often built as-needed to address specific one-off questions or policy changes. They often must bring together multiple data sources that provide information on the relevant tax base or taxes paid by income group. For example, to build a sales tax model, the Montana Department of Revenue starts with sales data for the state's different economic sectors from U.S. Census Bureau's Economic Census of Businesses, and then adjusts this data for subsequent changes in consumer spending patterns and population growth.[11]

Advantages:

- While ad hoc approaches require careful analysis and creativity, analysts have a great deal of flexibility in how they approach an estimate. For this reason, ad hoc estimation approaches may be the best available method for estimating novel or highly nuanced policy changes, such as detailed changes to the sales tax base.
- Ad hoc analysis tends to be fairly common for sales tax changes, since there is no source of individual-level tax payment data.
- Analysts may be able to incorporate distributional analysis by income (or other types of disaggregation) if relevant data sources can be found.

Limitations:

- These methods often require numerous simplifying assumptions and rely on imperfect, incomplete, or inconsistent data sources, affecting their accuracy.
- Analysts sometimes must draw on academic research literature to help answer the question at hand (for example, research on the responsiveness of cigarette consumption to excise tax rates). But for very nuanced questions the body of directly relevant literature may be fairly small.
- Since ad hoc models are often built to answer specific questions, the time required to develop the model, and the expertise gained, might not be directly deployable to new policy questions.

Resources and Examples:

- Colorado's Department of Revenue relied on data from the Consumer Expenditure Survey on how much consumers spend on a variety of items to estimate sales and excise taxes paid by income group.[12]
- Montana's Department of Revenue maintains a sales tax model for purposes of estimating the revenue impacts of implementing a statewide sales tax (see above).

Econometric Revenue Models

These methods use statistical and econometric methods to understand how revenue has historically responded to economic conditions (e.g. a 1% change in personal income), allowing analysts to forecast future revenue under various economic assumptions. These methods are often used by states to produce the official revenue forecasts used in their budgeting process. In some cases, they can be used to inform the effect of a tax policy change.

Advantages:

- For tax changes where these models are appropriate (see "Limitations" below), these estimates can be relatively easy to produce since they are often based on a state's standard econometric revenue projection models.

Limitations

- These methods might be helpful for estimating the revenue impact of relatively simple tax policy changes, such as a change in the sales tax rate. But they are not as well suited for more complex or novel policy changes, such as nuanced changes to the tax base or changes to graduated income tax rates.
- Econometric models are most often used for estimating aggregated revenues. But they are probably less suited to breaking out taxes by specific types of taxpayers (e.g. buy income group).

Dynamic Economic Impact Models

The methods described above generally do not include estimates of how tax policy changes might ripple through the economy—i.e., they are *static* models.[13] In contrast, *dynamic* modeling approaches attempt to estimate downstream macroeconomic effects on measures like GDP, employment, wages, and business investment.[14] While these macroeconomic effects can be of interest on their own, a dynamic revenue analysis aims to estimate how these secondary economic effects might offset or strengthen the initial

static revenue effect.[15] There are a handful of different methods that can be used for dynamic analysis, including Input/Output models, Computable General Equilibrium (CGE) models, and proprietary hybrid economic models such as those available from REMI.[16]

In 2015 researchers at the Georgia State University (GSU) Center for State and Local Finance published a review of states' experiences with dynamic modeling.[17] They concluded that dynamic modeling can potentially provide useful information on the economic effects of policy changes, tax incidence, and distributional analysis. They also noted that dynamic analysis might help policymakers compare tradeoffs between tax and expenditure policies. However, they also noted a number of limitations. State and national economies are highly complex, and all models must make potentially consequential simplifying assumptions, often relying on "educated guesses." The authors concluded that "[t]his lack of precision can significantly reduce the model's reliability and limit predictive power" and that policymakers "should not budget to these effects." The report also found that "policymakers are often disappointed in the results" because the estimated dynamic effects are not as large as they expected.

Advantages:

- Provides an estimate of the revenue effects of a tax change that accounts for many indirect, downstream economic effects.
- May allow for a more nuanced picture of tax incidence and distributional analysis.

Limitations:

- GSU recommends that policymakers carefully consider what they want to learn from dynamic estimation and whether it will be worth the cost.
- The economic theory underlying dynamic revenue analysis also applies to spending policies. Multiple observers have noted that since states generally must balance their budgets, a consistent and full picture of the dynamic effects of a tax reduction should also account for the offsetting economic effects of any required reduction to expenditures or increase in other taxes.[18] In many cases, it might be difficult or impossible for analysts to determine how the tax reduction is offset elsewhere in the budget, leading to an indeterminate net outcome.
- Dynamic models, whether purchase as off-the-shelf software or developed in-house, can be costly and time consuming and require a high level of expertise to operate and maintain.[19]

- For the reasons discussed above, some states have found that results were not significantly different enough from static estimates to make a substantial difference in policy decisions or to justify the effort.[20]

Resources and Examples:

- IMPLAN is a commercially available input/output model.
- Regional Economic Models, Inc. (REMI) sells economic modeling software that combines aspects of input/output, CGE, and econometrics techniques.
- The Buckeye Institute's Economic Research Center maintains a dynamic computable general equilibrium model that they have used for state level analysis.
- A few national nonprofit and government organizations maintain dynamic macroeconomic models for analyzing federal tax policy changes. These include the Joint Committee on Taxation, the Tax Foundation, and the Urban-Brookings Tax Policy Center in partnership with the Penn Wharton Budget Model.[21] To our knowledge, these models are generally not intended for state level analysis, but the documentation and discussion of their technical aspects may be informative.

