



Getting the Tax Structure Right: It's Complicated

Briefly

Charges that Washington has the nation's most regressive state and local tax structure stem from a 2015 report by the Institute on Taxation and Economic Policy (ITEP). The ITEP analysis contains a number of methodological flaws that lead it to overstate the tax burden on low-income households nationally and, to an even greater extent, in Washington. In particular, our critique of the ITEP report identifies two major errors:

- 1. ITEP overestimates consumption spending by lower-income taxpayers relative to income, leading to an overstatement of the taxes they pay.*
- 2. The ITEP treatment of Washington's business and occupation tax causes it to overestimate the degree to which the tax is shifted onto lower-income taxpayers. Their treatment of personal and corporate income taxes levied in other states shifts relatively less of the burden to lower-income taxpayers.*

We also point to a key principle of fiscal federalism (a theory allocating responsibilities among the three levels of government), which holds that redistributive tax policies are best enacted at the national level. Adding this dimension to the analysis leads to our third finding:

- 3. All state and local tax structures are regressive. But when the steeply progressive federal income tax system is considered, the overall federal-state-local tax burden is progressive in Washington and every other state, and the differences among the states represent smaller proportions of households' tax burdens.*

This report, of course, will not settle the debate about tax policy in Washington. Those who prefer a highly progressive tax structure may examine the data, accept that Washington is perhaps not the "most regressive" state in the nation, and still contend that Washington should adopt a more progressive tax system. States with an income tax typically rank as more progressive than those that lack one. Others may examine the data and conclude that, within the context of fiscal federalism and the expressed preferences of Washington voters, the state's tax structure is satisfactory.

We recognize that the debate will be ongoing. Our hope is that this paper helps inform that debate.

It's a rare tax policy discussion that doesn't lead off with criticisms of Washington's "upside-down" tax structure, the "most regressive" system in the nation. The phrases peppered the Seattle City Council's head tax discussions. The contention is typically taken as a truism, one requiring no further comment or analysis.

Yet, further analysis is required, not primarily to refute the observation, but to understand better how the tax system works in our state.

The claim that the state's tax structure is the most regressive in the nation rests on a single report by the Institute on Taxation and Economic Policy (ITEP), most recently updated in 2015. The report contains a number of well-documented flaws that lead it to overstate the tax burden on low-income households nationally and, to an even greater extent, in Washington.

The measurement errors are a problem, as is another shortcoming of the report: its focus on state and local taxes without

an appreciation of fiscal federalism and the role played by the highly progressive federal income tax. Simply, two facts should be kept in mind.

- In every state the combined state and local tax burden is regressive, according to ITEP.
- When federal taxes are factored into the analysis, the combined federal, state and local tax burden in every state is progressive.

This report, of course, will not settle the debate about tax fairness in Washington. Those who prefer a highly progressive tax structure may examine the data, accept that Washington is perhaps not the “most regressive” state in the nation, and still contend that Washington should adopt a more progressive tax system. States without an income tax typically rank as more regressive than those that have one. Others may examine the data and conclude that, within the context of fiscal federalism and the expressed preferences of Washington voters, the state’s tax structure is satisfactory. We recognize that the debate will be ongoing. Our hope is that this paper helps inform that debate.

A Little Background

Tax systems are generally described as regressive (lower-income taxpayers pay a greater share of their income in taxes than do high-income taxpayers), proportional (the share of income paid in taxes is the same across income levels), or progressive (high-income taxpayers pay relatively more than lower-income taxpayers).

Establishing how the tax burden falls (tax incidence), then, requires accurate measurement of taxpayers’ income and spending. It also depends on tracing how business taxes are passed on to customers and employees. Perhaps surprisingly, these measurements are difficult, reliable data are rarely available, and analysts are forced to make assumptions, some of which are inevitably questionable and occasionally just wrong.

Because state and local tax systems typically rely relatively heavily on sales taxes, the assumptions about consumption and income play a determinative role. Only Alaska, Delaware, Montana, New Hampshire, and Oregon have no sales tax.

Further, Washington’s business and occupation (B&O) tax adds an unusual element to analysts’ estimation of how business taxes affect the individual and household tax burden in the state. The ITEP treatment of Washington’s primary tax on business income differs significantly from its treatment of other states’ taxes on business income.

Our analysis, detailed in Appendix 1, takes an in-depth look at these issues and more. (Appendix 2 reproduces ITEP’s description of its assumptions.)

Below, we briefly review two significant ways in which the ITEP report overstates the regressivity of state and local tax structures and introduce a third consideration, the role of federal tax policy:

- 1. ITEP overestimates consumption spending by lower-income taxpayers relative to income, leading to an overstatement of the taxes they pay.*
- 2. The ITEP treatment of Washington’s B&O tax causes it to overestimate the degree to which the tax is shifted onto lower-income taxpayers. Their treatment of personal and corporate income taxes levied in other state shifts relatively less of the burden to lower-income taxpayers.*

After critiquing the ITEP analysis, we briefly place state-local tax systems in context. Local governments typically derive most of their revenues from property taxes. States rely more on sales and income taxes. Of the 41 states that tax wage and salary income, 33 have a graduated income tax, with the top marginal rate ranging from North Dakota’s 2.9 percent to California’s 13.3 percent. By comparison, the top 2018 federal income tax rate is 37 percent (40.8 percent when the Medicare tax is included). Washington households pay more than twice as

much in federal taxes than they do in state and local taxes.

A fundamental principle of what’s known as “fiscal federalism” is that redistributive tax policies are best enacted on a national basis, one of the justifications for the highly progressive federal income tax. Federal taxes offset regressive state and local tax structures without providing incentives for taxpayers to relocate to reduce their tax liability. Thus, our third point:

3. All state and local tax structures are regressive. But when the steeply progressive federal income tax system is considered, the overall federal-state-local tax burden is progressive in Wash-

ington and every other state, and the differences among the states represent smaller proportions of households’ overall tax burdens.

What the ITEP Report Shows

We’ll begin by breaking down the ITEP calculations of tax burdens by income groups for the U.S. and for Washington, as shown in Table 1. The tax calculations shown in the table indicate that the share of income paid to state and local governments nationally falls as income rises, from 10.9 percent for the lowest-income 20 percent of taxpayers to 7.0 percent of income for those in the top 1 percent (8.0 percent for the top quintile). For Washington, ITEP estimates the low-

