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HOW REGRESSIVE ARE STATE AND LOCAL TAXES?

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KEYWORDS

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ABSTRACT

State and local income, sales and property taxes are combined and tax regression is measured for each state and the District of Columbia. All direct tax systems are regressive and there are large differences across states. State and local tax systems are ranked in terms of both the Reynolds-Smolensky and Kakwani indexes of global progression. The most regressive state is 75 to 88 times more regressive than the least regressive state. Inspection of the data underpinning the Gini-based indexes reveals that 49 of the 51 tax systems are unambiguously regressive at every measured point within the income and direct tax distributions.

1. INTRODUCTION

State and local taxes in the United States account for approximately 40 percent of the overall tax burden and totaled more than $1.29 trillion in 2010. The constitutional provisions underpinning U.S. tax law permit great diversity in the structure of taxes at the federal, state and local levels. All rights, including the right to tax, not expressly granted to the federal government are constitutionally reserved to individual states. States, in turn, delegate certain powers to tax to the cities, counties (parishes) and school districts within their borders. As a result of this wide discretion, there is considerable variation in the structure of state and local tax systems across the U.S. Thus, not only do state and local tax structures differ from the federal tax system, there are also significant differences among the states. An important dimension of tax structure is the degree of progression and regression, which is closely related to the question of who bears the burden of taxation. It is well known that, on balance, federal taxes are progressive, which is attributable to both the size and graduated rate structure of the individual income tax. In contrast, many state and local taxes are believed to be regressive. For example, sales taxes and property taxes are perceived to be regressive. On the other hand, state income taxes are widely interpreted to be progressive.

On balance, tax distribution tables derived from the Institute on Taxation and Economic Policy's (ITEP) microsimulation model strongly suggest that most, if not all, state and local tax systems are regressive.[1] In contrast, the federal tax distribution tables derived from the ITEP model indicate a highly progressive tax structure.[2] However, Gale and Potter's estimates before and after the Bush tax cuts of 2001 reveal decreasing relative federal tax burdens for high income recipients and rising relative burdens for low and middle income families, which implies tax cut induced decreases in overall federal tax progressivity. In this paper we use microsimulation estimates of family incomes and direct tax burdens from the ITEP model to calculate and compare exact summary measures of overall progressivity among the fifty state and local tax systems and for the District of Columbia. The purpose is to provide a precise answer to the question raised by the title of the paper: How Regressive are State and Local Taxes? Progressivity is measured using Gini-based indexes and state and local tax systems are ranked. Consistent with the findings of Chernick (2005)[3] the results indicate that state personal income taxes are important in explaining observed differences in the degree of tax regressivity across states. To shed additional light on this issue we combine the 51 state and local tax systems into two broad groups: states with personal income taxes and states without any form of personal income tax. Results are reported for each broad group and comparisons are made to the overall regressivity of all state and local tax systems combined.

The next section reviews progressivity and regressivity measurement issues and outlines the procedures used in calculating the two Gini-based summary indexes employed in the empirical analysis. This section also briefly discusses the ITEP data highlighting its strengths and limitations. The third section presents the basic results and makes comparisons across state and local tax systems. We first report regressivity measures and rank tax systems using absolute values of two summary measures across all states. We then normalize the measures by setting the overall index for all state and local tax systems combined to 100.0 and report the indexes of the 51 state and local tax systems as percentages of the observed overall degree of regressivity. Next, state and local tax systems are combined into two groups consisting of those that do not levy personal income taxes and those imposing personal income taxes as a part of portfolio of revenue sources. Regressivity comparisons are then made across groups and to overall regressivity in all state and local tax systems combined. The final section summarizes and concludes.

2. LITERATURE REVIEW

A distinct literature focusing on tax induced changes in the distribution of income and income inequality originated with Musgrave and Thin's (1948) classic paper on tax progression. The literature distinguishes two broad concepts of progressivity that are referred to as "local" and "global" progression. A tax is locally progressive (regressive) if the average tax rate rises (falls) as income increases, in a given income range.[4] Thus, local indicators of tax progression provide a

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[1] Inspection of ITEP distribution tables indicates that state and local average tax rates generally decline as average income rises.

[2] Gale and Potter (2002) use the ITEP model to construct tax distribution tables that show rising average combined direct federal tax rates as income increases. Their ITEP results are consistent with other studies of the distribution of direct federal tax burdens and incomes.

[3] Chernick pools three state specific data sets for 1976, 1985 and 1991 to investigate the determinants of state and local tax progressivity. He notes (2005, 94, fn. 1) that income and sales tax shares explain 58% of the cross-sectional time series variation in measured degrees of progression. However, Chernick's main purpose is to explore other political and economic determinants of the degree of tax progression. So, income and sales tax shares are not included in his main regression.

[4] Pigou (1929) was the first to formalize the concept of tax progressivity and suggested two distinct but related local measures – average rate and marginal rate progression. Arc elasticities are often employed in calculating these point measures with values greater (less) than one indicating progressive (regressive) taxes.

measure at two points within an income distribution. For this reason, local progressivity measures are often referred to as "point" measures. Local measures are intuitive and easy to explain. However, a difficulty with point measures is that they almost always vary within an income distribution, and it is generally not possible to know the overall progressivity by calculating a series of local measures. In fact, based upon local measures a tax system can be regressive in some income ranges and progressive in others.

