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**Title** **Business and Prosperity: Optimal Business Taxation in State and Local Government**

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## Abstract

This paper uses collected sample data from 96 cities across 33 states in the U.S. to examine statistical relationships and predictions between business tax rates, city financial statement line item ratios, and bond ratings. It finds a model that predicts city bond ratings based on selected tax rates and financial ratios. This paper then tests the model on California cities and finds that it can accurately predict many California city bond ratings. These bond ratings are then compared to other states' business tax rates to indicate that lower business tax rates may predict better city bond ratings and, by extension, greater city prosperity.


## 1. Introduction

City governments face an inherent tension in the taxation of business within their limits. On the one hand, taxing businesses generates revenue that can buoy city funds. Yet if tax rates prove too high, businesses may relocate to other areas and negate any potential for their tax revenues to bolster city revenue.

With recent city bankruptcies occurring across the country, such as in Stockton, California, and Detroit, Michigan, city officials and citizens seek to understand how American city finances are increasingly in dire straits. A significant portion of assessing a city's financial position is measuring the role of business in the local economy and optimizing business tax structure so it is both comprehensive to generate sufficient tax revenue and measured to keep businesses open locally.

Cities can tax businesses through sales taxes, utility taxes, property taxes, transient occupancy taxes, and corporate income taxes, though tax structures vary. Similarly, there are many ways to assess a city's financial position.[1]

Using a hand-collected sample of 96 cities' 2012 tax rates and relevant 2012 city annual financial statement line items to calculate financial ratios, this paper seeks to analyze the effect of business taxation on city financial prosperity and to ultimately develop predictions of future financial relationships. This paper utilizes methods most similar to the Kosmont-Rose Institute's annual Cost of Doing Business Survey, which quantifies the cost of doing business in the western region of the United States through a proprietary formula that factors in a variety of business tax rates and fees. This paper goes beyond analyzing the costs of doing business as imposed by cities, and additionally examines the connection between business taxation and cities' financial health. While the Kosmont-Rose Institute Survey strictly provides a resource for businesses seeking to understand their economic environment, this paper puts forward policy recommendations to city governments. Moreover, the Kosmont-Rose Institute Survey includes city data exclusively from 9 western states while this paper analyzes cities from 33 states.

## 2. Data methodology and description

The goal of this paper is to identify and examine statistical relationships between state and local business tax rates and structures and financial measures of cities. The information used

[1] including use of traditional accounting ratios such as liquidity and solvency ratios, credit rating analysis, and per capita measures of long-term obligations and revenue

in this paper comes from several sources. The sample of states was selected to capture geographic diversity, and the sample of cities was chosen based on population. Population data was found on the U.S. Census website. Business tax rates were obtained from 2012 city, county, and state codes. State and city income tax rates were obtained from their respective websites. City financial statement line items were taken from cities' 2012 comprehensive annual financial reports.

Table 1 shows the distribution of the dataset's cities by state. Unfortunately, there is no centralized database or a dataset for this data. What is more, the data subset that was available was at least five years old and, therefore, unhelpful given ever-changing local tax rates. Thus, the sample data for the 96 cities was hand-collected from a variety of online municipal sources.

TABLE 1
*City and State Sample Detail*

| States | Number of Cities | States | Number of Cities |
|---|---|---|---|
| Alaska | 3 | Montana | 2 |
| Arizona | 4 | Nevada | 3 |
| California | 10 | New Hampshire | 2 |
| Colorado | 4 | New Mexico | 4 |
| Delaware | 2 | New York | 3 |
| Florida | 4 | North Carolina | 2 |
| Hawaii | 1 | Ohio | 4 |
| Illinois | 3 | Oregon | 4 |
| Indiana | 2 | Pennsylvania | 3 |
| Iowa | 2 | South Dakota | 2 |
| Kansas | 2 | Texas | 4 |
| Kentucky | 2 | Utah | 3 |
| Maine | 2 | Vermont | 2 |
| Massachusetts | 2 | Washington | 4 |
| Maryland | 2 | Wisconsin | 3 |
| Michigan | 2 | Wyoming | 2 |
| Minnesota | 2 | | |
| Total States: 33 | | Total Cities: 96 | |

The sample of "business tax rates" identified as relevant includes utility taxes such as electric, gas, water, cellular, cable, and telephone. These are rates commonly assessed at city, county, or state levels that provide additional revenue from taxes on utility consumption by businesses. Some locations in the United States feature taxation on utility consumption by multiple levels of government, whereas some areas do not levy taxes on utility consumption at all. Sales tax, transient occupancy tax, and ad valorem property tax are additional tax rates that are included in this paper's dataset. Sales taxes are tax rates applied to sale receipts. Sales tax revenues are in turn remitted to the state or local government. They are assessed on most retail and other transactions. Transient occupancy taxes are assessed on various forms of lodging, usually within a city, though county and state transient occupancy tax rates may apply as well.