Table 1: ITEP’s Estimates of the Distribution of State and Local Taxes in 2015

Income Group	Lowest 20%	Second 20%	Middle 20%	Fourth 20%	Top 20%		
					Next 15%	Next 4%	Top 1%
U.S. Average							
Average Income in Group	\$11,200	\$26,900	\$45,000	\$72,800	\$126,200	\$280,400	\$1,593,400
Sales & Excise Taxes	7.0%	5.8%	4.7%	3.7%	2.7%	1.7%	0.8%
General Sales—Individuals	3.2%	2.9%	2.4%	2.0%	1.5%	1.0%	0.5%
Other Sales & Excise—Ind.	1.6%	1.1%	0.8%	0.6%	0.4%	0.2%	0.1%
Sales & Excise on Business	2.2%	1.8%	1.4%	1.1%	0.8%	0.5%	0.2%
Property Taxes	3.7%	2.7%	2.8%	2.9%	2.9%	2.6%	1.6%
Property Taxes on Families	3.6%	2.6%	2.6%	2.7%	2.6%	2.1%	0.7%
Other Property Taxes	0.1%	0.1%	0.2%	0.2%	0.2%	0.5%	0.9%
Income Taxes	0.2%	1.4%	2.2%	2.7%	3.2%	3.7%	4.5%
Personal Income Tax	0.2%	1.4%	2.2%	2.7%	3.1%	3.6%	4.3%
Corporate Income Tax	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%
Total Taxes	10.9%	10.0%	9.7%	9.3%	8.8%	7.9%	7.0%
Washington							
Average Income in Group	\$11,900	\$30,300	\$52,800	\$82,200	\$135,300	\$289,100	\$1,517,800
Sales & Excise Taxes	12.6%	9.4%	7.6%	6.1%	4.6%	2.9%	1.6%
General Sales—Individuals	3.8%	3.1%	2.7%	2.2%	1.7%	1.1%	0.6%
Other Sales & Excise—Ind.	3.9%	2.6%	2.0%	1.6%	1.1%	0.7%	0.3%
Sales & Excise on Business	4.8%	3.6%	2.9%	2.3%	1.7%	1.1%	0.7%
Property Taxes	4.3%	2.4%	2.6%	2.7%	2.5%	2.2%	1.2%
Property Taxes on Families	4.2%	2.3%	2.5%	2.6%	2.4%	1.8%	0.6%
Other Property Taxes	0.1%	0.1%	0.1%	0.1%	0.1%	0.3%	0.6%
Income Taxes	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Personal Income Tax	—	—	—	—	—	—	—
Corporate Income Tax	—	—	—	—	—	—	—
Total Taxes	16.8%	11.7%	10.3%	8.8%	7.1%	5.0%	2.8%

Source: ITEP 2015

est-income quintile pays 16.8 percent, while the top 1 percent pays 2.8 percent (5.2 percent for the top quintile).

An examination of the calculations will demonstrate that they overstate the regressivity of the state-local tax structure, both nationally and—to a greater degree—for Washington.

For both the U.S. average and for Washington, Table 1 shows sales and excise taxes make up the largest share of the tax burden for all income groups and fall most heavily on those in the lowest 20 percent.

The general sales tax (the state's most productive revenue source) accounts for only 0.6 of the 5.9-point gap between taxes paid as a share of income by the lowest quintile in Washington (16.8 percent) and the U.S. average (10.9 percent). ITEP calculates that Washington's lowest quintile directly paid 3.8 percent of income in general sales taxes. This ranks 13th highest among the states. (This ranking is surprisingly low considering that Washington's sales tax rate ranked fifth highest; the reason is that Washington exempts groceries from the sales tax.)

A more significant factor in the reported regressivity in Washington's tax structure can be found in the state's reliance on excise taxes. Other sales and excise taxes on individuals account for 2.3 points of the 5.9 percent gap. Included in this category are the gasoline tax, the public utility tax, and sin taxes such as the beer, liquor and cigarette taxes. ITEP calculates that Washington's lowest quintile paid 3.9 percent of income on these taxes. This ranks top among the 50 states.

The reported estimates, however, are all too high, for the reasons explained below.

1. ITEP OVERESTIMATES CONSUMPTION SPENDING RELATIVE TO INCOME

Let's start with a simple illustration of the importance of consumption assumptions.

Take two taxpayers at the same income level. Taxpayer Alan does not smoke, drink alcohol, drive a car, or dine at restaurants. Taxpayer Betty is a heavy smoker, drinks a lot of beer and bourbon, drives a gas-guzzler, and takes most of her meals at a neighborhood café. In Washington, Alan bears a much lower tax burden than Betty.

Proponents of sin taxes, like proponents of tax incentives, frequently assert that taxes influence behavior, a principle with which most economists heartily agree. The corollary is that behavior influences tax burden. In a consumption-based tax structure, particularly one that imposes higher taxes on certain behaviors, lifestyle choices significantly affect the taxes paid by individuals. Of necessity, calculations of tax burdens, then, rely on estimates of how taxpayers spend their money. That means survey data.

For its estimates of household spending by income (the source of the calculated sales and excise tax numbers) ITEP relies on data from the quarterly Consumer Expenditure Survey (CE). The Census Bureau conducts these interviews for the Bureau of Labor Statistics (BLS), which uses the information to determine the weights given to various items in the Consumer Price Index.

The Census Bureau itself acknowledges that the CE underreports income and spending. Understanding the problems Census analysts identify helps explain why the ITEP estimates are wrong.

Underreported Income

The underreporting of income is greatest for the lowest income households. A 1995 analysis of CE data by BLS analysts John Rogers and Maureen Gray found that for the lowest 20 percent of households, average reported spending (\$12,306) exceeded average reported after-tax income (\$5,981) by 106 percent. That is, households in the lowest income quintile spent more than double their reported income. As Table 2 on page 5

Table 2: CE Estimates of Income and Spending by Quintile in 1992

	Lowest Income Quintile	Second Income Quintile	Third Income Quintile	Fourth Income Quintile	Highest Income Quintile
Income after taxes	\$5,981	\$14,606	\$25,108	\$40,284	\$83,131
Average annual expenditures	\$12,306	\$17,864	\$24,825	\$34,033	\$54,824

Source: Rogers and Gray 1994

shows, the degree of overspending lessens as income increases.

Rogers and Gray observe, “Results from the CE Survey have typically shown that when the data are classified by income quintile, the expenditures-to-income ratio is quite high for the lowest income quintile.” While households can tap savings, borrowing and credit, they note, “the degree by which expenditures exceed income—a factor greater than 2 for the lowest quintile—seems extreme.”

One explanation, assuming their reported spending is roughly accurate: Survey respondents are underreporting their income. And the evidence of such an understatement is persuasive.

Comparing income estimates based on the CE surveys with those gathered in the Current Population Survey (CPS, a monthly survey also conducted by the U.S. Census Bureau for BLS), BLS analysts found that the CE estimate of income was 11 percent less than the CPS estimate.

A major source of the discrepancy is respondents’ tendency to underreport income from transfer payments (e.g., unemployment insurance and food stamps) in the CE surveys, according to a 2009 analysis by economists Wallace Mok and James Sullivan. For example, they found that in 1992, the value of Aid to Families with Dependent Children was underreported by 16.1 percent; the value of food stamps was underreported by 29.2 percent; the value of unemployment insurance was underreported by 46.2 percent; and the value of workers’ compensation was underreported by 53.2 percent.

The CE estimates of wage and salary income also show a pattern of underre-

porting. The BLS found aggregate wage and salary income reports based on the CE were 10 percent less than those from the CPS. The underreporting is considerably more pronounced for self-employed workers, according to a 2014 economic analysis that estimated that the self-employed underreport income by an average of 24.5 percent.

The U.S. Congress’s Joint Committee on Taxation, the U.S. Treasury’s Office of Tax Analysis and the Tax Policy Center of the Brookings Institution and Urban Institute agree that the CE, upon which ITEP relies, greatly overstates spending-to-income ratios for the poor (see Appendix 1). All three of these groups have developed alternative methodologies to correct for the errors.

Using any of these alternative methodologies would reduce the estimated sales tax burden as a share of income for the bottom quintile of Washington households by at least one-third, we estimate. There would also be sizeable reductions in the excise tax burden.