In contrast to local indicators, a global measure provides an index of the overall degree of progression or regression. There is wide agreement that global progressivity measures are more appropriate techniques for assessing overall progressivity and comparing entire tax systems. If a tax system is in part progressive and in part regressive, then global measures net out the differences and present the result in the form of a single number that summarizes overall progressivity. A number of such indexes have been developed, which provide distinct but related measures of global progression. All global indexes belong to one of two broad classes of progressivity measures, which involve conceptually different approaches to the meaning and measurement of overall progression. Kiefer (1985) emphasizes that one basic approach to measurement involves the use of distributional indexes. Musgrave and Thin's (1948) measure of effective progression pioneered this method. Global indexes of this type belong to the "redistributive class" of progressivity measures. The essence of this approach involves measuring the redistributive effects of taxes by calculating their impact on overall income inequality. A tax is globally progressive (regressive) if it causes the after-tax income distribution to be more (less) equal than the before-tax income distribution.

The second approach to global progressivity uses indexes that measure deviations from a proportional or flat tax system. Blackorby and Donaldson (1984) refer to summary indexes of this type as the "tax-scale-invariant class". Measures fitting into this class focus on the relative distribution of taxes as it relates to the relative distribution of before-tax income. All scale invariant indexes measure the departure of a tax system from proportionality. Under this approach, a tax is progressive (regressive) if taxes are more (less) heavily concentrated on those with higher incomes. A characteristic of the scale invariant class of measures is that proportionate changes in all taxes leave progressivity unchanged. Thus, a doubling of taxes or any other proportionate tax surcharge does not affect the overall index of progression. This characteristic leads to the key difference between scale invariant and redistributive class of progressivity indexes measures. An across the board tax surcharge increases the average tax rate and leads to greater progressivity (or regressivity) for all indexes belonging to the redistributive class. However, the same tax surcharge leaves scale invariant progressivity indexes unchanged.

Suits (1977) emphasizes that income distributions play an integral role in the construction of any summary measure of tax progression. There is broad agreement in the literature that Lorenz curves and the data underpinning them provide the most general indicators of relative income inequality. Additionally, concentration curves are also widely applied when examining tax burdens ordered by pre-tax incomes. Differences in Lorenz and tax concentration curves show deviations from proportionality, which are at the heart of all scale invariant measures of tax progressivity. Similarly, differences in before and after-tax Lorenz curves show the effects of taxes on the relative distribution of income and are at the heart of redistributive measures of progressivity. Thus, Lorenz curves and concentration curves provide the foundations for the two classes of global progressivity and regressivity measures.

The two broad classes of global progressivity measures each contain a number of specific indexes that differ depending upon the number of data points used and weights attached to them. For example, Chernick's (2005) study of the determinants of subnational tax progressivity uses an index from the scale invariant class that is equal to the ratio of average tax rates in the top and bottom quintiles of state income distributions. This index has the advantage of being easy to calculate, but it gives zero weight to income and tax distribution data for quintiles 3, 4 and 5.[5] Pfähler (1987) shows that new indexes from each of the broad classes can be created by changing the weights assigned to income and tax distribution data. Pfähler (1987) also establishes that indexes from the same class that use similar weights tell essentially the same story about progressivity and yield virtually the same rankings of tax systems. We now consider Gini-based progressivity indices that are similar to Gini coefficients of income inequality. These summary indexes make use of the natural weights inherent within the Lorenz curves and tax concentration curves underpinning all global progressivity measures.

Gini-based Indexes of Global Progression and Regression

Gini coefficients (G) and related concentration coefficients (C)[6] are closely related to Lorenz and concentration curves and can be derived from basic income and tax distribution data. There are a number of advantages in using Gini coefficients and associated concentration coefficients to evaluate the degree of tax progression and regression. First, these indexes are intuitively appealing and have simple geometric interpretations, which make them readily understandable. Moreover, the measures are the most widely applied techniques for evaluating the overall degree of tax progressivity. In addition, Gini-based indexes make use of all available data points in the income and tax distributions and, as noted above, apply the natural weights inherent in Lorenz curves and tax concentration curves. Furthermore, Gini-based indices from both the redistributive and tax scale invariant classes of progressivity measures are available. Finally, there is a fundamental relationship, discussed in detail below, between two specific Gini-based indexes drawn from each of the broad classes. This relationship turns out to be useful in explaining observed differences in the structure of state and local tax systems.

Despite the advantages and appeal of Gini based measures of tax progression, the use of such indexes is not without difficulty. Two problems warrant discussion. First, Gini coefficients and associated concentration coefficients are only one of a number of possible indexes that could be employed to evaluate income inequality and global tax progressivity. Second, the Lorenz curves and/or concentration curves that underpin the indexes may intersect, which may cause the progressivity index to be less than completely informative. Such crossings signify that a tax system contains elements of both progression and regression,[7] i.e. some local measures are progressive while others are regressive. A tax system containing both regressive and progressive

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[5] Chernick (2005) notes this weighting problem and considers alternative scale invariant indexes that use ratios of average tax rates for alternative pairs of income distribution quintiles, e.g., top to middle quintile ratio and middle to bottom ratio. In addition, Chernick uses average tax rates in specific quintiles as progressivity measures. The quintile specific tax rates are essentially local measures, while the ratios of quintile average tax rates are global measures. Chernick's purpose is to identify determinants of progressivity using pooled time series regression analysis. Measures for all states are not reported.

[6] Gini coefficients and concentration coefficients, respectively, measure how close a given Lorenz curve or concentration curve is to the line of equality and can be defined as two times the area between the Lorenz curve or concentration curve and the line of equality. See Lambert (2001) for a more concise definition and mathematical representation of each coefficient.