Ad valorem property tax rates represent the total tax rates assessed on property value. Since this paper studies the effects of business taxation, commercial property tax rates were selected whenever available. In addition, ad valorem taxes are based on assessed property value and encompass local tax rate area rates in addition to county and state rates, as applicable. Individual and corporate income tax rates, when present, are flat rates or tiered systems of tax rates that apply to personal or corporate income. This paper collected individual rates in order to control for probable relationships among the tax rates and in order to isolate certain rates to control for existing interactions.

Table 2 summarizes the key variables in assessing business tax rates in the dataset's 96 cities, and includes the tax rates that are encompassed by the "total index" calculation, discussed later in the paper. In the appendix, Panel A provides the distribution of the city tax rates. Panel B and Panel C provide the distributions for some of the more central tax rates such as sales and property taxes, by state. It should be noted that these statistics are based on the dataset of 96 cities, and are representations of the means and standard deviations of the cities within the dataset, not a comprehensive summary of all of the cities' tax data within a given state.

TABLE 2
*Summary of Business Tax Rate Information*

| Variable | N | Mean (%) | SD (%) | First Quartile (%) | Median (%) | Third Quartile (%) | Min (%) | Max (%) |
|---|---|---|---|---|---|---|---|---|
| Sales Tax[a] | 96 | 6.36 | 2.69 | 6.00 | 7.00 | 8.05 | 0.00 | 9.50 |
| Property Tax | 96 | 2.64 | 1.80 | 1.36 | 2.23 | 3.08 | 0.67 | 9.65 |
| Transient Occupancy Tax | 96 | 9.43 | 3.76 | 6.50 | 9.00 | 12.00 | 2.00 | 17.65 |
| Cable Tax | 96 | 3.32 | 2.78 | 2.43 | 5.00 | 6.00 | 0.00 | 12.00 |
| Cellular Tax | 96 | 4.54 | 2.67 | 3.00 | 5.00 | 6.00 | 0.00 | 12.00 |
| Telephone Tax | 96 | 4.84 | 2.50 | 3.63 | 5.00 | 6.25 | 0.00 | 12.00 |
| Electric Tax | 96 | 4.81 | 2.78 | 3.00 | 5.00 | 6.00 | 0.00 | 12.50 |
| Gas Tax | 96 | 4.75 | 2.77 | 2.92 | 5.00 | 6.00 | 0.00 | 10.00 |
| Water Tax | 96 | 4.08 | 3.48 | 0.00 | 4.75 | 6.00 | 0.00 | 15.54 |
| Individual Income Tax | 96 | 5.65 | 4.22 | 1.54 | 5.30 | 8.09 | 0.00 | 13.30 |
| Corporate Income Tax | 96 | 6.21 | 3.50 | 4.82 | 7.10 | 8.77 | 0.00 | 12.00 |

Notes: [a] These tax rates were aggregated from 2012 city, county, and state codes

Panel A shows fairly similar standard deviations across the tax rates. There is greatest variation in sales tax, transient occupancy tax, and personal and corporate income taxes. Panel B shows sales tax distributions by state. Arizona has the highest average sales tax rate at 9.23%, while Delaware, Montana, New Hampshire, and Oregon tie for the lowest average sales tax rate of 0.00%. Panel C describes property tax distributions by state. Hawaii has the highest property tax rate of 9.10%, though the dataset only includes 1 city from Hawaii. Pennsylvania has the second highest mean property tax rate of 8.41% from a sample of 3 cities within the state. Wyoming has the lowest average property tax rate within the overall sample at a mean of 0.67%. As with sales tax, property taxes show fairly low levels of standard deviation between the cities in a given state. This is a fairly intuitive result, as certain sales or property tax measures are often set at a state level, and many cities and counties are restricted in how much additional tax they are allowed to levy on top of the state-wide rate.

TABLE 3

*Correlation Matrix for Business Tax Variables Used In Regressions and Total Index. The First Entry In Each Cell Is the Correlation. The Second Entry is the p-value. * Indicates Significance at the 5% Level, ** at the 1% Level.*