2. ITEP OVERSTATES THE DEGREE TO WHICH WASHINGTON’S PRIMARY BUSINESS TAX IS SHIFTED ONTO HOUSEHOLDS

As shown in Table 1, ITEP calculates that the share of income paid in sales and excise taxes on business borne by taxpayers in the lowest quintile is 4.8 percent for Washington, more than double their national estimate of 2.2 percent for taxpayers in this group. While this is in part due to Washington’s heavy reliance on business taxes, it is primarily an artifact of ITEP’s tax incidence assumptions.

This category includes, for example, business taxes that are passed forward onto customers through higher prices

and backwards onto employees through lower wages (see Appendix 1). The sales-and-excise-taxes-on-business category includes the general sales tax businesses pay on goods they purchase that are not ingredients incorporated in the goods they sell, public utility taxes and the B&O tax.

ITEP gets the B&O tax wrong, with consequences that overstate the regressivity of the state tax system.

ITEP treats B&O as a broad sales tax, largely borne by in-state consumers. This treatment misunderstands the B&O tax, which is a tax on business gross income, and is a stark departure from the way ITEP analysts handle other states' primary taxes on business income.

Further, as we explain below, even were we to accept the treatment of the B&O tax as a sales tax, the ITEP estimate of how it is passed on to taxpayers in the bottom quintiles is overstated.

How Business Taxes Affect Estimates of Tax Incidence

ITEP divides taxes paid by businesses into two groups: (1) taxes on capital (business income and property taxes) and (2) sales and excise taxes (including the retail sales

tax and Washington's business and occupation tax). They then assume that taxes on capital are primarily borne by the owner of the business and that sales and excise taxes are primarily passed forward onto customers as higher prices.

Because of this partitioning, the primary taxes on business entities in most other states (the corporate and personal income taxes) are seen to be paid by the businesses' owners, while Washington's primary tax on business entities (the B&O) is seen to be passed on to households.

Further tilting the scales to overstate the regressivity of Washington's tax structure, ITEP distributes the business sales and excise taxes passed-forward to households in proportion to household aggregate consumption. As we know, ITEP overestimates the amount that lower income households consume relative to their income, so this allocation of business taxes further exaggerates the share paid by those households.

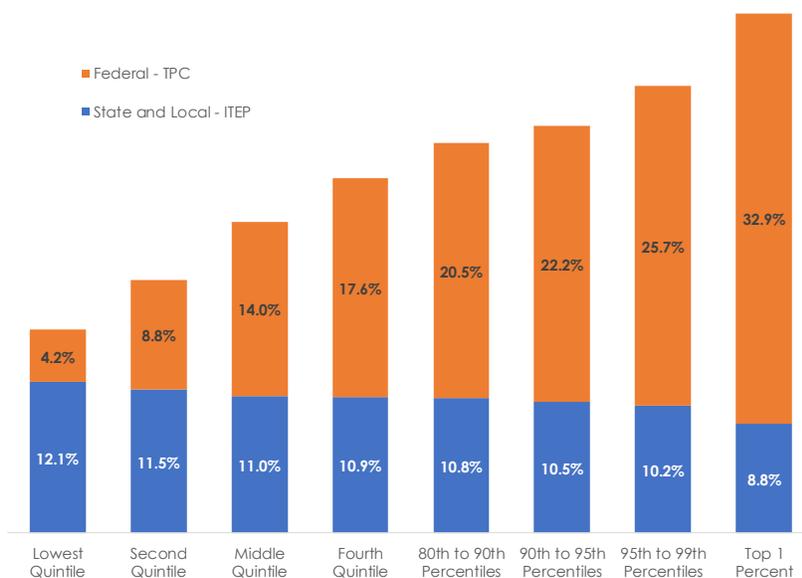
3. THE COMBINED FEDERAL-STATE-LOCAL TAX BURDEN IN ALL STATES IS PROGRESSIVE

The progressivity of the overall tax system is not a new finding. The 2002 Washington State Tax Structure Study Committee, chaired by William Gates, Sr., concluded, "Analysis by the Committee confirmed that when evaluating the total tax system—local, state and federal—all states have progressive taxes and the differences among states are not as great" (WSTSSC 2002). That said, states without a progressive income tax do tend to have a more regressive overall state-local tax structure.

The committee's conclusion remains valid. Chart 1 uses the ITEP estimates of state and local tax burdens by income category as the base. On that base, we have added estimates of the federal tax burden made by the Tax Policy Center (TPC).

Two observations stand out that are in keeping with the generally accepted principles of fiscal federalism.

Chart 1: Average Federal and State & Local Tax Rates, 2017



Source: ITEP, TPC

First, for taxpayers in the middle and upper quintiles, federal taxes make up a larger share of the overall tax burden than do state and local taxes (significantly more for the wealthier groups).

Second, the overall system is progressive. For taxpayers in the lowest quintile, the combined federal-state-local tax burden represents about 17 percent of income; for those in the top quintile, the combined tax burden ranges from 32 percent to 45 percent.

By focusing on state-local tax structures, the 2015 ITEP study leaves off the biggest, most progressive leg of the tax system.

Conclusion

Washington's reputation for having the nation's most regressive and "upside-down" tax system rests on a flawed analysis, one which overstates the regressivity of state and local taxes nationally. In particular, the overstatement of regressivity is magnified for Washington, largely as a result of ITEP's misunderstanding of the state's primary business tax. And, within the context of the combined federal, state, and local tax system, taxpayers in Washington, as in every other state, bear a progressive tax burden.

Appendix 1: Details of the Analysis

Below we provide a detailed analysis of the methodological flaws affecting the ITEP analysis. The tax burden on the poor is certainly less than ITEP calculates. Uncertainties over the extent to which taxes on business are shifted forward onto customers (in the form of higher prices) and backwards onto employees (in the form of lower wages) make precise rankings of states by the regressivity of their tax systems rough approximations, at best. Although the ITEP analysis attempts to fill a void, there are good reasons for the void. State and local tax structures change annually, the calculation of incidence is fraught with methodological challenges, and the assumptions underpinning such efforts mean that the analysis will be short-lived and inconclusive.

We will highlight three problems with the ITEP approach:

1. ITEP's model overestimates consumption spending by the poor and therefore overestimates the amount of sales taxes they pay.
2. The organization's treatment of Washington's major business tax (the B&O tax) is different from its treatment of

the major taxes on business income of most other states (the personal and corporate income taxes). As a result of this, the ITEP analysis shifts a greater proportion of Washington's business taxes onto the poor than is the case for other states.

3. ITEP fails to acknowledge that in states with high income tax rates, some of the taxes paid by mobile high wage workers may be shifted onto employers through higher wage costs.

Tax Incidence

Economist George Zodrow explains that the burdens of taxes frequently fall on people other than those from whom the government collects the money:

One of the most fundamental questions addressed by public finance economists is that of who bears the final burden of a tax. The basic issue is that tax-induced changes in individual and firm behavior and the associated changes in commodity prices and factor returns are likely to imply that the final burden or "economic incidence" of a tax will be different from its "statutory incidence"—that is, a tax may be partially or fully "shifted" from one set of economic agents to another. Business taxes are a frequently cited example, as they may be either "shifted forward" as higher consumer prices or "shifted backward" as lower wages or land [rents]. (Zodrow 1999)

These shifts are not always intuitively obvious. Laurence Kotlikoff and Lawrence Summers conclude their widely cited survey of tax incidence theory with the following observation:

Economics is at its best when it offers important insights that contradict initial, casual impressions. The theory of incidence provides a rich assortment of such insights ... The study of tax incidence is both fun, because it offers such surprising findings, and very im-

The Shifting Burden of a Tax on Income

The fact that taxes are borne by immobile factors means that the extent of redistribution that is feasible at the local level is very limited. Assume, for instance, that some community decides that doctors are too wealthy. The local government, accordingly, imposes a licensing tax on doctors in an attempt to redistribute income from this wealthy class of individuals to others. Doctors, in making their decisions about where to set up practice, will look at their prospects in different communities. When they discover that after-tax income is lower in this community than elsewhere, they will be discouraged from setting up practice in this community. If the tax is not too high, doctors who are already established will not leave; the costs of moving exceed the losses from the tax. The fact that its doctors do not leave may fool the community into thinking that it has been successful in extracting some additional tax out of doctors; in the short run they may be right. But gradually, as fewer doctors move into the community, the scarcity of doctors will become felt, and their wages will be bid up. Wages will continue to be bid up until the after-tax wage of the doctor will equal what could be earned elsewhere. In the long run doctors do not bear the burden of the tax (although they do in the short-run). In the long run, the community bears the burden of the tax, in the form of less medical services and higher prices for doctors.

