An Investigation of State Tax Progressivity

by Cody F. Kallen, Sita N. Slavov, and Alan D. Viard

In this article, we review statistical measures of income inequality and tax progressivity and use data from the Institute on Taxation and Economic Policy (ITEP) to analyze the progressivity and size of state tax systems. In line with ITEP’s conclusions, we find that most state tax systems are regressive. We also find that Democratic-leaning states tend to have larger and less regressive tax systems, but we otherwise find few factors that are systematically related to tax progressivity. States that rely on income taxes tend to have less regressive tax systems compared with other states.

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The authors thank Alex Brill for helpful comments and Michael Ettlinger for assistance in obtaining part of the data used in this article. The views expressed in this article are those of the authors and do not reflect the views of any other person or any institution.

In this article, Kallen, Slavov, and Viard review statistical measures of income inequality and tax progressivity to analyze the progressivity and size of state tax systems.

Inequality

A common measure of income inequality is the Gini coefficient, which ranges from zero (the value that would prevail if all incomes were equal) to one (the value that would prevail if a miniscule fraction of the population received all of the income).

Measures of Inequality and Progressivity

A tax system’s progressivity measures the extent to which taxes are a larger share of income for higher-income households. The progressivity of a tax system can be evaluated by comparing the distribution of tax payments with the distribution of income. A tax system is progressive if higher-income individuals bear a larger share of the tax burden compared with their share of total income and is regressive if the reverse is true. We therefore begin by discussing the measurement of income inequality.

1 The discussion in the text is drawn from Sita N. Slavov and Alan D. Viard, “Taxes, Transfers, Progressivity, and Redistribution: Part 1,” Tax Notes, Sept. 5, 2016, p. 1437, which also includes additional details and numerical examples.
The Gini coefficient is the sum of $n$ values where $n$ is the population. To obtain the first term in the sum, subtract the poorest individual’s share of society’s total income from her share of the population ($1/n$). To obtain the second term in the sum, subtract the combined share of total income for the poorest two individuals from these two individuals’ population share ($2/n$) and so on. The last term, which is the combined population share for all individuals minus the combined share of income for all individuals, must be zero because the entire population (100 percent) earns all of society’s income (100 percent).

Because the population shares and the income shares would be the same if everyone had the same income, each term is a measure of the cumulative deviation from equality. Adding up all of the terms, dividing by the population size, and multiplying by two yields the Gini coefficient.

The Gini coefficient can also be understood graphically. Figure 1 shows the distribution of before-tax income (including cash transfers) for U.S. households, based on the income shares by quintile reported by the U.S. Census Bureau for 2015. Each circular marker along the dotted line represents the cumulative share of total income for the share of the population indicated on the horizontal axis. For example, the bottom 20 percent of the population earns 3.1 percent of total income and the bottom 40 percent of the population earns 11.3 percent of total income. The dotted line — known as a Lorenz curve — interpolates between these points to approximate the income shares at intermediate values. The solid 45-degree line labeled “perfect equality” represents the Lorenz curve that would exist if income were distributed equally. If the number of individuals in society is very large, the Gini coefficient is equal to twice the area between the perfect-equality 45-degree line and the Lorenz curve.

**Progressivity**

A tax system’s progressivity depends on the shares of taxes paid by different income groups.

\[ \text{Progressivity} = \frac{\text{Area under Lorenz curve}}{\text{Area under perfect-equality line}} \]

\[ \text{Gini coefficient} = 2 \times \text{Area between perfect-equality line and Lorenz curve} \]

\[ \text{Income shares were obtained from U.S. Census Bureau, Table H-2.} \]
relative to their shares of income. For example, if high-income households pay 30 percent of total taxes, that could occur because high-income households have 20 percent of total before-tax income and the tax system is progressive, because they have 30 percent of total before-tax income and the tax system is proportional, or because they have 40 percent of total before-tax income and the tax system is regressive.

A common measure of progressivity is the Kakwani index, which equals the concentration coefficient for taxes minus the Gini coefficient for before-tax income. The concentration coefficient for taxes is similar to a Gini coefficient for tax payments, as it measures inequality in tax burdens, but the computation ranks individuals by before-tax income rather than by taxes paid. The Kakwani progressivity index is the difference between the tax concentration coefficient, which is a measure of income groups’ shares of total taxes, and the Gini coefficient for before-tax income, which is a measure of income groups’ shares of total before-tax income.