| Variable | Sales Tax | Property Tax | Transient Occupancy Tax | Cable Tax | Cellular Tax | Electric Tax | Gas Tax | Tele-phone Tax | Water Tax | Individual Income Tax | Corporate Income Tax |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sales Tax | 1.0000 | | | | | | | | | | |
| Property Tax | -0.0232<br>0.8227 | 1.0000 | | | | | | | | | |
| Transient Occupancy Tax | 0.2199<br>0.0313* | -0.0001<br>0.9995 | 1.0000 | | | | | | | | |
| Cable Tax | 0.3052<br>0.0025** | 0.1290<br>0.2103 | 0.0136<br>0.8954 | 1.0000 | | | | | | | |
| Cellular Tax | 0.3141<br>0.0018** | 0.1074<br>0.2975 | 0.0479<br>0.6431 | 0.6583<br>0.0000** | 1.0000 | | | | | | |
| Electric Tax | 0.4508<br>0.0000** | 0.0045<br>0.9655 | 0.0231<br>0.8230 | 0.5700<br>0.0000** | 0.6859<br>0.0000** | 1.0000 | | | | | |
| Gas Tax | 0.4808<br>0.0000** | 0.0258<br>0.8030 | 0.0807<br>0.4343 | 0.5936<br>0.0000** | 0.6890<br>0.0000** | 0.9349<br>0.0000** | 1.0000 | | | | |
| Telephone Tax | 0.2396<br>0.0187* | 0.0299<br>0.7728 | 0.0096<br>0.9262 | 0.6976<br>0.0000** | 0.8365<br>0.0000 | 0.7278<br>0.0000 | 0.7277<br>0.0000 | 1.0000 | | | |
| Water Tax | 0.2624<br>0.0098** | -0.0009<br>0.9930 | -0.1052<br>0.3078 | 0.5299<br>0.0000** | 0.3862<br>0.0001** | 0.5900<br>0.0000** | 0.5901<br>0.0000** | 0.4169<br>0.0000** | 1.0000 | | |
| Individual Income Tax | -0.0432<br>0.6827 | -0.0568<br>0.5826 | 0.0689<br>0.5049 | -0.0106<br>0.9181 | -0.0475<br>0.6459 | 0.0228<br>0.8254 | -0.0326<br>0.7528 | 0.0972<br>0.3460 | -0.0668<br>0.5177 | 1.0000 | |
| Corporate Income Tax | -0.2289<br>0.0249* | 0.2250<br>0.0275* | -0.0094<br>0.9279 | 0.0071<br>0.9455 | 0.0494<br>0.6323 | 0.0542<br>0.5999 | 0.0174<br>0.8664 | 0.1083<br>0.2934 | 0.0110<br>0.9152 | 0.5717<br>0.0000** | 1.0000 |

Table 3 represents the correlation matrix for the business tax rates. As might be expected, many of the correlations between tax rates are positive, especially within utility tax rates. This seems reasonable since most cities have close to equal rates across the different kinds of utility services. However, not all tax rates are positively correlated across the dataset. Individual and corporate income taxes are slightly negatively correlated with sales tax, for example. This supports hypotheses that state and local governments must balance the effect of raising and lowering tax rates with other forms of taxation. States within the dataset with higher sales tax rates may have lower income tax rates for both individuals and corporations in order to counter businesses' tendencies to move away from locations with higher tax rates.

Personal and corporate income taxes have significant influence in business location decisions as well (Hofmann 2002). When given a range of tax rates, as is fairly common for taxes such as personal and corporate income, and property, this paper selected the highest rate. According to some research, this may overstate the effect of the tax variable because it does not reflect potential reductions that may be provided by exemptions, lower tax brackets, and tax credits (Hofmann 2002).

However, this method may be balanced out by many of the ratios calculated by city financial statement line items. For example, the use of year-end revenue in several of the ratios will provide a more conservative ratio calculation since revenue is often collected at the beginning of the fiscal year and spent throughout.

In order to determine relevant ratios, I surveyed several academic articles that discuss financial analysis of city and county financial reports, and selected the following eight ratios to use as a metric for gauging cities' financial position.

*Total Tax Revenue/Total Revenue*

This ratio measures what proportion of a city's total revenues, which can be generated from a variety of sources, specifically come from tax revenues. It can also be expressed as the degree of an entity's dependence on tax receipts (Lansford 1994). Other sources of revenue for a city, not including tax receipts, are intergovernmental transfers and miscellaneous fees and charges.

*Revenue/Capita*

Revenue per capita can indicate demand for resources and willingness to provide resources (Brown 1993). A low revenue per capita ratio could suggest that a city is not generating enough revenue to provide services to its population, but a high revenue per capita ratio could also suggest that few other future avenues of generating revenue are left available to the city.

*Current Assets/Current Liabilities*

Also known as a liquidity ratio, this ratio measures the ability of cash or easily liquidated assets to cover outstanding obligations that are due within one year.

*Expenditure/Capita*

Expenditure per capita provides a sense for what kind of cost of services per person a city might be experiencing. A high ratio can indicate inefficiencies or the potential for expenses to exceed residents' ability to pay for city services (Brown 1993).

*General Obligation Debt/Capita*
This ratio expresses the amount of general obligation bonds per person within a city. General obligation bonds are issued to raise funds for public works. This ratio is a measure of how much debt is being issued to raise funds for the community, per person. Similar to the expenditure per capita ratio, a high ratio of general obligation debt to city population may indicate inefficiencies.

*Debt Service Expenditure/Total Expenditure*
Debt service includes interest paid on outstanding general obligation bonds or pension/other post-employment benefits (OPEB) liabilities. Comparing the expenditures on debt services can indicate the extent of the government's fixed costs for paying interest on debt compared to the rest of its expenses (Brown 1993).

*General Obligation Debt/Total Assets*
This ratio provides an estimate of how well a city's total assets are able to cover taxpayer-financed outstanding general obligation debt. Since general obligation debt is only a portion of city long-term debt, total assets should generously cover general obligation debt amounts.

*Pension and Other Post-Employment Benefit Liabilities/Total Assets*
Similarly, this ratio provides an estimate of the relationship between a city's total assets and net pension obligations and/or other post-employment benefit (OPEB) obligations. As with general obligation debt, total assets should abundantly cover pension and OPEB liabilities.