Joseph Stiglitz and Jay Rosengard, *Economics of the Public Sector*,

portant, because of its implications about the impacts of government policies. (Kotlikoff and Summers 1987)

The quotation from Joseph Stiglitz in the box on page 8 illustrates the mechanism through which the market shifts the burden of a tax. Taxes tend to be shifted off agents who as a group are more mobile and onto those who are less mobile. Capital and labor are more mobile between U.S. states than they are between the U.S. as a whole and other nations. For this reason, state and local taxes are likely to be shifted to a greater degree than federal taxes. Thus, as ITEP acknowledges, “assumptions about state and local tax incidence can often be quite different from, say, the incidence of a national tax ….” (See Appendix 2.)

As Zodrow notes, economists frequently disagree on the incidence of specific taxes:

[T]he incidence of many taxes—especially those on capital income, including corporate income taxes and local property taxes—is still a controversial topic. More generally, there is considerable disagreement about various theoretical issues, including the appropriate market structure for incidence analysis and the extent to which capital is mobile internationally; similarly, there is a lack of consensus on various empirical issues, including the parameter values that should be used in numerical simulations of the theoretical models. (Zodrow 1999)

Because of these disagreements, estimates of the regressivity of individual state tax systems are subject to considerable uncertainty and precise rankings, such as those that ITEP presents, are problematic.

ITEP’s description of its assumptions on the incidence of various taxes is reproduced in Appendix 2.

Sales Taxes Paid By Households

ITEP assumes that the sales tax paid by individuals on their purchases of goods

and services is borne by the payers. This assumption is not controversial. However, ITEP overestimates the amount of taxable purchases made by lower income households and underestimates purchases by higher income households and therefore overestimates sales taxes paid by low-income households and underestimates sales taxes paid by higher income households.

ITEP estimates the relationship between household expenditures and income econometrically using data from quarterly interviews conducted in the early 1990s as part of the Consumer Expenditure Survey (CE), which is conducted by the Census Bureau for the Bureau of Labor Statistics (BLS). BLS uses CE data to derive expenditure weights for the Consumer Price Index (CPI), and the CE is primarily designed for this purpose.

The Census Bureau has regularly published comparisons of aggregate income and expenditure derived from the CE to aggregates derived from other sources (See the BLS web page [CE Data Comparison Articles and Presentations](#).) These comparisons typically show that both income and expenditures are underreported in the CE.

Regarding income, a 1995 report by the BLS compared estimates of money income before taxes based on the CE to estimates based on the Current Population Survey (CPS). For 1992, the CE-based estimate of income was 11 percent less than the CPS-based estimate (BLS 1995, text table 9). BLS notes that “some of the differences … are expected because the CPS is designed specifically to collect income data, while the focus of the Consumer Expenditure Survey is primarily on expenditures” (BLS 1995).

Regarding expenditures, a 2013 paper by BLS economists compares estimates of aggregate expenditures from the CE to aggregate personal consumption expenditures (PCE) from the Bureau of Economic Analysis’s national income and product accounts. For 1992, aggregate CE expenditures totaled \$3.0 trillion,

while aggregate PCE expenditures totaled \$4.2 trillion (Passero et al. 2013). More than half of the difference between these two measures in that year has been attributed to definitional differences and the wider coverage of PCE, which includes, for example, expenditures of the nonprofit sector, overseas purchases of U.S. citizens and employer provided health insurance (Meyer and Sullivan 2009). When the comparison is restricted to items that are commonly defined in the two measures, the CE estimate is 16 percent less than the PCE estimate. (For durable goods, the CE estimate is 18 percent less than the PCE estimate; for non-durable goods, the CE estimate is 30 percent less than the PCE estimate; for services, the CE estimate is only 5 percent less than the PCE estimate.)

ITEP corrects for the underreporting of expenditure in the CE by adjusting upward expenditure estimates from their econometric model by the ratio between PCE and CE measures of spending for various categories. ITEP makes no attempt to adjust for underreporting of income in the CE.

The underreporting of income is more pronounced at the bottom end of the income distribution. This is evident in

Chart A1.1, which shows CE estimates of average annual expenditures and income before taxes by quintiles of before-tax income for 1992. (These numbers come from a 1994 Monthly Labor Review article by BLS analysts John Rogers and Maureen Gray.) For the lowest 20 percent of households, average reported expenditures (\$12,306) equaled 206 percent of average reported before-tax income (\$5,981). For the second quintile of households, average annual expenditures equaled 122 percent of average annual income. For the third quintile it equaled 99 percent; for the fourth quintile, 84 percent; for the fifth quintile, 66 percent.

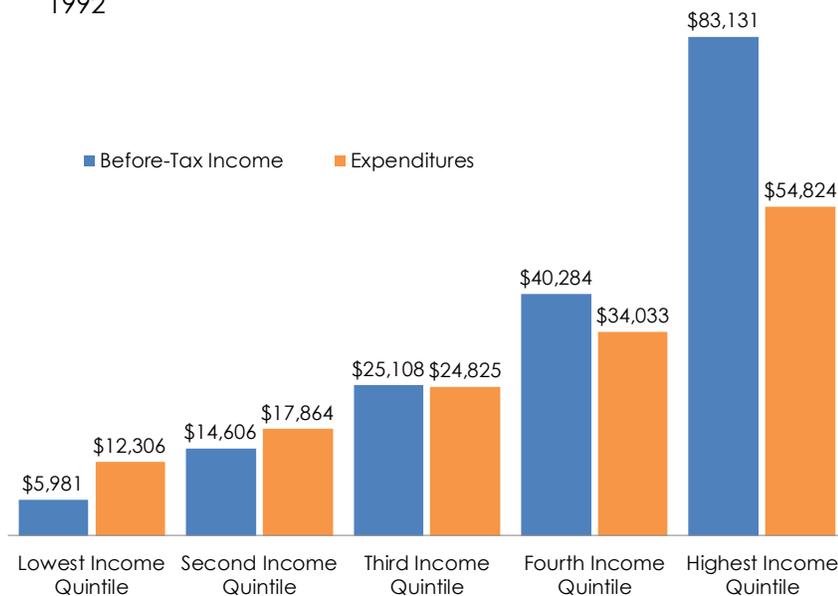
Rogers and Gray observe:

Results from the CE Survey have typically shown that when the data are classified by income quintile, the expenditures-to-income ratio is quite high for the lowest income quintile. . . . The trend in the expenditures-to-income ratios from the first to the fifth quintile is decreasing, as expected, with expenditures exceeding income in the first and second quintiles. That expenditures exceed income in these quintiles is not unreasonable, given consumers' access to savings, borrowing, and credit, mentioned earlier. However, the degree by which expenditures exceed income—a factor greater than 2 for the lowest quintile—seems extreme. (Rogers and Gray 1994)

Adjusting expenditures up by PCE-CE ratios (as the ITEP model does) would make the degree by which expenditures exceed income in the lowest quintiles even more extreme.