[7] Davies (1980) was the first to discuss the crossing problem in the context of global progressivity measures. Another problem worth mentioning is that statistical inference procedures are unavailable for Gini based indexes calculated from distribution tables. Bishop, Formby and Zheng (1998) provide inference procedures for Gini based measures of tax progressivity, but only for indexes calculated from large samples using micro data.

taxes in different segments of the income distribution cannot be identified using a summary index. Crossing can only be detected by inspecting the Lorenz curves and relevant concentration curves, which provide the basic data underpinning all summary measures of progression.

The two problems noted above are somewhat interrelated. If no crossings exist, then any two global indexes from the same class necessarily tell essentially the same story about tax progression and regression. The absence of crossings results in unambiguous conclusions concerning the progressivity of a tax system irrespective of the particular global index (from the same class) that a researcher may employ. However, if crossings exist then conceivably alternative global indexes that weight the progressive and regressive segments of the tax and income distributions differently could provide contradictory conclusions concerning whether the tax systems is, on balance, progressive or regressive. The crossing problem is discussed further below.

3. METHODOLOGY AND DATA

We apply two widely used Gini-based indexes, one from each of broad classes of global progressivity measures described above. Specifically, we use the Reynolds-Smolensky (Π_{RS}) index and the Kakwani (Π_K)[8] index to investigate the redistributive effects of state and local tax systems in the U.S. Reynolds and Smolensky (1977) developed the most widely used global progressivity measure in the redistributive class, while Kakwani (1977b) developed one of the two most widely applied global progressivity indexes in the tax-scale-invariant class of measures. Suits (1977) developed the other. The Kakwani and Suits' indexes differ by a weighting factor equal to the slope of before-tax Lorenz curve.[9] We use the Kakwani index rather than Suits index because it has well known relationship to the Reynolds and Smolensky index, which we discuss below.

The Π_{RS} measures the tax induced change in income inequality using the absolute difference in Gini coefficients of before and after-tax incomes. In contrast, Π_K measures the deviations of a tax system from proportionality using the absolute difference between before-tax Gini coefficient and the associated tax concentration coefficient. The details of the specific indexes are as follows. Denoting the before-tax Lorenz curve as L_X and the after-tax Lorenz curve as L_{X-T},[10] then the Reynolds-Smolensky index is:

$$\Pi_{RS} = G_X - G_{X-T}, \qquad (1)$$

where G_X is the pre-tax Gini coefficient and G_{X-T} is the post-tax Gini. G_X and G_{X-T} are calculated from the before-tax and after-tax Lorenz curves respectively. If $G_X - G_{X-T}$ is positive, i.e., the Gini coefficient for post-tax income is smaller than the pre-tax Gini coefficient, the tax system has an equalizing effect on the distribution of income and the tax system is globally progressive. The larger the index, the greater is the degree of measured progressivity. Conversely, when Π_{RS} is negative, then state and local taxes induce greater inequality and the tax system is regressive. For the redistributive class of global measures Figure 1.a illustrates a progressive tax system and Figure 1.b shows a regressive tax structure. If taxes do not induce a change in inequality then, G_X

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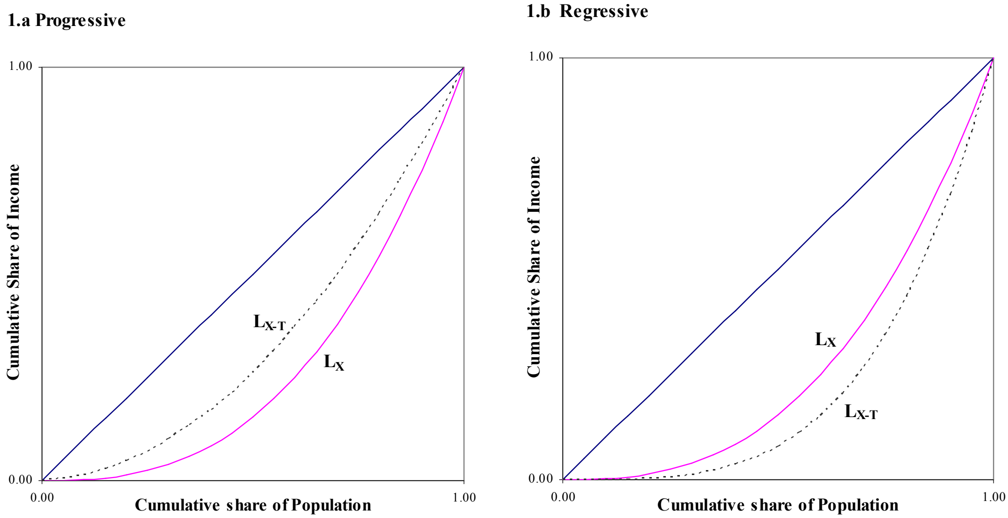
[8] Tax equity issues are often divided into vertical and horizontal components. Vertical equity (VE) is based on the ability to pay principle of taxation, which asserts that individuals with larger incomes should pay more taxes. Horizontal equity is a fairness principle that asserts that individuals with equal incomes should pay equal taxes. VE (see Kakwani, 1984) is related to tax progressivity, which is the focus of this research. Regressive taxes are vertically inequitable (VI). Π_{RS} and Π_K can be thought of as measures of VE and VI.

[9] On this point see Formby, Seaks and Smith (1981).

[10] Unless otherwise noted, all notation for distributional measures and related indexes is identical to that used by Lambert (2001) and other editions of this well known work.

= $G_{X\text{-}T}$, Π_{RS} = zero, and the tax system is classified as proportional. In Figure 1.a Π_{RS} is a positive number equal to twice the area between L_X and $L_{X\text{-}T}$. In Figure 1.b Π_{RS} is a negative number equal to twice the area between L_X.and $L_{X\text{-}T}$.