Table 4 gives the summary detail of the eight financial statement line item ratios. The ratios are different in how they are expressed. For example, the liquidity ratio is expressed as a ratio of proportion in contrast to ratios that are expressed in dollar amounts per capita such as Total Revenue/Population. There are fairly high levels of standard deviation with ratios such as total revenue and total expenses per capita. This is partially due to the fact that they are expressed in terms of dollars per capita, but also because these ratios vary significantly based on the population of the city in question. Outlier ratios often correspond to outlier populations. For example, New York City has one of the highest expense per capita ratios, but it is also the largest city in the United States.

The sample size varies depending on the ratio being summarized, so N ranges from 81-96. This is because not all cities had certain components of the ratios on their financial statements. Thus while all cities are included in the Tax Revenue/Total Revenue, Total Revenue/Population, Total Expenses/Population, and Liquidity ratios, not all cities had the information available to calculate the General Obligation Debt/Population, Interest on General Obligation Debt/Total Expenses, and General Obligation Bonds/Total Assets due to no general obligation debt listed or identified. The same applies to ratios involving Net Pension Liabilities.

TABLE 4

*Summary of Calculated City Financial Statement Line Item Ratios*

| Ratio | N | Mean | SD | First Quartile | Median | Third Quartile | Min | Max |
|---|---|---|---|---|---|---|---|---|
| Tax Revenue/Total Revenue[a] | 96 | 0.39 | 0.15 | 0.30 | 0.40 | 0.47 | 0.00 | 0.90 |
| Total Revenue/Population | 96 | 789.71 | 626.94 | 437.40 | 708.65 | 992.62 | 0.67 | 3241.17 |
| Current Assets/Current Liquidity (Liquidity) | 96 | 5.86 | 4.73 | 2.48 | 4.37 | 8.15 | 0.31 | 26.76 |
| General Obligation Debt/Population | 87 | 1087.20 | 1098.47 | 218.32 | 815.01 | 1412.11 | 0.01 | 5072.30 |
| Interest on General Obligation Debt/ Total Expenses | 87 | 1.25 | 6.24 | 0.00 | 0.017 | 0.03 | 0.00 | 44.27 |
| Total Expenses/Population | 96 | 2102.56 | 1653.09 | 1310.06 | 1732.81 | 2560.28 | 1.65 | 9028.34 |
| General Obligation Bonds/Total Assets | 87 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| Net Pension and OPEB Liabilities/Total Assets | 81 | 0.35 | 1.20 | 0.00 | 0.02 | 0.07 | 0.00 | 7.42 |

Notes: [a] These ratios were calculated using line item from cities' 2012 comprehensive annual financial reports

TABLE 5

*Correlation Matrix for Ratios Used in Regressions. The First Entry In Each Cell Is the Correlation. The Second Entry Is the p-value. * Indicates Significance at the 5% Level, and ** at the 1% Level.*

| Variable | Tax Revenue/ Total Revenue | Total Revenue/ Population | Current Assets/ Current Liabilities | GOB/ Population | Interest GOB/ Total Expenses | Total Expenses/ Population | GOB/ Total Assets | Net Pension or OPEB Liabilities/ Total Assets |
|---|---|---|---|---|---|---|---|---|
| Tax Revenue/ Total Revenue | 1.0000 | | | | | | | |
| Total Revenue/ Population | 0.3176<br>0.0016** | 1.0000 | | | | | | |
| Current Assets/ Current Liabilities | 0.0170<br>0.8691 | -0.0690<br>0.5044 | 1.0000 | | | | | |
| General Obligation Bonds[a]/ Population | -0.1120<br>0.2771 | 0.2173<br>0.0335* | -0.2447<br>0.0163* | 1.0000 | | | | |
| Interest on GOB/ Total Expenses | 0.0337<br>0.7443 | -0.1848<br>0.0715 | -0.0812<br>0.4318 | 0.2868<br>0.0046** | 1.0000 | | | |
| Total Expenses/ Population | -0.1990<br>0.0520 | 0.6178<br>0.0000** | -0.1479<br>0.1504 | 0.3858<br>0.0001** | -0.1857<br>0.0700 | 1.0000 | | |
| GOB/Total Assets | -0.0642<br>0.5344 | -0.2118<br>0.0000** | -0.1298<br>0.2076 | 0.3165<br>0.0017** | 0.7639<br>0.0000** | -0.2142<br>0.0361* | 1.0000 | |
| Net Pension or OPEB Liabilities/Total Assets | -0.0811<br>0.4321 | -0.2327<br>0.0225* | -0.2048<br>0.0453* | 0.2452<br>0.0160* | 0.3655<br>0.0003** | -0.1836<br>0.0734 | 0.7372<br>0.0000** | 1.0000 |

Note: General Obligation Bonds is abbreviated as GOB

Table 5 shows the correlation matrix for the financial ratios. Correlations are not especially strong among the ratios, though ratios involving debt tend to be positively correlated with ratios incorporating expenses. This positive correlation illustrates how cities with large proportions of expenses may tend to take on higher levels of debt in order to support those expenses, suggesting that many cities are not able to, or choose not to, rely on tax revenue to fund their expenses. Moreover, ratios that share common denominators, such as Total Expenses/Population and Total Revenue/Population are positively correlated.