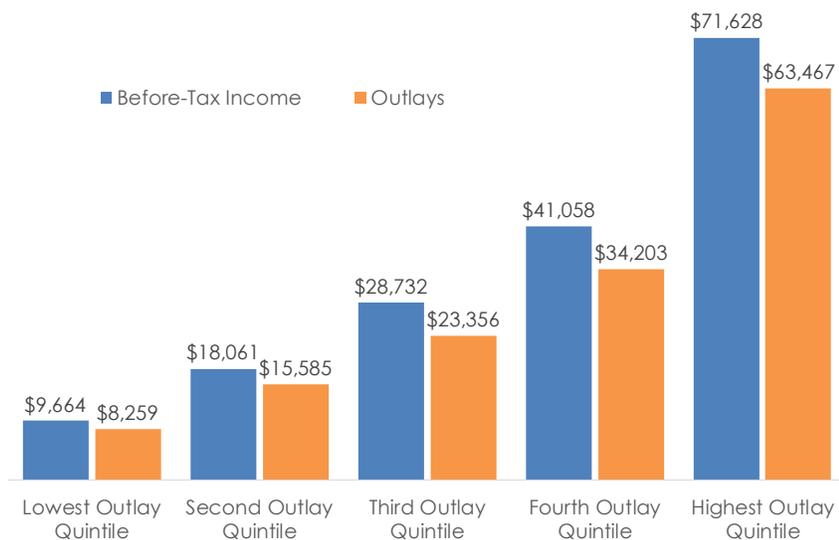
The most likely explanation is that income is underreported by some of the respondents in the CE. Underreporters will tend to be overrepresented in the bottom quintiles of reported income. Rogers and Gray suggest an alternate way of grouping households, by quintiles of spending, which avoids this sorting.

Chart A1.1: Income and Expenditures by Quintiles of Income, 1992



Source: Rogers and Gray 1994

Chart A1.2: Income and Outlays by Quintiles of Outlays, 1992



Source: Rogers and Gray 1994

Chart A1.2 shows annual spending and income grouped by quintiles of spending for 1992, as reported by Rogers and Gray. (The spending measure used, total outlays, is equal to total expenditures plus principal payments on home mortgages plus principal payments on purchased vehicles less purchase prices of financed vehicles. For each quintile of income, the average of outlays is nearly equal to the average of expenditures. (Rogers and Gray 1994, Table 3) For the lowest 20 percent of households, average reported outlays (\$8,259) equaled 85 percent of average reported before-tax income (\$9,664). For the second quintile of households, average annual expenditures equaled 86 percent of average annual income. For the third quintile it equaled 81 percent; for the fourth, 83 percent; for the 5th, 89 percent.

Barry Bosworth, Gary Burtless, and John Sabelhaus compare savings rates by income quintile derived from the CE to those derived from the Federal Reserve Board’s Survey of Consumer Finances (SCF) and find that the SCF shows much less dissaving by the lower income quintiles than does the CE. They attribute this to the CE’s failure to measure income

accurately, particularly income from transfer payments and from alimony (Bosworth, Burtless and Sabelhaus 1991). Likewise, Sabelhaus and Jeffery Groen, after comparing the CE to the SCF, the University of Michigan’s Panel Study of Income Dynamics, and the Census Bureau’s CPS, attribute the high level of dissaving by the lower quintiles in the CE to measurement error (Sabelhaus and Groen 2000).

There is direct evidence that income is underreported in the CE.

Transfer Payments. Bruce Meyer, Wallace Mok and James Sullivan (2009) demonstrate that transfer income (e.g. unemployment insurance and food stamps) is systematically underreported in the CE. Specifically, in 1992, the value of Aid to Families with Dependent Children is underreported by 16.1 percent; the value of food stamps is underreported by 29.2 percent; the value of Social Security Old Age and Survivors Insurance is underreported by 6.8 percent; the value of Social Security Disability Insurance is underreported by 9.0 percent; the value of Social Security Supplemental Security Income is underreported by 37.2 percent; the value of unemployment insurance is underreported by 46.2 percent; and the value of workers’ compensation is underreported by 53.2 percent (Meyer, Mok and Sullivan 2009).

Wages and Salaries. BLS found estimates of aggregate wage and salary income based on the CE were 10 percent less than estimates of aggregate wage and salary income based on the Census Bureau’s CPS (BLS 1995). Moreover, a 2002 Census Bureau study by Marc Roemer that linked survey records from the CPS with detailed earnings records from the Social Security Administration found that earnings of those who were at the bottom end of the distribution in the Social Security files were underreported in aggregate in the CPS (Roemer 2002).

Self-Employment Income. Erik Hurst, Geng Li and Benjamin Pugsley note that it is well documented that the self-

employed “consistently and substantially underreports their income to the tax authorities” and provide convincing evidence that the group similarly underreports income on household surveys. Specifically, in the case of the CE, Hurst, Li and Pugsley estimate that the self-employed underreport income by 24.5 percent on average (Hurst, Li and Pugsley 2014).

Consumption in Other Tax Incidence Models

Three large scale microsimulation models of the incidence of federal taxes recognize that income is underreported at the bottom of the income distribution in the CE and estimate consumption in ways that avoid this problem.

Joint Committee on Taxation. When in the early 1990s the U.S. Congress’s Joint Committee on Taxation (JCT) revamped the model it uses to measure the distributional impacts of changes to the federal tax code, it took note of the reporting of income in the CE, and rejected the method ITEP uses to estimate consumption:

In order to perform the distributional analysis ... , it is necessary to have detailed information on consumption as well as income by income class. The traditional data set used to measure consumption, the Consumer Expenditure Survey, shows large amounts of dissaving at the bottom of the income spectrum, and very high saving rates at the top. Many analysts believe that this observed pattern of saving rates is inaccurate and results from problems with the data set. Furthermore, the Consumer Expenditure Survey does not have reliable information on individuals with income greater than \$100,000. The JCT staff has used a different data set, the Survey of Consumer Finances, to calculate saving rates, and use these saving rates to impute [aggregate] consumption [of each household]. Like other analysts that have used this method, a small amount of dissaving is observed in the lowest income group, rather than

the huge dissaving found from the Consumer Expenditure Survey. Using this method of imputing consumption reduces the measured regressivity of consumption taxes using the traditional ... method. (JCT 1993, pp. 54-55)

The CE is still used to calculate the shares of each household’s aggregate consumption represented by different categories of goods.

Office of Tax Analysis. Similarly, in the late 1990s, the U.S. Treasury’s Office of Tax Analysis (OTA) revamped its model of the incidence of federal taxes to overcome the CE’s known shortcoming:

The only source of detailed consumption information is the [CE]. Unfortunately, it has documented problems with regard to underreporting of income, and the accuracy of its consumption rates (consumption relative to income), particularly for low- and high-income households, have been questioned. ...

In order to build a more consistent relationship between consumption and income, Treasury recently began to derive aggregate consumption by income class using tax data and estimates of aggregate savings from the [National Income and Product Accounts]. The CE is still used to apportion aggregate consumption within an income class across particular categories of goods.