Figure 1: Progressive and Regressive Tax Systems for the Redistributive Class of Global Indices



The Kakwani index is:

$$\Pi_K = C_T - G_X, \qquad (2)$$

where G_X is as defined in equation (1) and C_T is the tax liability concentration coefficient. Positive index values again denote progressivity, negative values indicate regressivity, and a value of zero represents proportionality. For the tax scale invariant class of measures Figure 2 provides simple pictures of progressive and regressive tax structures using before-tax Lorenz curves and tax concentration curves. In Figure 2.a Π_K is a positive number equal to twice the area between L_X and C_T, while in Figure 2.b Π_K is a negative number equal to twice the area between L_X and C_T.[11]

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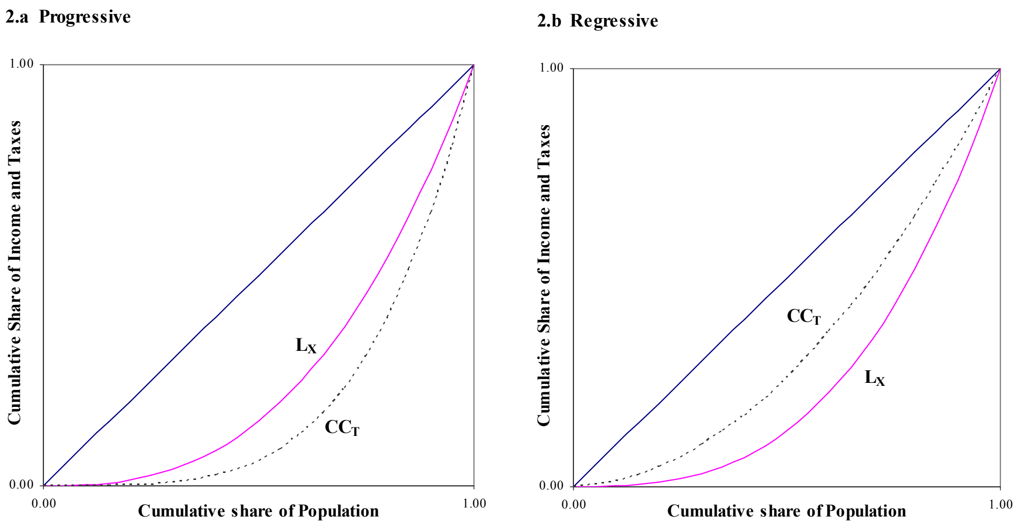
[11] In addition to Π_{RS}, Gini-based measures of progressivity of the redistributive class include Musgrave and Thin's index of effective progression and the Pechman Okner index. In addition to the Kakwani and Suits indexes the scale invariant Gini-based measures includes the Khetan-Podder and Pfähler indexes. See Lambert (2001) for further information on these indexes and how they differ.

Figure 2: Progressive and Regressive Tax Systems for the Tax Scales Invariant Class of Global Indices



The following fundamental relationship between the Π_{RS} and Π_K indexes was demonstrated by Kakwani (1977a, 1977b):

$$\Pi_{RS} = \frac{g}{1-g}\,\Pi_K,\text{ [12]} \qquad (3)$$

where g is the average effective tax rate. This relationship shows that both tax progressivity, measured by Π_K, and average tax rates influence the distributional impact of taxes. Holding Π_K constant, any change in the average tax rate necessarily alters progressivity as measured by Π_{RS}, but, leaves progressivity measured by the departure from proportionality unchanged. For two tax systems with the same average tax rate, equation (3) implies that Π_{RS}, is a monotonic transformation of Π_K. However, if average tax rates differ, as they do across states, there is no monotonic relation and rankings of tax systems using Π_K can diverge from rankings created by measures of Π_{RS}. Thus, when we observe variations in state rankings based upon Π_{RS} and Π_K we know immediately that they are caused by differences in average tax rates across tax regimes.

ITEP Data

Information on the distributions of tax burdens and income is required in order to estimate the Lorenz curves, concentration curves, and related coefficients described above. Distributions constructed using microdata for each household's income and tax burden would obviously provide the best possible information, but such data is generally unavailable at the state and local level. However, grouped data provided by the Institute on Taxation and Economic Policy (ITEP) is available for 2002. Therefore, ITEP data will be employed to explore the measures of interest in

[12] This version of Kakwani's fundamental equation assumes there are no tax induced income re-rankings. See Kakwani (1977b) and Lambert (2001). This version of the equation is the one that is appropriate for analyzing grouped data and distribution tables of the sort provided by the Institute on Taxation and Economic Policy (ITEP). ITEP data provides the basic data for our progressivity (regressivity) estimates and the ITEP model and estimation of taxes and after tax incomes ignores income re-rankings.

this paper. Specifically, Who Pays? A Distributional Analysis of the Tax Systems in All 50 States (ITEP, 2003) provides the foundation for estimating the global tax regressivity of state and local tax systems. The ITEP model provides estimates of mean incomes and tax burden data for the bottom four quintiles and three points within the top quintile of income recipients. For state and local taxes, ITEP includes separate estimates for sales and excise taxes, property taxes, personal income taxes, corporate income taxes, and any Federal income tax offset. At the Federal level, the ITEP model also includes payroll and estate taxes.