In addition to the ratios listed above, I gathered the Standard and Poor's bond ratings on both a city and state bond level to supplement my use of financial ratios as a metric for city financial position comparison. City bond ratings were gathered from city annual financial reports. State bond ratings were available through the U.S Census website.

Because Standard and Poor's bond ratings are available on a letter scale from NR-AAA, I assigned numerical values 1-11 to each letter grade for city ratings and 1-6 to each letter grade for state ratings. From there I was able to develop a numeric city bond rating and a numeric state bond rating. I calculated the rating for the city bonds by dividing the numerical value of the corresponding letter grade for the city by the median city rating of its state. The state bond rating was calculated by dividing the numerical bond value of the city by the median state bond rating of its state.

This paper examines the relationships between the gathered business tax rates and the calculated ratios. However, for more useful analysis, this paper combined some of the individual utility service tax rates, sales tax rates, corporate income tax rates, and property tax rates into a more general business index. The index was calculated based on the Kosmont-Rose Institute Cost of Doing Business Survey's proprietary formula.

The Kosmont-Rose Institute formula includes a "business tax rate" that is based on business license fees as part of its calculation, using a set of assumptions about a typical business. It was not within the scope of the paper to gather and interpret data on business license fee structures across over 5 different types of business for 96 cities. In order to examine the effect of omitting the business tax rate, I conducted a t-test between the calculated index of 29 cities, for which I had pre-existing access to business license fee structures, and the calculated index of those 29 cities, omitting the business tax rate. The t-test result between the two was t=-3.1848, which represents a statistically significant difference between the indexes with and without a business tax rate. The mean index with the business tax rate was 81.54 and the mean index without the business tax rate was 96.36. Hence the difference in measured rates omitting the business tax rate may affect the conclusions of this study. Table 6 illustrates summary statistics for the business tax rate index variable.

TABLE 6

*Summary of Business Cost Index Detail*

| | N | Mean | SD | First Quartile | Median | Third Quartile | Min | Max |
|---|---|---|---|---|---|---|---|---|
| Business Cost Index[a] | 96 | 93.00 | 33.62 | 73.96 | 96.99 | 110.09 | 25.71 | 195.73 |

Notes: [a]This index was calculated using a modified form of the Kosmont-Rose Institute's proprietary formula

I also developed a bond index in order to develop a sense of how city bond ratings may vary in relationship to the bond rating of the state to which the state belongs. To generate the index, I took the assigned numerical value of a state's rating and subtracted it from the assigned numerical value of a city's rating. The difference presents a rough estimate of to what degree a city's financial position or policies differ from the state's. Examining potential differences in results using city or state ratings may aid our understanding of how local fiscal policy may have different effects than statewide policy.

I then ran a series of regressions using financial ratios, bond ratings, and the bond index as my dependent variables and business tax rates and financial ratios as my explanatory variables in order to develop my model.

## 3. Data Analysis and Results

I ran regressions of calculated financial ratios on key tax rates – sales, property, individual income, corporate income, and the business tax rate index – to determine how tax rates might predict certain financial ratios. The results, found in Table 7, are mixed. $R^2$ values range from 0.0243 to 0.1382.

In considering Tax Revenue/Total Revenue, the resulting equation is:

$$y = 0.394 + 1.198(\textit{Sales Tax}) + 3.840(\textit{Property Tax}) - 1.248(\textit{Individual Income Tax}) + 3.270(\textit{Corporate Income Tax}) - 0.003(\textit{Total Index})$$

Individual income taxes played the largest role with a coefficient of -1.248 and a t-statistic of -2.66.This means that increases in individual income taxes are associated with decreases in tax revenue over total revenue and suggests that raising personal income taxes may not be effective in terms of generating additional tax revenue for a city.

If we consider general obligation bonds per capita as a proxy for how much debt a city is issuing for public works projects per person, we can see that some of the tax rates are positively correlated with general obligation bonds per capita. The resulting equation can be expressed as:

$$y = 587.565 + 19468.04(\textit{Sales Tax}) + 54928.32(\textit{Property Tax}) - 4674.579(\textit{Individual Income Tax}) + 39645.57(\textit{Corporate Income Tax}) - 48.156(\textit{Total Index})$$

That is, this model predicts that cities with higher sales, property, and corporate income tax rates will have higher amounts of general obligation debt per person. This could be indicative of the fact that cities that look to finance large scale projects will generally need to have established high tax rates in order to do so. Yet it also suggests that high tax rates and the resulting revenues are not sufficient to finance these projects, and that a city will then have to rely on large amounts of debt to carry the projects out. Moreover, it suggests that cities with high tax rates are more likely to be in a financially "unhealthy" position, at least in terms of amounts of debt per person. This may support much of the recent research on the effect of business location decisions. If a city's rates are raised above a certain threshold of tax rates, businesses may choose to relocate. Thus a city may have high business tax rates but collect relatively low tax revenues as businesses move away to more tax-competitive areas. In the face of insufficient tax revenue, a city must then issue debt in order to finance its projects.