... Treasury’s derived savings rate ... rises from 0.8 percent for the lowest income quintile to 4.7 percent for the highest income quintile and 8.4 percent for the top 1 percent of families. (Cronin 1999, pp. 13-15)

Urban-Brookings Tax Policy Center. More recently, the Tax Policy Center (TPC), which is a joint venture of the Urban Institute and the Brookings Institution, expanded its federal tax microsimulation model to include federal excise taxes and the capability to simulate value

added taxes. TPC staff note the problems with under reporting of income in the CE:

The most credible explanation for the high level of dissaving in the lowest and second-lowest income quintiles ... is that the income reported in the CE is substantially understated... Further, it appears that the relative amount of income underreporting is higher among units that are classified as lower-income, thereby greatly distorting the relationship between their expenditures and income... If consumption-to-income ratios fall as income rises due simply to misreporting, a VAT or other broad-based consumption tax would appear to be much more regressive than it is as an artifact of the misalignment [of income and expenditures for lower-income units]. (Toder, Nunns, and Rosenberg 2011, p. 18)

For this reason, they choose not to use the traditional method of estimating consumption-income ratios from the CE. Instead, they derive ratios for each household in the model from saving rates generated by the Urban Institute's Dynamic Simulation of Income Model (DYNASIM). The CE is then used to apportion total consumption across categories.

Using the methodologies of JCT, OTA or TPC would reduce the sales tax burden on the bottom quintile of Washington households by at least one-third, we estimate. There would also be sizeable reductions in the excise taxes.

Taxes on Businesses

As noted earlier, ITEP calculates that the indirect burden on Washington's lowest quintile of households of sales and excise taxes on businesses exceeds the burden of the retail sales taxes directly paid by these households. The 4.8 percent of income paid by Washington's poorest quintile ranks highest among the states and is more than twice the national average of 2.2 percent. While this is in part due to Washington's heavy reliance on business taxes, it is primarily an artifact of ITEP's tax incidence assumptions.

ITEP divides taxes paid by businesses into two groups: (1) taxes on capital and (2) sales and excise taxes. The former category includes taxes on business income and property taxes. The latter category includes the retail sales tax and Washington's business and occupation tax. ITEP assumes that taxes on capital are primarily borne by the owner of the business while sales and excise taxes are primarily passed forward onto customers as higher prices. Thus, ITEP assumes that the primary taxes on business income in most other states (the corporate and personal income taxes) are paid by the businesses' owners and that Washington's primary tax on business income (the business and occupation tax) is not ultimately paid by business owners but rather is passed on to households.

ITEP distributes the business sales and excise taxes passed-forward to households in proportion to household aggregate consumption. As we noted above, ITEP overestimates the amount that lower income households consume. Thus, even were we to accept the suspect assumption that B&O and sales taxes are primarily passed on to consumers, the burden on lower income households is overstated.

One place where ITEP's dichotomization between sales and excise taxes and taxes on capital clearly breaks down is the collection of sales tax on businesses' capital investments (for example, purchases of machinery and equipment or construction of buildings). The incidence of an ad valorem sales tax collected when such items are acquired ought to be the same as the incidence of an ad valorem property tax collected annually as these items are used.

More generally, there is little reason to believe that the incidence of taxes on business income differs dramatically from the incidence of sales and excise taxes. As the example of the tax on a doctor presented on page 8 illustrates, tax shifting is caused by the movement of businesses and people between juris-

dictions, based on the relative costs of doing business. When a business calculates the tax cost of a particular jurisdiction, it totals all the various taxes it will pay in that place. It is the total that matters in the locational decision, not the distribution of that total across various types of tax. (The local mix of taxes might, however, affect production decisions in the chosen location. For example, high property taxes encourage less capital-intensive production processes, and the B&O tax encourages vertical integration.)

ITEP's assumption that other states' taxes on business income are borne primarily by business owners is out of line with conventional thinking. Thirty years ago (in a paper cited by ITEP's methodology document), Laurence Kotlikoff and Lawrence Summers concluded, "[For] a country in an open world economy or a state or locality within a country ... a tax on investment income at the business level is, at least in part and possibly in full, effectively a tax on wages and land rents" (Kotlikoff and Summers 1987).

A 1996 survey asked 69 public finance economists at leading economics departments in the United States for their best estimates of the percentage of the corporate income tax in the United States that is ultimately borne by capital; the mean response was 41.3 percent; the median response was 40 percent (Fuchs, Krueger, and Poterba 1998). Don Fullerton and Gilbert Metcalf note that the proposition that the corporate income tax is borne 100 percent by the owners of capital "is commonly believed to be false" by public finance economists (Fullerton and Metcalf 2002).

A prominent recent paper by economists Juan Carlos Suárez Serrato and Owen Zidar finds that business owners bear roughly 40 percent of state corporate income taxes and personal income taxes on noncorporate business profits, while workers bear 30–35 percent and (residential) landowners bear 25–30 percent (Suárez Serrato and Zidar 2016).

The incidence of sales and excise taxes paid by businesses should be similar to the incidence found for taxes on business income.

Personal Income Tax

ITEP assumes that the state and local individual income taxes are fully borne by the persons from whom they are collected. However, as noted above, portions of the personal income tax on business income is shifted onto employees and onto landowners. Economists have also found evidence that portions of the individual income tax on wages are shifted from the workers onto their employers.

Paul Bingley and Gauthier Lanot examined a large multi-level longitudinal data set of Danish businesses and workers. They found "strong evidence for partial shifting of the burden of income tax from worker to employer. Higher marginal tax rates are associated with increases in gross wages and earnings" (Bingley and Lanot 1999).

James Alm, William Kaempfer, and Edward Sennoga studied Major League Baseball's market for free agent players and concluded that local income taxes were shifted from the players to their teams through higher salaries. "In short, free agent salaries are affected at least in part by the existence of individual income taxes. Players choosing to play in high-tax cities demand – and receive – higher free agent salaries as compensation" (Alm, Kaempfer, and Sennoga 2012).

Henrik Kleven, Camille Landais, Emmanuel Saez and Esben Schultz examined a Danish program that provides a lower income tax rate on labor earnings for a period of up to three years to high-earning immigrants. Kleven et al. find that the tax savings from the program are split between the worker and the employer. When, after three years, the worker becomes subject to the ordinary tax schedule, employers typically provide a sharp increase in pay to offset the higher taxes.

Federal Taxes

Within the U.S., citizens receive services from three federated levels of government: national, state and local. The theory of “fiscal federalism,” which was originally developed by Richard Musgrave, explains how public-sector functions and revenue sources should be allocated across the three levels (Bird 1999). Musgrave concluded that redistribution is best conducted at the national level, rather than at the state or local level. Regarding revenues, Musgrave found progressive income taxes to be appropriate only at the national level. State governments should use retail sales taxes and income taxes with relatively flat rates. Local governments should use property taxes and payroll taxes. To balance resources with the demands for public services, grants-in-aid should be used to transfer resources from higher to lower levels of governments (Musgrave and Musgrave 1984; McClure 2001).

During 2015, the amount collected by the federal government in taxes, \$3.3 trillion, was slightly more than twice the amount that state and local governments collected, \$1.6 trillion (BEA n.d.). Washington households likewise pay twice as much in federal taxes as they do in state and local

taxes. A significant fraction of federal tax dollars were passed on to state and local governments: For every \$3 state and local governments raised in taxes, they received an additional \$1 in federal grants-in-aid. For these reasons, it makes little sense to look at the state and local tax system in isolation from the federal system.