Special Considerations

- Distributional Analysis: Policymakers are often interested in how tax changes will impact different types of taxpayers (for example different income groups or residents versus non-residents). Some of the methods described above are particular well-suited to this type of analysis. For example, because microsimulation models are based on detailed individual-level data, they are ideal for examining tax liability by income group. Analysts might be able to use ad hoc modeling to estimate these distributions as well, contingent upon the availability of external data on the current distribution of income, consumption, or other characteristics. However, this will probably be less accurate than a microsimulation approach. Some commercially available software may be able to disaggregate impacts by certain taxpayer groups.[22]
- Tax Incidence: If policymakers are concerned with burden of taxes on different types of people, it is important to remember that the individual or business who remits a tax to the state may not bear the ultimate economic burden of the tax. For example, when taxes go up on a business, that cost may be passed on as increased prices for consumers, reduces wages for employees, or lower returns for owners or shareholders. This shifting process is known as "tax incidence" and depends crucially on how individuals and businesses respond to changing after-tax

prices and income. Analyses of tax incidence attempt to measure or estimate this shifting process. The academic research literature may help analysts estimate tax incidence and should be considered carefully if policymakers are interested in who bears the ultimate economic burden of a tax change or tax system. Some commercially available software might be able to aid analysts in estimating tax incidence.[23]

- Multi-method approach: Multiple experts who we spoke with affirmed that different approaches have strengths and weaknesses and may be better suited to different types of tax or policy questions. Moreover, even for a given situation, it may be informative to pursue multiple analytical approaches. They recommended (when practical) comparing multiple methods or data sources.

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[1] For examples of the use of Montana's model, see D. Dodds, "Trends and Cycles in Montana Income Tax Data: Implications for Revenue Forecasting," Montana Department of Revenue (2016), http://mtrevenue.gov/wp-content/uploads/2018/01/2016-08-Trends-and-Cycles-in-Montana-Income-Tax-Data.pdf; and A. McNay, "SB 399 Distributional Impacts," Montana Department of Revenue (2021), https://montanafreepress.org/wp-content/uploads/2021/04/2021_03_31_Sen_Cohenour_SB399_Information-2.pdf.

[2] Minnesota's model is called the House Income Tax Simulation and is used both for forecasting and for estimating the impact of tax changes. For example, see Minnesota Department of Revenue, "2021 Minnesota Tax Incidence Study: An Analysis of Minnesota's Household and Business Taxes," (2021), p. 38, https://www.revenue.state.mn.us/sites/default/files/2022-07/2021%20Tax%20Incidence%20Study.pdf.

[3] For a brief description, see New York Division of Budget, "Economic, Revenue, and Spending Methodology," (2022), p. 6, https://www.budget.ny.gov/pubs/archive/fy22/fy22-methodology-report.pdf.

[4] For a brief description and example of an application of Pennsylvania's model, see Pennsylvania Independent Fiscal Office, "Analysis of Revenue Proposals, FY 2021-22 Executive Budget," p. 19-20, http://www.ifo.state.pa.us/download.cfm?file=Resources/Documents/Revenue_Proposal_Analysis_2021_04.pdf.

[5] The Chainbridge website says that the software suite includes modules for personal income tax; corporate income tax; sales, use, and excise taxes; and property tax. The website describes the overall PolicyLinks software suite as a microsimulation model and says that each tax module is based (at least in part) on individual-level data. Chainbridge Software LLC, accessed August 8 2023, https://chainbridge.com/policylinks/.

[6] Virginia used the Chainbridge personal income tax model to estimate the revenue effects of the Tax Cuts and Jobs Act. See Commonwealth of Virginia Department of Taxation, "Estimated Impact of The Tax Cuts and Jobs Act on Virginia", (2018), p. 1, https://www.finance.virginia.gov/media/governorvirginiagov/secretary-of-finance/pdf/master-revenue-reports/additional-reports/Chainbridge-Technical-Appendix-corrected-82318.pdf.

[7] Office of Program Evaluation and Government Accountability, Maine State Legislature, "Information to Support 2022 Expedited Reviews of Maine State Tax Expenditures "Necessity of Life" Sales & Use Tax Exemptions," p. 21, https://legislature.maine.gov/doc/9299.

[8] Vermont Department of Taxes, "Annual Report on the Tax Computer System Modernization Fund," (2016), p. 2, https://ljfo.vermont.gov/assets/docs/jfc/2016/2016_11_14/f4415e3b76/11-10-16-Tax-Modernization-System-Report.pdf.