TABLE 7

*Regressions Explaining Relationships Between Financial Ratios and Business Tax Rates*

| ***Variable*** | *Tax Revenue/ Total Revenue* | *Total Revenue/ Population* | *Total Expenses/ Population* | *Current Assets/ Current Liabilities* | *Interest on General Obligation Bonds/Total Expenses* | *General Obligation Bonds/ Population* | *General Obligation Bonds/Total Assets* | *Pension and OPEB Liabilities/Total Assets* |
|---|---|---|---|---|---|---|---|---|
| Sales Tax | 1.1985 | -14036.58 | -7328.52 | -7.2646 | -26.316 | 19468.04 | -0.00531 | 11.451 |
| | (0.55) | (-1.59) | (-0.31) | (-0.11) | (-0.29) | (1.24) | (-0.28) | (0.61) |
| Property Tax | 3.8404 | -47097.94 | -36545.8 | 20.7128 | -88.021 | 54928.32 | -0.0202 | 25.137 |
| | (0.58) | (-1.75) | (-0.50) | (0.11) | (-0.32) | (1.15) | (-0.35) | (0.44) |
| Individual Income Tax | -1.2475 | -2900.90 | -706.131 | 12.1468 | 8.1002 | -4674.579 | 0.00261 | -0.2258 |
| | (-2.66) | (-1.53) | (-0.14) | (0.88) | (0.41) | (-1.39) | (0.64) | (-0.05) |
| Corporate Income Tax | 3.2698 | -30101.56 | -28804.5 | 27.9058 | -21.201 | 39645.57 | -0.00557 | 25.783 |
| | (0.75) | (-1.70) | (-0.60) | (0.22) | (-0.12) | (1.27) | (-0.15) | (0.68) |
| Total Index | -0.0034 | 47.5035 | 45.9187 | -0.0811 | 0.0554 | -48.15559 | 0.00001 | 0.0259 |
| | (-0.54) | (1.88) | (0.67) | (-0.44) | (0.21) | (-1.08) | (0.12) | (-0.48) |
| $R^2$ | 0.0837 | 0.0225 | 0.0245 | 0.1382 | 0.0243 | 0.0552 | 0.0340 | 0.0493 |
| N | 96 | 96 | 96 | 96 | 88 | 87 | 87 | 81 |

However, using another measure of debt - General Obligation Bonds/Total Assets - gives us limited information in this model. All of the t-statistics for the tax rates as dependent variables are insignificant and range from -0.35 to 0.64. While this should not be interpreted as barring tax rates from being relevant to a city's relationship between debt and assets, it does suggest that perhaps using general obligation bonds over total assets is not the best metric for expressing that relationship. A similar observation is found in the regression using Pension and OPEB Liabilities/Total Assets.

However, the statistical significance of many of the relationships between the various business tax rates and the financial ratios is sometimes inconsistent. This signals potentially limited predictions using just city tax rates and calculated line item ratios.

Another set of regressions included the numeric assigned city and state bond ratings as the dependent variables with a selection of central tax rates as the explanatory variables. With $R^2$ values of 0.1952 and 0.3499 respectively, these results, found in Table 8, could be more consistently predictive than the previous regressions using financial ratios as the dependent variables. Overall, tax rates were more strongly correlated with state bond ratings than city bond ratings, an interesting result given that the gathered tax rates were aggregated city, county, and state for rates such as sales, property, and income taxes. Moreover, tax rates are more consistently *negatively* correlated with state bond ratings, suggesting that lower tax rates predict higher bond ratings. This is not as distinctly true for the city bond ratings, where tax rates are generally positively correlated with bond ratings.

TABLE 8

*Regression Explaining Relationships Between Business Tax Rates and Bond Ratings*

| ***Variable*** | *City Bond Rating* | *State Bond Ratings* |
|---|---|---|
| Sales Tax | 34.9145<br>(1.36) | -12.0837<br>(-0.68) |
| Property Tax | 60.2374<br>(0.77) | -3.9805<br>(-1.01) |
| Individual Income Tax | -0.8516<br>(-0.15) | -20.0672<br>(-5.32) |
| Corporate Income Tax | 57.427<br>(1.12) | -0.04978<br>-0.01 |
| Total Index | -<br>0.09426<br>(-1.28) | 0.00174<br>(0.00174) |
| $R^2$ | 0.1952 | 0.3499 |
| N | 96 | |

Table 9 uses the same dependent variables as the previous regressions, but includes select financial ratios - Pension & OPEB Liabilities/Total Assets and Current Assets/Current Liabilities (Liquidity) - in additional to an expanded number of taxes. Transient Occupancy Tax and Cellular Tax were added to the explanatory tax variables. The result is fairly strongly predictive for both city and state bond ratings. The $R^2$ values are 0.2553 and 0.4414, respectively. The regression equations are:

For city bond ratings:

y = 10.535 + 72.7770(*Sales Tax)* + 204.355(*Property Tax)* +1.883(*Transient Occupancy Tax)* + 20.150(*Cellular Tax)* - 0.236(*Total Index)* + 0.758(*Individual Income Tax)* + 150.510(*Corporate Income Tax)* - 0.058(*Current Assets/Current Liabilities)* + 0.082(*Pension & OPEB Liabilities/Total Assets)*