The reliability of the ITEP data warrants comment. We note that more is known about the distribution of tax burdens at the federal level compared to state and local tax burdens. Examination of Federal ITEP tables reveals results that are consistent with what is generally known about the distribution of federal taxes relative to income. Gale and Potter (2002) use the ITEP model to investigate distributional changes in federal tax law and comment that the ITEP results are similar to results obtained from other models and studies. Similarly, Sullivan (2001) remarks that the ITEP simulation model "… is of extremely high quality and in the past has produced results consistent with official Treasury analyses." Sullivan (p. 1751) further argues that there is no reason to question the accuracy of the ITEP distribution tables.

The reliability of the ITEP data at the federal level suggests that we can have confidence in state and local ITEP estimates. Nevertheless, before presenting results based upon the data we briefly discuss some limitations. First, ITEP considers only direct taxes when estimating total tax burdens and ignores indirect taxes. This necessarily leads to an underestimation of the total tax burden in each state. Furthermore, not all states have the same mix of direct and indirect taxation.[13] A second difficulty involves the use of non-elderly married taxpayers as the "representative family" in the ITEP data set. Although a majority of the population is a part of this group for a substantial part of their lives, demographic changes and the growing number single parent households suggests that using non-elderly married taxpayers to estimate total state and local tax burdens for each state may result in imprecise estimates. Unfortunately, the ITEP model provides the only readily available data for systematically investigating distributional tax issues across all state and local governments in the U.S. In the absence of better data it is impossible to know the exact degree of accuracy in the ITEP estimates of state and local tax burdens.

The first step in estimating the distributional effects induced by state and local tax systems is to use the ITEP tables to construct distribution tables analogous to those employed by Formby, Smith and Thistle (1992). Formby et al. use such tables to represent the distributional impacts of various tax reform alternatives. Here, similar tables derived from ITEP data are used to support the estimation of global progressivity indexes for each of the fifty states and the District of Columbia. Each table contains information for the four bottom quintiles and for three points in top quintile of income recipients. Thus, the ITEP data provides seven points within the income tax distributions that can be used in estimating tax progressivity. Each table contains the following 2002 conditional mean values: before-and after-tax incomes, total state and local taxes, sales and excise taxes, property taxes, total income taxes, personal income taxes and corporate income taxes. Thus, the tables contain the basic income and tax distribution data for all direct state and local taxes, as well as the specific burden for each type of tax. In addition to the state tables, similar tables have been constructed for all U.S. state and local tax systems combined as well as aggregations of all states that levy personal income taxes and all states that do not levy personal income taxes.

[13] Comparisons of ITEP average tax rates with tax burden data from other sources (e.g., Tax Foundation) reveals dissimilarities in tax rates and average state rankings. Such comparisons indicate that indirect and possibly exported state and local taxes may be important. However, the distributional implications of such taxes are not well understood or researched.

The distribution tables constructed from ITEP data are used to estimate before- and after-tax Lorenz curves, tax concentration curves, and corresponding Gini coefficients and concentration coefficients. However, a problem arises when constructing distributional measures and corresponding indexes when utilizing grouped data, which is the case when ITEP data are employed. Lorenz curves and concentration curves, as described above, can be constructed by drawing straight line segments between observed data points. Lambert (2001) provides a simple example. The problem with this approach was emphasized by Paglin (1975), who observed that the linear segments create a bias that understates income inequality when fewer than eight data points are available. The bias carries over to the distribution of taxes as well. The ITEP data employed in this paper is constructed using seven data points. To avoid the bias associated with linear segments we adapt the procedure first employed by Paglin (1975) and apply it to ITEP data. In the relevant literature, Paglin's procedure[14] is referred to as a smoothing technique. In this paper, we use a SAS statistical analysis routine to perform a smoothing procedure similar to the cubic-spline method employed by Paglin (1975). The integration procedures required to estimate the Gini and concentration coefficients are performed using SAS procedures.

Results

Table 1 reports regressivity estimates using two formats. Columns 1 and 2 show absolute values of the Π_K and Π_{RS} measures of global tax regression across states. The second series, reported in columns 3 and 4, normalizes the results by expressing regressivity estimates as a percentage of the overall regressivity for all U.S. state and local tax systems combined. This format makes the absolute regressivity measures of states easier to interpret by comparing them to the overall combined index, which is set at 100.0. Normalizing the results also allows a state to be assessed relative to all other states in a straight forward manner.

Table 1 also provides rankings of the degree of regressivity, with 1 representing the most regressive state and 51 the least regressive. Thus, a state and local tax system ranked first (1) by Π_K or Π_{RS} exhibits more regressivity than any other state and local tax system, and a ranking of fifty-first (51) indicates less regressivity than any other state. Column 5 presents state rankings based on the Π_K measure of regressivity while the Π_{RS} rankings are shown in Column 6.[15] Recall that the indexes are from two distinct classes of global progressivity measures. Based on the two indexes a state may or may not have the same regressivity ranking. A cursory review of columns 5 and 6 in Table 1 reveals that most states do not have the same regressivity ranking. As discussed previously, differences in rankings signify that there are important variations in the average tax rates contained in the underlying ITEP distribution data that are used to calculate the indexes. If tax rates were equivalent, Kakwani's fundamental relation (equation 3 above) insures that the Π_K and Π_{RS} regressivity measures would be simple monotonic transformations, implying identical rankings.[16]

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[14] For a detailed review of Paglin's estimation procedure, see Campano and Salvatore (2006) p. 75 – 80.

[15] The normalization procedure does not alter the rankings of either index and therefore the rankings provided in Columns 5 and 6 denote a state's rank for both absolute and normalized results.