In accord with the previous discussion, progressivity depends on a comparison of tax shares and income shares. If each individual’s tax share equals his income share (for example, if an individual who earns 10 percent of the total income pays 10 percent of total taxes), the Kakwani index is zero and the tax system has no progressivity. If the tax shares are distributed less equally than before-tax income shares, so that high-income individuals pay a greater share of total taxes than their share of total before-tax income, the Kakwani index is positive and the tax system is progressive. If high-income individuals pay a smaller share of total taxes than their share of total before-tax income, the Kakwani index is negative and the tax system is regressive.

Size of Tax System

The amount of redistribution, or reduction in income inequality, caused by a fiscal system partly depends on the progressivity of its tax system. But it also depends upon the size of government, namely the size of taxes and the size of the transfer payments financed by the taxes, and on the progressivity of the transfer payments.

A common measure of the redistribution induced by a tax system is the Reynolds-Smolensky index, which equals the difference between the Gini coefficient for before-tax income and the Gini coefficient for after-tax income. Mathematically, the Reynolds-Smolensky index is equal to the progressivity of the tax system (measured by the Kakwani index) multiplied by its size. A similar formula expresses the redistribution achieved by transfer payments as the progressivity of transfer payments multiplied by their size.

As discussed below, most state tax systems are regressive; that is, they have negative Kakwani indexes. Because a regressive tax system in isolation increases income inequality, making the tax system bigger would appear to cause an even larger increase in inequality. However, the transfer payments financed by the tax system are surely progressive and therefore reduce inequality. (It is important to recognize that transfer payments are progressive and reduce income inequality even if higher-income people receive larger payments, provided that the payments rise less than proportionately with income.) Scaling up a regressive tax system through an across-the-board tax hike would increase the negative redistribution induced by the tax system but would almost always increase the positive redistribution induced by the entire fiscal system. Because the ITEP data do not include transfer payments, we cannot directly measure the contribution that increasing the size of government makes to redistribution.

Nevertheless, we view both an increase in the size of the tax system and an increase in its progressivity as ways to increase redistribution. Our investigation therefore looks at both progressivity and the size of taxes and examines the relationship between them.


Data and Methods

We use data about state and local tax systems presented in five ITEP “Who Pays?” reports, which were released in 1996, 2003, 2009, 2013, and 2015. The 1996 report presents data for 1995; the 2003 report presents data for 2002; the 2009 report presents data for 2007, including the impact of tax changes enacted through October 2009; the 2013 report presents data for taxes paid in 2012, at 2010 income levels, including the impact of tax changes enacted through January 2, 2013; and the 2015 report presents data for taxes paid in 2015, at 2012 income levels, including the impact of tax changes enacted through December 31, 2014. ITEP states that its results are not strictly comparable across years because of methodological changes. We therefore focus on the 2015 results in our analysis.

The appendix provides a more complete description of ITEP’s methods, including its incidence assumptions. In general, the reports tabulate state and local tax burdens on non-elderly taxpayers (the 1996 report was confined to non-elderly married couples). ITEP obtained its results using a microsimulation model and an input-output model for each state. With various exceptions detailed in the appendix, ITEP generally attributed individual income taxes to the taxpayers, sales and excise taxes to consumers, and property taxes on owner-occupied homes and cars to the owners. ITEP generally allocates state corporate income taxes to capital income recipients nationwide, but allocates part of the burden to consumers or resident workers when a state imposes higher corporate taxes on an industry than it faces in other states. Although incidence assumptions are inevitably controversial and we might not have always made exactly the same assumptions that ITEP made, we believe that the ITEP reports present a reasonable picture of the distribution of state and local tax burdens.

Each ITEP report includes the share of total state taxes paid by each of the bottom four quintiles, the next 15 percent (the 80th through 95th percentiles), the next 4 percent (the 95th through 99th percentiles), and the top 1 percent. It also includes the average before-tax income earned in each of the groups. We use these figures to compute the Kakwani index and to compute the size of taxes (total taxes as a share of after-tax total income). By implicitly assuming that all individuals in each income group earn the same income and pay the same taxes, our calculations abstract from variation in income and taxes within income groups. Nevertheless, our calculations capture the salient features of the state tax systems.