For state bond ratings:

y = 6.567 - 50.943(*Sales Tax)* – 146.937(*Property Tax)* - 3.418(*Transient Occupancy Tax)* - 19.935(*Cellular Tax)* + 0.139(*Total Index)* - 21.123(*Individual Income Tax)* - 93.943(*Corporate Income Tax)* - 0.001(*Current Assets/Current Liabilities)* + 0.221(*Pension & OPEB Liabilities/Total Assets)*

Again, we see variation within individual taxes on whether they correlate positively or negatively with city or state bond ratings. For example, both individual and corporate income tax rates correlate positively with city bond ratings. When individual and corporate income taxes rise, they predict the improvement of city bond ratings. However, because of their negative correlation with state bond ratings, when individual and corporate income taxes rise, they also predict a decline in state bond ratings. The results so far point to the need to use city and state bond ratings as separate metrics, as they rarely mirror one another's results.

TABLE 9

*Regression Explaining Relationships between Business Tax Rates and Selected Ratios, and Bond Rating*

| ***Variable*** | *City Bond Rating* | *State Bond Rating* |
|---|---|---|
| Sales Tax | 72.77043 | -50.9434 |
| | (2.20) | (-2.33) |
| Property Tax | 204.3546 | -146.9372 |
| | (1.89) | (-2.06) |
| Individual Income Tax | 0.758033 | -21.1230 |
| | (0.14) | (-5.82) |
| Corporate Income Tax | 150.5097 | -93.9429 |
| | (2.14) | (2.02) |
| Transient Occupancy Tax | 1.88265 | -3.4184 |
| | (0.709) | (-1.03) |
| Cellular Tax | 20.15025 | -19.9350 |
| | (0.054) | (-2.93) |
| Total Index | -0.236310 | 0.13923 |
| | (-1.28) | (2.05) |
| Pension & OPEB Liabilities/ | 0.081917 | 0.22127 |
| Total Assets | (0.48) | (1.95) |
| Current Assets/ Current Liabilities | -0.058191 | -0.000057 |
| | (-1.38) | (-0.02) |
| $R^2$ | 0.2553 | 0.4414 |
| N | 81 | |

I also ran regressions using my bond index instead of the numerical bond ratings as a dependent variable and a narrow selection of tax rates as explanatory variables. The regression found that the tax rates used can be useful predictions of my bond index, with an $R^2$ value of 0.3007. The result of the regressions can be expressed as the following equation:

y = 4.060 + 46.998(*Sales Tax*) + 64.218(*Property Tax*) + 19.216(*Individual Income Tax*) + 57.925(*Corporate Income Tax*) - 0.0960(*Total Index*)

Comparing selected tax rates against the bond index shows that local taxes play some role in explaining and predicting differences between city and state bond ratings. The differences suggest that there are disparities in predicting city and state bond ratings, and that tax structures may affect bond ratings differently, depending on whether city or state bond ratings is the dependent variable.

A few trends emerge from the regressions presented so far. First, using bond ratings or indexes as a dependent variable resulted in better predictive models than using financial ratios by themselves as dependent variables. This is because the bond ratings serve as a kind of "summary statistic" of the other ratios. They incorporate more pieces of overall financial position into a single variable than just the relationship between two financial statement line items. Including ratios as explanatory variables in addition to tax rates also resulted in better $R^2$ values. Moreover, across many of the regressions, individual income tax rates do not appear to have significant effects on the dependent variables, while corporate income tax rates do. In order to capture optimal results of these various regressions, I set up a new regression (Table 10) in order to generate my model. I used city bond rating as the dependent variable as I consider city bond ratings as a better metric for a city's financial position than the state rating. I included sales, property, corporate tax rates and the total business rate tax index as my explanatory tax rate variables. The tax revenue/total revenue ratio is an additional explanatory variable. The $R^2$ result of this regression was 0.2076. Sales, property, and corporate income taxes are positively associated with city bond rating. Total index is negatively associated with city bond rating, which could arguably better capture a broad spectrum of taxes' effects on city bond rating in contrast to the isolated tax variables such as sales or property tax rates. Tax Revenue/Total Revenue is negatively associated with city bond ratings. This means that as a city's tax revenue occupies a smaller portion of overall revenue, a city's bond rating will improve. The improvement may be because cities that overly rely on tax revenue may be in a financially more risky position than cities that have revenue coming from other sources. For example, if a city relies heavily on tax revenue in order to cover its expenses, if revenue is negatively impacted, the city will either need to sweepingly cut expenses or take out even more debt. Both options represent suboptimal possibilities in terms of future financial position.