The federal tax system is highly progressive.

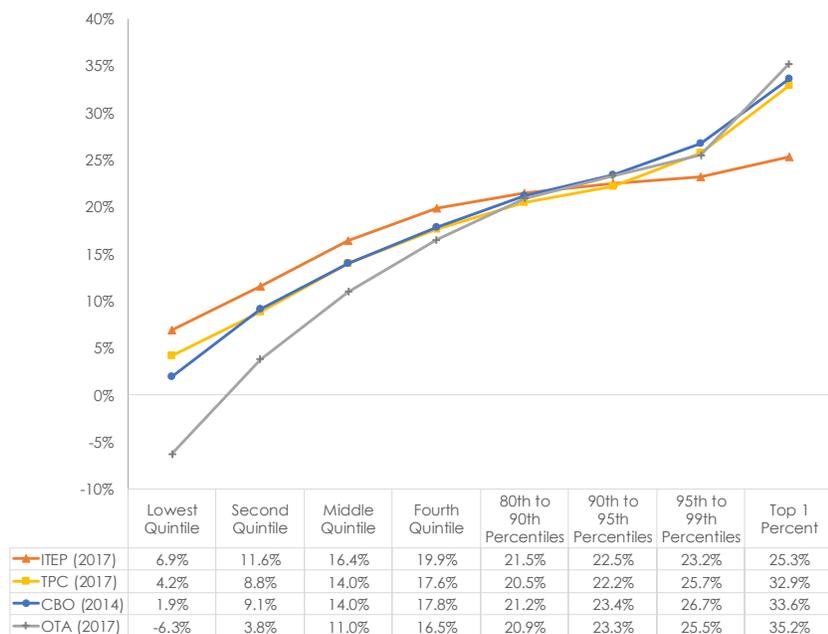
Three federal agencies maintain microsimulation models with which they produce distributional analyses of the federal tax system: OTA, JCT, and the Congressional Budget Office (CBO). Private distributional analyses of the federal tax system are prepared by the TPC and by ITEP. The OTA, CBO, TPC and ITEP analyses are presented by quintiles of income, with further breakdowns within the top quintile. The JCT analysis is presented by dollar intervals of income.

Chart A1.3 shows the ITEP, OTA and TPC estimates of the 2017 distribution of federal taxes and the CBO estimate of the 2014 distribution. (2014 is the most recent year for which CBO has published an estimate.) The negative rates of taxation shown by OTA for the bottom two quintiles are the result of refundable tax credits (e.g. the Earned Income Tax Credit, the refunded portion of which is treated as a negative tax [Falk and Crandall-Hollick 2018]).

JCT’s results are similar. For 2017, JCT estimates that the average federal tax rate for filers with incomes of \$500,000 and higher (the top 0.96 percent) was 31.8 percent. The average rate for those with incomes between \$200,000 and \$500,000 (the next 5.2 percent) was 26.3 percent. For those with incomes of \$20,000 or less (the bottom 22.7 percent), the average federal tax rate was 1.1 percent (JCT 2017).

All five analyses show the federal system of taxes to be highly progressive. However, ITEP’s distributional estimate is decidedly less progressive than the other

Chart A1.3: Four Estimates of the Distribution of Federal Taxes



Source: ITEP 2017, TPC 2017, CBO 2018, OTA 2016

four, with higher tax rates at the bottom four quintiles and substantially lower rates at the very top, where the other four estimates are in close agreement. It

is for this reason that we use the TPC estimate of the distribution of federal taxes in Chart 1 (page 6) rather than the ITEP estimate.

Appendix 2: ITEP's Description of its Incidence Assumptions

Public finance theory suggests that it is often the case that the person or entity that initially remits a tax or fee is not necessarily the one that bears the ultimate burden of the tax. Some useful recent surveys of the tax incidence literature are Kotlikoff and Summers (1990) and Bradford (1995), the latter being particularly concerned with the distributional analysis of tax burden across income groups. Our approach in the ITEP model was not to break new ground on the incidence debate but to use generally accepted and reasonable guidelines by which to base our analysis. Since assumptions about state and local tax incidence can often be quite different from, say, the incidence of a national tax due to the mobility of factors of production (capital and labor), a number of interesting issues present themselves. Our approach followed closely, in principle, that which the Minnesota Department of Revenue has employed in its incidence analyses, with some differences in underlying assumptions.

First, individuals were assumed to bear the burden of the individual income tax directly according to their liability. Similarly, consumption taxes paid by individuals were assumed to be borne directly. Visitors taxes were assumed borne by the visitors. In our analyses, however, we do not show this visitors tax burden because we generally only show taxes paid by taxpayers to their own state and local governments. Direct payments of individual property taxes were also assumed borne by the payer.

Second, taxes on business income, capital and property were generally treated as taxes on capital and allocated to individuals--both residents and out-of-state owners of capital-- according to the ownership of capital. For purposes of computing this amount, half of total business property taxes on residential rental property was assigned to individual tenants and distributed based on rents

paid. Capital income was defined to include interest, dividends, realized capital gains, passive income reported on Schedule E and seventy percent of taxable pension income (the approximate amount that reflects the return to capital rather than deferred wages). The distribution of these items was computed using the microsimulation model.

Third, in computing each states' share of the overall burden of capital taxes, each state was assumed to retain its share of national capital income with an adjustment to reflect the fact that residents of a particular state would be somewhat more likely to own in-state taxable capital than out-of-state residents. For residential rental property, this adjustment was generally 50 percent of the remaining portion of the tax. For other business taxes, the adjustment was 20 percent. In cases where a state's personal income as a share of its GSP was below the national median (e.g. Alaska, Delaware and the District of Columbia) these amounts were reduced ratably.

Fourth, in states that imposed very high taxes on capital, those taxes may not be borne entirely by capital owners and may instead be shifted back to wages or forward to consumers. To account for this effect we computed, roughly, the total amount of corporate income and capital taxes and non-residential business property taxes as a share of output for several different types of industries: mining, timber, national market agriculture, national market financial activities, national market hotel activities, other national market activities, tourist activities, and other domestic market activities. These shares were based on the input-output model. In cases where one of these computed taxes was significantly above the national median, we assigned the excess to either in-state wages or in- and out-of-state consumption depending on the type of activity.

Fifth, sales and excise taxes paid by businesses were divided into taxes paid by industries principally engaged in the production of output sold in national and domestic markets. Taxes on domestic market items were assumed to be borne by the residents of each state (except for amounts paid by visitors) according to their share of total consumption. Taxes on national market items were assigned to national consumption with an adjustment to reflect a proportion (about 15 percent) assumed to be retained in-state. These adjustment factors were adjusted downward in states where personal income as a share of state GSP was below the national median.

Finally, in states that imposed abnormally high sales and excise taxes on national

market activities, those taxes may not entirely be borne by consumers because of competitive factors. Instead, they may be shifted back to wages or capital. We computed total national market business sales and excise taxes as a share of each state's national market GSP and where these national market business taxes were significantly above the national median, we assigned 50 percent of the excess to in-state wages and the remaining half to capital. The latter amounts were allocated according to our rules for allocating capital.