[16] The rankings based upon Π_K and Π_{RS} are highly correlated. The Spearman Rank correlation coefficient is 0.8933. Nevertheless, tax rates are not equivalent and the rankings are not the same.

Based on ITEP data and estimations of global progressivity, all state and local tax systems included in this analysis are regressive.[17] Table 1 shows that even though regressivity is present in each tax system, the degree of regressivity ranges broadly from 0.2187 to 0.0029 as measured by Π_K and 0.0176 to 0.0002 for Π_{RS}. Clearly, there are large differences in the extreme cases in Table 1. Washington is the most regressive state with indexes equal to -0.2187 for Π_K and -0.0176 for Π_{RS}. Delaware is the least regressive with Π_K equal to -0.0029 and Π_{RS} equals -0.0002. Thus, direct tax regressivity in Delaware is very close to zero. If the coefficients were exactly zero, then Delaware's tax system would be globally proportional. Instead, the coefficients are ever so slightly negative, which means that, on balance, direct taxes are regressive. Based on the Π_K index Washington is more than 75 times more regressive than Delaware and 88 times more regressive when measured by Π_{RS}.

Rankings provided in Columns 5 and 6 of Table 1 reveal that, as measured by Π_K, Washington (1),[18] Florida (2), Nevada (3), Wyoming (4), and Tennessee (5) comprise the five most regressive state and local tax systems in the United States. Washington [1], Florida [2], and Tennessee [3] are also ranked in the top five when measuring regressivity by Π_{RS} while Nevada drops to sixteenth and Wyoming moves to twenty-sixth. The dramatic difference in Wyoming's ranking is explained by very low average tax rates vis-à-vis other states. South Dakota [4] and Illinois [5] complete the five most regressive states utilizing the Π_{RS} assessment of regressivity. Π_K values for South Dakota and Illinois rank them sixth and eleventh, respectively.

Focusing on tax systems exhibiting low regressivity, Table 1 shows that the five states with the lowest degrees of regressivity as measured by Π_K includes South Carolina (47), Vermont (48), Maine (49), Montana (50), and Delaware (51). Again, rankings change depending upon which index of regression is used. The five least regressive tax systems as measured by Π_{RS} are Vermont [47], Maine [48], Alaska [49], Montana [50], and Delaware [51]. South Carolina is ranked 46th by Π_{RS}, while Alaska is ranked 38th by Π_K. While the degree of regressivity among the five most regressive states is somewhat concentrated, i.e. the states ranked first and fifth are only separated by twenty percent as measured by Π_K and sixty-percent under Π_{RS}; the same is not true when examining states that display low degrees of regressivity. Columns 1 and 2 reveal a sizable difference between Delaware, the least regressive state, and Montana, the state with the next lowest level of overall tax regressivity.

Columns 3 and 4 of Table 1 normalize the results provided in Columns 1 and 2 to the U.S. average.[19] This procedure provides a useful method for identifying similarities among states as well as comparing individual states to the overall combined state and local regressivity in the U.S., which equals 100. Thus, states with normalized values exceeding 100 are above the national average while states with values less than 100 indicate that a state's measured regressivity is below the national average.

Column 3 of Table 1 depicts the normalized Π_K index. Inspection reveals that 20 of 51 state and local tax systems (39.2%) exhibit greater regressivity than the overall combined state and local tax regression in 2002. Results for Π_{RS} are shown in Column 4, where 19 of 51 state and local tax

[17] As measured by the progressivity indexes Π_K and $\boldsymbol{\Pi_{RS}}$, each state and local tax system is regressive. For reporting purposes, only positive values for each index are shown in Columns 1 and 2 of Table 1 and all results are described as a degree of regressivity.

[18] Values in parentheses, ( ), denote Π_K rankings while values in brackets, [ ], indicate Π_{RS} rankings.

[19] Normalized values are obtained by dividing state values for each index by the U.S. average for the respective index and multiplying by 100. For example, the normalized Π_K index in Alabama is calculated as follows: (Π_K Alabama / ΠK U.S. Average)*100. Thus, the reported normalized values represent a percentage of the national average.

systems (37.3%) display a degree of regressivity that is above the level for all state and local systems combined. An examination of states displaying the largest degree of regressivity shows that only Washington has a tax system with both regressivity indexes more than twice as large as the combined level for all state and local systems. Two other states, Florida and Nevada, join Washington with degrees of regressivity greater than twice the U.S. average when considering only Π_K.

Furthermore, according to both global indexes, the five states with the lowest degree of regressivity exhibit less than half of the regressivity associated with the combined national average. Regressivity in South Carolina [46] is also less than half of the national average when examining only the Π_{RS} index. As noted previously, Delaware displays the smallest degree of regressivity by a sizeable margin. Montana possesses the second lowest amount of regression according to both Π_K (-0.0268) and Π_{RS} (-0.0018). However, according to both indexes, Montana is more than twice as regressive as Delaware.

Focusing on state and local tax systems in the middle of the rankings reveals smaller but still noteworthy differences in tax regressivity. Rhode Island is the median state in the rankings of Kakwani indexes, while Wyoming is the median in the Π_{RS} rankings. The quintile of states surrounding Rhode Island (states ranked between 21 through 31 in column 5 of Table 1 have Π_K indexes that range from 0.0782 (Virginia) to 0.0907 (North Dakota), a difference of 16 percent. The quintile of states surrounding Wyoming (states ranked between 21 through 31 in column 6) have Reynolds and Smolensky indexes ranging from 0.0070 (Iowa) to 0.0082 (Colorado), a difference of 17 percent. Two states in the Π_{RS} rankings, Kansas and Wisconsin, have indexes of regressivity almost identical to, but slightly larger, than Wyoming. In the Kakwani rankings New Mexico has a Π_K index only slightly smaller than Rhode Island. Seven of the 11 states in the middle of the rankings are the same in columns 5 and 6. The states and localities include the District of Columbia, Kansas, Mississippi, New Jersey, New Mexico, North Dakota and Rhode Island. The tax systems of these states are clearly "average", irrespective of the index used to measure tax regressivity.