Results

In 2015 only three states — California, Oregon, and Delaware — had progressive tax systems, as indicated by positive Kakwani indexes. The five states with the most regressive tax systems were Florida, Nevada, South Dakota, Washington, and Wyoming. All three of the progressive states have income taxes, and two of them (Oregon and Delaware) do not have sales taxes. Of the five most regressive states, all have sales taxes and none have income taxes.

These results are intuitive because sales taxes tend to be regressive, while income taxes are usually progressive. More generally, Table 1 shows that states with only income taxes have the least regressive systems, followed by states with both sales and income taxes. States with only sales taxes have the most regressive systems. Table 1 also indicates that states with both income and sales taxes have the largest tax systems, followed by states with only income taxes and then states with only sales taxes.

5 ITEP attributes some of each state’s taxes, including the bulk of corporate income tax payments, to nonresidents. Our measure of the size of total taxes therefore refers to the size of the tax burden imposed on the state’s residents, which we view as the relevant concept in this context.


7 We classify Tennessee and New Hampshire, which tax only interest and dividend income, as having income taxes. Alaska is the only state with neither an income tax nor a sales tax.

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Figure 2 (on next page) shows a scatter plot of the size of taxes versus progressivity for each state and D.C. in 2015. The scatter plot suggests that there is a positive relationship between these factors, meaning that states with less regressive tax systems tend to have larger tax systems. The positive correlation between progressivity and size of taxes is statistically significant.

Figures 3 and 4 show the geographic distribution of tax progressivity and size of taxes in 2015. The less regressive states are generally in the Northeast and on the West Coast of the country, and the more regressive states are generally in the Midwest and the South.

We investigated how tax progressivity and size of taxes are related to various state characteristics, including percent white, percent foreign born, percent 65 and older, average income, total population, population density, the percentage of the legislative vote required to enact a tax increase, and the fraction voting for the Democratic candidate in the most recent presidential election. The only state characteristic that appears to be strongly related to the progressivity or size of taxes is the Democratic percentage of the vote, as illustrated in Figures 5 and 6 for 2015 data. States with a larger Democratic presidential vote share tend to have larger and less regressive tax systems. Based on our regression results, a 10 percentage point increase in the vote share for the Democratic presidential candidate is associated with a 0.0241 increase in the Kakwani index (compared with a mean Kakwani index of -0.0765 in 2015) and a 0.0098 increase in the size of the tax system (compared with a mean size of 0.0893 in 2015).

A similar relationship holds for partisan affiliations of legislatures. Table 2 shows the average progressivity and size of taxes for states with two-thirds supermajorities in their lower legislative chambers (where appropriations and tax bills typically originate) in the years immediately preceding the years measured by the ITEP reports.

| Table 1. Progressivity and Size By Type of Tax System (2015) |
|-----------------|-----------------|-----------------|
| Kakwani Index (Progressivity) | Size of Taxes (Taxes/After-Tax Income) |
| Sales Only (FL, NV, SD, TX, WA, WY) | -0.219 | 0.06 |
| Income Only (DE, MT, NH, OR) | -0.02 | 0.072 |
| Both Income and Sales (All others except AK) | -0.059 | 0.097 |

Table 2. Progressivity and Size of Tax Systems By Legislative Supermajorities

<table>
<thead>
<tr>
<th>Democratic</th>
<th>Republican</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kakwani Index 2015</td>
<td>-0.027</td>
<td>-0.118</td>
</tr>
<tr>
<td>Tax System Size 2015</td>
<td>0.109</td>
<td>0.077</td>
</tr>
<tr>
<td>Kakwani Index 2012</td>
<td>-0.042</td>
<td>-0.108</td>
</tr>
<tr>
<td>Tax System Size 2012</td>
<td>0.107</td>
<td>0.075</td>
</tr>
<tr>
<td>Kakwani Index 2009</td>
<td>-0.057</td>
<td>-0.135</td>
</tr>
<tr>
<td>Tax System Size 2009</td>
<td>0.104</td>
<td>0.07</td>
</tr>
<tr>
<td>Kakwani Index 2002</td>
<td>-0.047</td>
<td>-0.096</td>
</tr>
<tr>
<td>Tax System Size 2002</td>
<td>0.1</td>
<td>0.073</td>
</tr>
<tr>
<td>Kakwani Index 1995</td>
<td>-0.056</td>
<td>-0.068</td>
</tr>
<tr>
<td>Tax System Size 1995</td>
<td>0.104</td>
<td>0.082</td>
</tr>
</tbody>
</table>

9 We used multiple regression to estimate these relationships. Our regressions included 235 observations — from the 50 states plus the District of Columbia — in each of the five years in our sample. In addition to the variables mentioned in the text, we included year dummies, which automatically controlled for any common factors affecting all states in each year, such as macroeconomic factors or methodological differences across ITEP reports. Full regression results are available upon request.