From: ITEP Tax Model Methodology
http://www.itep.org/about/itep_tax_model_full.php
Accessed 8/23/2013

References

- Alm, James, William Kaempfer, Edward Sennoga. 2012. Baseball Salaries and Income Taxes: The "Home Field Advantage" of Income Taxes on Free Agent Salaries. *Journal of Sports Economics*. Vol 13, No. 6.
- Auerbach, Alan J. 2006. [Who Bears the Corporate Tax? A Review of What We Know](#). In James M. Poterba, editor, *Tax Policy and the Economy*, Volume 20. National Bureau of Economic Research.
- Bingley, Paul and Gauthier Lanot. 1999. The Incidence of Income Tax on Wages and Labour Supply. 2002. *Journal of Public Economics*. Vol. 83, No. 2, 173-194.
- Bird, Richard M. 1999. [Fiscal Federalism](#). In *The Encyclopedia of Taxation and Tax Policy*. Washington, D.C.: The Urban Institute Press.
- Bureau of Labor Statistics (BLS). 1995. [Consumer Expenditure Survey 1992-93, Bulletin 2462, U.S. Department of Labor](#), U.S. Government Printing Office, Washington, D.C., September
- . n.d. [CE Data Comparison Articles and Presentations](#), Web page.
- Bosworth, Barry, Gary Burtless, and John Sabelhaus. 1991. [The Decline in Saving: Evidence from Household Surveys](#). *Brookings Papers on Economic Activity*, 1:1991.
- Browning, Edgar K. 1995. Tax Incidence Analysis for Policy Makers. In David F. Bradford (ed.), *Distributional Analysis of Tax Policy*.
- Bureau of Economic Analysis (BEA). n.d. [National Income and Product Account Tables](#)
- Congressional Budget Office (CBO). 2018. [The Distribution of Household Income, 2014](#).
- Cronin, Julie-Anne. 1999. [U.S. Treasury Distributional Analysis Methodology](#). U.S. Department of the Treasury, Office of Tax Analysis. OTA Paper 85. September.
- Falk, Gene and Margot Crandall-Hollick. 2018. [The Earned Income Tax Credit \(EITC\): An Overview](#). Congressional Research Service.
- Fuchs, V.R., A.B. Krueger, and J.M. Poterba. 1998. Economists' Views About Parameters, Values, and Policies: Survey Results in Labor and Public Economics. *Journal of Economic Literature*.
- Fullerton, Don and Gilbert E. Metcalf. 2002. [Tax Incidence](#), in *Handbook of Public Economics*, Vol. 4, edited by Alan Auerbach and M. Feldstein.
- Garner, Thesia I., Robert McClelland, and William Passero. 2009. "[Strengths and Weaknesses of the Consumer Expenditure Survey from a BLS Perspective](#)," paper presented at the NBER Summer Institute, July.
- Hurst, Erik, Geng Li and Benjamin Pugley. 2014. [Are Household Surveys Like Tax Forms: Evidence from Income Underreporting of the Self Employed](#). *Review of Economics and Statistics*. Vol. 96, No. 1. March.
- Institute for Taxation and Economic Policy (ITEP). 2015. [Who Pays: A Distributional Analysis of the Tax Systems in All Fifty States \(Fifth Edition\)](#). January.
- . 2017. [Who Pays Taxes in America in 2017?](#) April.
- . n.d.a. ITEP [Microsimulation Tax Model Overview](#).
- . n.d.b. ITEP Tax Model Methodology.
- . n.d.c. [ITEP Tax Model Methodology—Frequently Asked Questions](#).
- Joint Committee on Taxation (JCT). 1993. [Methodology and Issues in Measuring Changes in the Distributions of Tax Burdens](#). JCS-7-93. June 14.
- . 2017. [Overview of the Federal Tax System and Policy Considerations Related to Tax Reform](#). JCX-36-17.

- Kleven, Henrik, Camille Landais, [Emmanuel Saez and Esben Schultz](#). 2014. [Migration and Wage Effects of Taxing Top Earners: Evidence from the Foreigners' Tax Scheme in Denmark](#). The Quarterly Journal of Economics. Vol. 129, No. 1.
- Kotlikoff, Laurence and Lawrence Summers. 1987. "Tax Incidence," in Alan Auerbach and Martin Feldstein (eds.), Handbook of Public Economics, Vol. 2., Amsterdam: Elsevier Science Publishers.
- McClure, Charles E., Jr. 2001. The Tax Assignment Problem: [Ruminations on How Theory and Practice Depend on History](#). National Tax Journal. Vol. 54 No. 2.
- Meyer, Bruce, Wallace Mok and James Sullivan. 2009. [The Under-reporting of Transfers in Household Surveys: Its Nature and Consequences](#). National Bureau of Economic Research Working Paper 15181. July.
- Musgrave, Richard A. and Peggy B. Musgrave. 1984. Public Finance in Theory and Practice, 5th Edition. New York: McGraw Hill, Inc.
- Nunns, James R., Deena Ackerman, James Cilke, Julie-Anne Cronin, Janet Holtzblatt, Gillian Hunter, Emily Lin, and Janet McCubbin. 2008. [Treasury's Panel Model for Tax Analysis](#). U.S. Department of the Treasury, Office of Tax Analysis. OTA Technical Working Paper 3.
- Office of Tax Analysis (OTA). 2016. [Distribution Table 2017 001](#). U.S. Department of the Treasury,
- Passero, William, Thesia I. Garner and Clinton McCully. 2013. [Understanding the Relationship: CE Survey and PCE](#). Bureau of Labor Statistics Working Paper 462. March.
- Roemer, Marc. 2002. [Using Administrative Earnings Records to Assess Wage Data Quality in the March Current Population Survey and the Survey of Income and Program Participation](#). U.S. Census Bureau Technical Paper No. TP-2002-22. November.
- Rogers, John M. and Maureen B Gray. 1994. [CE Data: Quintiles of Income Versus Quintiles of Outlays](#). Bureau of Labor Statistics, Monthly Labor Review. December.
- Sabelhaus, John. 1993. [What is the Distributional Burden of Taxing Consumption?](#) National Tax Journal 46(3). September.
- Sabelhaus, John and Jeffery Groen. 2000. Can Permanent-Income Theory Explain Cross-Sectional Consumption Patterns? Review of Economics and Statistics, 83(3). August.
- Sabelhaus, John, David Johnson, Stephen Ash, David Swanson, Thesia Garner, John Greenlees, and Steve Henderson. 2013. [Is the Consumer Expenditure Survey Representative by Income?](#) National Bureau of Economic Research Working Paper No. 19589. October.
- Suárez Serrato, Juan Carlos and Owen Zidar. 2016. [Who Benefits from State Corporate Tax Cuts? A Local Labor Markets Approach with Heterogeneous Firms](#). American Economic Review, Volume 106, Number 9.
- Tax Foundation. 2016. State-Local Tax Burden Rankings FY 2012. January 20.
- Tax Policy Center (TPC). 2017. Baseline Distribution of Income and Federal Taxes by Expanded Cash Income Percentile, 2017. [Table T17-0003](#).
- Toder, Eric, Jim Nunns, and Joseph Rosenberg. 2011. [Methodology for Distributing a VAT](#). Urban Institute-Brookings Institution Tax Policy Center.
- Washington State Tax Structure Study Committee (WSTSSC). 2002. [Tax Alternatives for Washington State: A Report to the Legislature](#). November.
- Zodrow, George. 1999. [Incidence of Taxes](#). The Encyclopedia of Taxation and Tax Policy, Joseph Cordes, Robert Ebel and Jane Gravelle editors.