[9] ITEP maintains a federal and state microsimulation model that includes. See Institute on Taxation and Economic Policy, "ITEP Microsimulation Tax Model Overview," https://itep.org/itep-tax-model/.
[10] Tax Policy Center, "Brief Description of the Tax Model," https://www.taxpolicycenter.org/resources/brief-description-tax-model. See section III.A. "Individual Income Tax Calculator."
[11] Montana Department of Revenue, "Revenue Impact of Statewide and Local Option Sales Taxes," (2016), https://leg.mt.gov/content/Committees/Interim/2015-2016/Revenue-and-Transportation/Meetings/March-2016/DOR-sales-tax-memo.pdf.
[12] Colorado Department of Revenue, 2022 Tax Profile & Expenditure Report, (2022), p. 190 https://cdor.colorado.gov/data-and-reports/tax-profile-and-expenditure-reports.
[13] It should be noted that sometimes analysts include estimates of how a tax change may cause taxpayers to change their behavior in a way that changes the size of the tax base in question. For example, if the state increases the tax on alcohol, analysts might choose to estimate how this change could reduce alcohol consumption, thus somewhat dampening the revenue gain from the tax rate increase. These are sometimes referred to as "microdynamic" estimates, but some states may refer to these as "static" estimates because while they allow the size of the relevant tax base to change, they hold constant macroeconomic variables such as GDP. In contrast, macrodynamic analysis goes even further by estimating how GDP or other macroeconomic variables change in response to the tax policy change, and how that feeds back into revenue. For more discussion of the terminology of static, microdynamic, and macrodynamic modeling, see Mikesell, "Revenue Estimation/Scoring by States…," p. 9-10.
[14] J. Mikesell, "Revenue Estimation/Scoring by States: An Overview of Experience and Current Practices with Particular Attention to the Role of Dynamic Methods," *Public Budgeting & Finance* 32, no. 2 (2012), 1-24. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1540-5850.2011.01000.x.
[15] Dynamic effects can offset some of the static revenue loss or gain from a tax change. However, experts generally agree that most types of tax cuts will not "pay for themselves"—i.e., will not fully make up for their static revenue loss with revenue gains via dynamic feedbacks. Some experts have noted that for tax reforms that include a package of offsetting (or partially offsetting) tax reductions *and* tax increases, dynamic effects could play an important role when estimating whether the overall package of reforms is revenue positive, neutral, or negative. See: N. Kasprak, "Do Tax Cuts Pay for Themselves?," Tax Foundation, May 10, 2013, https://taxfoundation.org/blog/do-tax-cuts-pay-themselves/; and Tax Policy Center, "Briefing Book: Do tax cuts pay for themselves?," accessed August 7, 2023, https://www.taxpolicycenter.org/briefing-book/do-tax-cuts-pay-themselves.
[16] For a description of the different approaches and some of their strengths and weaknesses, see P. Bluestone and C. Bourdeaux, "Dynamic Revenue Analysis: Experience of the States," Georgia State University Andrew Young School Center for State and Local Finance (2015), https://cslf.gsu.edu/files/2015/04/Dynamic-Revenue-Analysis_April2015.pdf.
[17] P. Bluestone and C. Bourdeaux, "Dynamic Revenue Analysis: Experience of the States," Georgia State University Andrew Young School Center for State and Local Finance (2015), https://cslf.gsu.edu/files/2015/04/Dynamic-Revenue-Analysis_April2015.pdf.
[18] In the same way, a tax increase in one area can be used to pay for increased spending, or tax reductions in other areas, both of which can have economic impacts. An exception to the need to account for the tradeoffs implied by balanced budget requirements might be revenue neutral tax changes that make structural changes and/or shift the burden of taxes among taxpayers, but do not change the overall level of revenue. For more discussion, see Bluestone and Bourdeaux, "Dynamic Revenue Analysis…," p. 1; and Mikesell, "Revenue Estimation/Scoring by States…," p. 11.

[19] Bluestone and Bourdeaux, "Dynamic Revenue Analysis…," p. 15; and Mikesell, "Revenue Estimation/Scoring by States…," p. 14.
[20] Bluestone and Bourdeaux, "Dynamic Revenue Analysis…," p. 27; and Mikesell, "Revenue Estimation/Scoring by States…," p. 16.
[21] A. Auerbach et al., "Macroeconomic Modeling of Tax Policy: A Comparison of Current Methodologies," *National Tax Journal* 70, no. 4 (2017): 819–836, https://scholarship.law.georgetown.edu/cgi/viewcontent.cgi?article=3030&context=facpub.
[22] For example, the Chainbridge website briefly notes that their sales tax module allows revenue from visitors to be broken out separately by purchase category. Chainbridge Software LLC, accessed August 8 2023, https://chainbridge.com/policylinks/sales-use-and-excise-tax/.
[23] For example, according to the Chainbridge website, their PolicyLinks software includes a module that "provides analysts with the ability to combine revenue estimates for more than one tax type to see overall incidence on resident households." Chainbridge Software LLC, accessed August 8 2023, https://chainbridge.com/policylinks/multi-tax-incidence/.