10 Although the District of Columbia might appear to be an outlier, the relationship between the Democratic share and both the Kakwani index and the size of taxes is robust to excluding District of Columbia.
Relative to states without supermajorities, states with Democratic supermajorities have larger and less regressive tax systems and states with Republican supermajorities have smaller and more regressive tax systems.

Discussion

In a previous article, two of us discussed considerations that may guide policymakers in deciding how and to what extent to redistribute income.\(^\text{11}\) In general, policymakers can induce any given amount of redistribution through a larger tax and transfer system with limited progressivity or through a smaller tax and transfer system with greater progressivity. Indeed, they can induce significant redistribution with a regressive tax system if the transfer system’s progressivity offsets the tax system’s regressivity.

We observe this trade-off when comparing the U.S. tax system with the tax systems of other OECD countries. The United States has the second most progressive tax system in the OECD (behind Ireland), but its combined tax and transfer redistribution is the fourth lowest in the OECD. Most European countries pursue redistribution through larger, less progressive tax systems, with greater government size and the progressivity of transfer payments offsetting the less progressive taxes.

The choice of redistributive strategy depends on the policymakers’ distributional preferences, the economic costs of taxes and transfers, and legal restrictions. A large tax system creates high average tax rates, which lower the incentive to participate in the labor force. A progressive tax system requires high marginal tax rates on high incomes, reducing the incentive of high-income workers to earn additional income.

States, like all governments, have a choice of redistributive strategy. However, the states face different economic and legal constraints from national governments. Because inefficiency rises at an increasing rate as the tax rate is raised, a more progressive tax system generally causes more inefficiency than a less progressive tax system of the same size. Hence the marginal inefficiency for states to implement progressive tax systems is greater because the state taxes are layered on top of the larger and highly progressive federal tax system.

Moreover, states also face labor mobility constraints that restrict the progressivity and size of the tax system. There are few or no language, cultural, and legal barriers to relocation across state lines, unlike for relocation across national borders. Individuals facing high average tax rates may relocate to lower-tax states. The risk of

\(^{11}\) Slavov and Viard, supra note 4, at 1882-1885.
population loss in addition to the standard economic inefficiency induced by taxes raises the effective costs that states face when increasing the size or progressivity of their tax systems.

Because of these additional constraints, states’ tax systems are more regressive than many countries’ national tax systems. Moreover, the progressivity of state tax systems is linked to political affiliation. In contrast to the international pattern, the progressivity of state tax systems is generally positively correlated with the size of the state tax systems, with larger and less regressive systems in liberal states and smaller and more regressive systems in conservative states. This finding is consistent with the idea that progressivity and tax system size are relatively more costly for states. Hence states with more redistributive preferences, as proxied by affiliation with the Democratic Party, are more willing to accept the economic costs of larger and more progressive taxes.

States can also be constrained by tax and expenditure limitations. One of the most common tax limitations is a supermajority requirement to raise taxes. In 2015, 12 states had supermajority requirements, and Colorado could raise taxes only through a popular vote. Table 3 shows the average progressivity and size of taxes for states with and without tax limitations in 2015.

The results in Table 3 show that states with tax limitations generally have smaller and less progressive tax systems, although the differences are not statistically significant. States with tax supermajority requirements also had smaller, less progressive tax systems on average than those without limitations in each of the earlier years for which ITEP published reports, although those differences were also statistically insignificant.

### Table 3. Progressivity and Tax System Size By Tax Limitations (2015)

<table>
<thead>
<tr>
<th></th>
<th>Tax Limitation</th>
<th>No Tax Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kakwani Index</td>
<td>-0.0922</td>
<td>-0.0712</td>
</tr>
<tr>
<td>Tax System Size</td>
<td>0.0824</td>
<td>0.0917</td>
</tr>
</tbody>
</table>

### Conclusion

We have used ITEP’s data on the distribution of taxes and income at the state level to compare tax progressivity — as measured by the Kakwani index — and size of taxes across states. Most states have regressive tax systems. States with sales taxes tend to have more regressive tax systems and states with income taxes tend to have less regressive tax systems. State tax progressivity is positively related to the size of the tax system, and more Democratic states tend to have larger and less regressive tax systems. These patterns differ from the negative relationship between size and progressivity observed across countries, reflecting the distinctive trade-offs that policymakers face at the state level.