As noted above, the Gini-based measures reported in Table 1 reveal nothing about crossing Lorenz and concentration curves, which signify possible problems with summary indexes of global tax regression. To investigate this issue we inspected and compared the relevant distribution tables and associated Lorenz and concentration curve ordinates for all 50 states and the District of Columbia using ITEP data. The results reveal that 49 of 51 comparisons for incomes and all direct taxes are free of relevant crossings. Only two states, Delaware and Montana, have crossing Lorenz and concentration curves in 2002. We conclude that the tax systems of 48 states and the District of Columbia are unambiguously regressive, which means that local measures of regressivity are always consistent with the global indexes. Delaware and Montana have progressive as well as regressive elements in their tax systems. On balance, however, Π_K and Π_{RS} indicate both states have regressive direct tax systems.

Tax System Regressivity in States with and without Personal Income Taxes

Inspection of Table 1 suggests that whether a state has a personal income tax is an important determinant of the state's overall degree of regressivity and its ranking. Seven states in the U.S. currently have no form of a personal income tax – Alaska, Florida, Nevada, South Dakota, Texas, Washington, and Wyoming. With the exception of Alaska, all these states exhibit high degrees of regressivity as measured by Π_K and/or Π_{RS}.[20] To illustrate the importance of the personal income taxes in determining the degree of state and local tax regressivity we combine states into two groups, states with personal income taxes and states without personal income taxes.

Table 1: State and Local Tax Regression, 2002

	Index of Absolute State and Local Tax Regression		Normalized State and Local Tax Regression		State and Local Tax Regressivity Rankings	
	Π_K	Π_{RS}	Π_K	Π_{RS}	Π_K	Π_{RS}
	(1)	(2)	(3)	(4)	(5)	(6)
All States*	**0.098**	**0.0083**	**100**	**100**	–	–
Alabama	0.1407	0.0108	143.6	130.6	9	7
Alaska	0.0681	0.0021	69.5	24.8	38	49
Arizona	0.1283	0.0105	131	127.1	12	9
Arkansas	0.0737	0.0071	75.2	85.6	33	30
California	0.0567	0.0051	57.9	62.1	44	42
Colorado	0.1115	0.0082	113.8	99	17	20
Connecticut	0.1163	0.0092	118.7	111	13	17
Delaware	0.0029	0.0002	2.9	1.8	51	51
District of Columbia	0.0852	0.0075	87	90.4	25	27
Florida	0.2075	0.0152	211.7	184.3	2	2
Georgia	0.1024	0.0093	104.5	112.8	18	15
Hawaii	0.1023	0.0101	104.4	122.4	19	10
Idaho	0.057	0.005	58.2	60	43	43
Illinois	0.1296	0.011	132.3	133.5	11	5
Indiana	0.113	0.0097	115.3	117.8	16	13
Iowa	0.0717	0.007	73.2	84.5	37	31
Kansas	0.0791	0.0076	80.8	92.1	30	25

*Includes the District of Columbia.

[20] Tennessee, another state displaying a considerable degree of regressivity, does levy a personal income tax, but only on interest and dividend income. As a result, this tax affects only a small portion of families, and the tax rate is extremely low. In the ITEP data, the tax affects only the top quintile in Tennessee, and the tax rate for this group is only 0.14 percent.

Table 1: State and Local Tax Regression, 2002 (Cont'd)

	Index of Absolute State and Local Tax Regression		Normalized State and Local Tax Regression		State and Local Tax Regressivity Rankings	
	$\prod_K$	$\prod_{RS}$	$\prod_K$	$\prod_{RS}$	$\prod_K$	$\prod_{RS}$
	(1)	(2)	(3)	(4)	(5)	(6)
All States*	**0.098**	**0.0083**	**100**	**100**	–	–
Kentucky	0.0671	0.0063	68.5	75.9	39	36
Louisiana	0.1134	0.0094	115.7	114.3	15	14
Maine	0.0355	0.0036	36.2	44.1	49	48
Maryland	0.0737	0.0059	75.2	71.3	34	37
Massachusetts	0.0874	0.0067	89.2	81	24	34
Michigan	0.1148	0.011	117.2	133.3	14	6
Minnesota	0.0618	0.0058	63.1	70.2	40	38
Mississippi	0.0894	0.008	91.3	96.7	22	23
Missouri	0.0724	0.0063	73.9	76	36	35
Montana	0.0268	0.0018	27.3	21.4	50	50
Nebraska	0.0582	0.0053	59.4	64.6	41	41
Nevada	0.1975	0.0093	201.6	112.1	3	16
New Hampshire	0.1569	0.0067	160.2	81.6	8	33
New Jersey	0.0826	0.0071	84.3	86.3	28	29
New Mexico	0.0836	0.0081	85.3	97.8	27	21
New York	0.0801	0.0083	81.8	100.5	29	19
North Carolina	0.0751	0.0069	76.6	83.7	32	32
North Dakota	0.0907	0.0073	92.5	88.9	21	28
Ohio	0.0579	0.0058	59.1	70.1	42	39
Oklahoma	0.0878	0.0088	89.6	106.1	23	18
Oregon	0.0521	0.0042	53.2	51.1	45	45
Pennsylvania	0.1331	0.0099	135.9	119.4	10	11
Rhode Island	0.0841	0.0081	85.8	97.8	26	22
South Carolina	0.0472	0.0039	48.2	46.7	47	46
South Dakota	0.1793	0.0116	183	139.8	6	4
Tennessee	0.183	0.0125	186.7	151.3	5	3
Texas	0.1653	0.0108	168.7	130.1	7	8
Utah	0.1015	0.0098	103.6	118.8	20	12
Vermont	0.04	0.0038	40.8	45.5	48	47
Virginia	0.0782	0.0057	79.9	69	31	40
Washington	0.2187	0.0176	223.2	213.4	1	1
West Virginia	0.0497	0.0047	50.7	56.9	46	44
Wisconsin	0.0736	0.0077	75.1	93.1	35	24
Wyoming	0.1912	0.0076	195.1	92.1	4	26