### Appendix: ITEP’s Methods

Appendix V to the 1996 report provides an eight-page description of the methods. The later reports provide very brief descriptions of the methods, which are generally similar to each other. ITEP provides a more detailed description of its methods, particularly how the underlying data were used, in a 2011 policy brief.

The one major change in methods over time is that the 1996 report tabulates tax burdens only on non-elderly married couples, while the other four reports tabulate tax burdens on all non-elderly taxpayers. The 2013 and 2015 reports include an addendum stating that the methods have remained “broadly similar” but discouraging “direct comparison” across years. The only stated reasons for discouraging direct comparison are the later studies’ use of new state-by-state IRS data on components of personal income and

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possible business-cycle effects on the relative size of the different tax bases.

ITEP uses a microsimulation model, drawing on a large, stratified sample of tax returns, aged to the year to which the analysis applies. ITEP also used the Census Public Use Microdata Sample for statistical matching to tax returns and to obtain information on households that did not file individual income tax returns. Consumption patterns were imputed to households based on regressions estimated using Consumer Expenditure Survey data. ITEP has constructed a 49-sector input-output model for each state, based on the Commerce Department’s national model. ITEP uses the input-output model to trace business taxes through to final consumers. Data from the U.S. Travel Data Center are used to estimate consumer purchases by tourists in each state. ITEP constructed purchases by commuters as a residual after computing purchases by residents, businesses, and tourists.

ITEP does not precisely describe its income classifier. ITEP states that the classifier includes Social Security benefits, workers’ compensation benefits, unemployment compensation, veterans’ benefits, child support, unspecified “financial assistance,” public assistance, and Supplemental Security Income payments. ITEP adjusts for underreporting of capital gains, passthrough income, rental income, and farm income. Imputed rent is not included.\(^\text{15}\)

ITEP states that its incidence assumptions are generally similar to those made by the Minnesota Department of Revenue. ITEP assumes that state and local individual income taxes are borne by the statutory taxpayers.

ITEP generally assumes that state and local corporate income taxes are borne by recipients of capital income throughout the nation. Capital income includes interest, dividends, realized capital gains, passive income reported on Schedule E of Form 1040, and 70 percent of pension benefits. Very little of the burden of a state’s corporate income tax therefore falls on its own residents. In states with corporate income taxes on an industry that are “significantly above the national median,” ITEP assigns part of the burden to either residents’ wages or to the industry’s consumers (both residents and nonresidents). The decision whether to assign burdens to workers or to consumers is made “depending on the type of activity” in an unspecified manner.\(^\text{16}\) ITEP apparently does not assign negative burdens to workers or consumers when corporate income taxes are below the national median.

ITEP assumes that state and local property taxes on owner-occupied homes and cars are borne by the owners. ITEP generally assumes that state and local property taxes on businesses are borne by recipients of capital income throughout the nation, with the same modifications for taxes significantly above the national median that applies to corporate income taxes. However, ITEP assumes that half of state and local property taxes on residential rental property are borne by the renters.

ITEP generally assumes that state and local sales and excise taxes on consumer goods are borne by consumers. Because some of a state’s consumers are assumed to be visitors (both tourists and commuters), not all of the burden falls on state residents. ITEP assumes that state and local sales taxes on business purchases are borne by final consumers, many of whom are nonresidents. However, in states with sales and excise taxes that are significantly above the national median on an industry that sells in national markets, ITEP assigns half of the excess burden to residents’ wages and half of the excess burden to capital (which is then allocated in the manner described under corporate income taxes).\(^\text{17}\) ITEP apparently does not assign negative burdens to workers or capital when sales and excise taxes are below the national average.

ITEP computes the offset to state and local tax burdens arising from the federal itemized deduction for state and local taxes and presents tax burdens both with and without the offset. Our analysis uses the tax burdens without the offset, to focus on the policies directly chosen by state and local governments.

\(^\text{15}\) Ibid. at 17, n. 5.

\(^\text{16}\) Ibid. at 7.

\(^\text{17}\) Ibid.