*Includes the District of Columbia.

Table 2, below, shows the progressivity comparisons of these two groups of states and makes comparisons to all 50 states and the District of Columbia combined. Analyzing the regressivity results in columns 1 and 2 of Table 2 reveals that states without personal income taxes have much larger regressivity measures than states that have personal income taxes. This result holds for both measures of global progression. The ΠK coefficients are -0.0819 and -0.1827 for states with and without personal income taxes, respectively. The corresponding ΠRS values are -0.0071 and -0.0105. Thus, as measured by ΠK, average regressivity in combined states without personal income taxes is more than twice the level found in states whose tax systems include an individual income tax. Utilizing the ΠRS measure of regressivity, we find somewhat smaller differences in the degree of regressivity between the two groups of state tax systems. The redistributive measure of tax regressivity shows states without personal income taxes to be approximately 1.5 times more regressive. The explanation of these differences is provided by average tax rates across groups. States without personal income taxes are low tax states when compared to states that have personal income taxes. The lower average tax rates cause the regressivity to have smaller redistributive effects. Hence, the differences in overall regressivity are smaller when measured by ΠRS. Finally, columns 3 and 4 of Table 2 show that the average regressivity in states without personal income taxes is larger than the U.S. average as measured by each progressivity index while the degree of regressivity is below the U.S. average for the state and local tax systems that levy personal income tax.

Table 2: State and Local Tax Regression in Combined States, 2002

	Indexes of Absolute State and Local Tax Regression		**Normalized State and Local Tax Regression**	
	$\prod_K$	$\prod_{RS}$	$\prod_K$	$\prod_{RS}$
	(1)	**(2)**	**(3)**	**(4)**
All States and the District of Columbia	**0.098**	**0.0083**	**100**	**100**
All States with Personal Income Taxes*	0.0819	0.0071	83.5	85.8
All States without Personal Income Taxes	0.1827	0.0105	186.5	127

*Includes the District of Columbia.

4. CONCLUSION

This paper uses ITEP data from 2002 to measure the degree of regressivity in state and local tax systems across the United States. Two widely used indexes of tax regressivity, one from each of the broad classes of global progressivity measures, are applied to direct taxes and income distributions in the 50 states and the District Columbia. The scale invariant Kakwani index (Π_K) is calculated and used to rank states in terms of regressive deviations from a proportional or flat tax distribution. The Reynolds-Smolensky index (Π_{RS}) from the redistributive class of measures is calculated to rank states in terms of tax induced increases in income inequality.

All state and local tax systems are found to be globally regressive by Π_K and Π_{RS}. Both indexes show that there are tremendous differences in the degree of regressivity across states. Average tax rates also differ across states, which accounts for the observed divergences in state ranking when the Kakwani and Reynolds-Smolensky indexes are used to measure regressive taxes. However, the regressivity rankings are highly correlated. Washington has the most regressive state and local tax system and Delaware has the least regressive system. While both states have regressive taxes, Washington is 75 times more regressive than Delaware in terms of Π_K and 88 times more regressive according to Π_{RS}.

Global indexes of regressivity are summary measures and may not illuminate all aspects of the distribution of incomes and tax burdens of interest. Inspection of the Lorenz curves and concentration curves underpinning the global indexes reveals that 49 of the 51 state and local tax systems are unambiguously regressive, which means local measures are consistent with global measures at all points within the tax and income distributions. The direct tax systems of Delaware and Montana have a mixture of regression and progression, which results in crossing Lorenz and concentration curves. These crossings mean that local measures of progression are inconsistent with the Gini-based indexes at some points in the Delaware and Montana income and tax distributions. Overall, both states have regressive direct tax system when measured using either Π_K or Π_{RS}, but local measures are progressive at one or more points within the income distribution.

Comparisons of regressivity measures across state and local tax systems suggest that whether a state has a personal income tax is an important determinant of the regressivity rankings. When ITEP data for states without income taxes are merged and compared to merged data for all states without income taxes we find large differences in global measures of regressivity. The Kakwani index for combined states without personal income tax is more than twice as large as in combined states with personal income taxes. The difference in the Reynolds and Smolensky indexes is somewhat smaller, slightly less than 50 percent greater in states without personal income taxes compared to states that have personal income taxes. The differences in Π_K and Π_{RS} in combined states with and without personal income taxes is explained by the fact that states without income taxes (Alaska, Florida, Nevada, South Dakota, Texas, Washington, and Wyoming) are, on balance, also low tax states when compared to the 44 combined state and local systems that impose personal income taxes. An interesting extension of this article would be to examine other years for which ITEP has published state and local tax burdens and determine how regressivity has changed over time.

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