The model can expressed using this regression's coefficients in the following equation where *y* represents the numerical city bond rating:

$$y = 10.688 + 35.425(\textit{Sales Tax}) + 64.440(\textit{Property Tax}) + 58.444(\textit{Corporate Income Tax}) - 0.0967(\textit{Total Index}) - 1.416(\textit{Total Tax Revenue/Total Revenue})$$

TABLE 10

*Regression Explaining Relationships between Selected Tax Rates and Ratios, and City Bond Rating*

| ***Variable*** | *City Bond Rating* |
|---|---|
| Sales Tax | 35.425<br>(1.39) |
| Property Tax | 64.440<br>(0.83) |
| Corporate Income Tax | 58.444<br>(1.16) |
| Total Index | -0.097<br>(-1.33) |
| Tax Revenue/Total Revenue | -1.416<br>(-1.20) |
| $R^2$ | 0.2076 |
| N | 96 |

It is a valuable exercise to apply this model to evaluate its usefulness. This paper uses California cities as a subset and applies the above coefficients to the relevant variables to determine how accurately the model predicts city bond rating. California cities were chosen for several reasons. The large number of California cities in the sample made those cities more useful to evaluate as compared to other states that generally have between two and four cities in this dataset. In addition, as a function of the state's geographic, industrial, and demographic diversity, California cities vary greatly in terms of their financial health. Coastal cities such as Long Beach and San Francisco weathered the recession fairly well and remained fairly financially secure. Meanwhile, smaller, inland cities such as Modesto and Stockton, battered by the housing crisis and rising unfunded pension liabilities, are on shakier ground.

I have replicated the results of my assigned numerical values for 2012 bond ratings and my model's predicted bond rating values based on the 2012 variables in my dataset in Table 11.

TABLE 11

*Presentation of California City 2012 Bond Rating Values and Model's Predicted Bond Rating Values*

| ***City*** | *Assigned Numerical Bond Rating* | *Standard and Poor's 2012 Bond Rating* | *Model's Predicted Numerical Bond Rating* | *Model's Predicted S&P Bon Rating* |
|---|---|---|---|---|
| Anaheim | 9 | AA | 9.94 | AA |
| Long Beach | 9 | AA | 9.16 | AA |
| Los Angeles | 8 | AA- | 8.63 | AA |
| Modesto | 8 | AA- | 9.38 | AA |
| Oakland | 8 | AA- | 8.62 | AA- |
| Sacramento | 7 | A+ | 9.11 | AA |
| San Diego | 8 | AA- | 9.68 | AA |
| San Francisco | 9 | AA | 8.87 | AA- |
| San Jose | 10 | AA+ | 9.07 | AA |
| Stockton | 1 | C | 8.99 | AA- |

As shown on the table, the model is moderately useful. It was able to predict fairly closely for the cities above an AA- rating. However, the model's predictive ability failed to generate the correct rating for Stockton, which is an outlier of the group with a S&P bond rating of C. This suggests that the model would need to incorporate more thorough evaluation of measures of city's financial positions such as other ratios that I did not consider in this paper. Standard and Poor's bond rating for Stockton relies on criteria not present in my model.

The model above shows a prediction for California city bond ratings, based on certain tax rates. But what might those bond ratings be if California cities had different business tax rates? One method of exploring this question is to take the model's equation and use another state's tax rates to see what the model predicts. In this case, I used the dataset's Texas cities because Texas's tax rates are consistently lower than California's. I used the median values of sales tax, property tax, corporate income tax, total business tax index, and Total Tax Revenue/Total Revenue for the dataset's Texas cities for the model:

$y = 10.688 + 35.425(\textit{Sales Tax}) + 64.440(\textit{Property Tax}) + 58.444(\textit{Corporate Income Tax}) - 0.0967(\textit{Total Index}) - 1.416(\textit{Total Tax Revenue/Total Revenue})$

The resulting bond rating value was 9.61, which is equivalent to a Standard and Poor's rating of AA. Therefore, the model predicts that some California cities such as Anaheim, Long Beach, and Sacramento would have the same S&P rating, even if their tax rates were closer to the median Texas values. However, other cities such as Los Angeles and San Francisco might see their city bond ratings improve if their tax structures were more similar to the dataset's median Texas rates. The average S&P bond rating for the dataset's California cities is AA-. Thus incorporating lower business rates such as the median Texas rates might improve California cities' bond ratings, even if only marginally.

The above comparison highlights how my model may insufficiently consider corporate income tax. The largest difference between California and Texas tax rates is the corporate income tax. California has some of the highest corporate income tax rates in the nation, while Texas has no corporate income tax. In addition, a linear model may not be fully representative of the relationships among the variables in the model.

## 4. Conclusion

While the model I designed using my limited dataset is imperfect, this paper still arrives to some useful conclusions and can still hope to catalyze research in the previously unexamined relationships between business tax rates, cities' financial ratios, and credit ratings. As evidenced by my regressions, these relationships are statistically significant. Business tax rates and financial ratios have some ability to predict Standard and Poor's bond ratings on both a city and state level. Moreover, the results of this paper evidence that tax rates and financial ratios do not support sweeping statements about all taxes or all financial ratios. That is, this paper's research does not support proposing unilaterally increasing or decreasing all relevant business tax rates to achieve an end result. The same can be concluded for financial ratios. Relationships among the paper's selected ratios did not always correlate as positively or negatively with other variables as might have been expected. The model that this paper puts forward as a prediction of city bond ratings partially succeeded in predicting California city's Standard and Poor's bond ratings, though it failed to predict the outlier of Stockton. Moreover, this model can be used to predict bond ratings using other cities' tax structures. I found that the dataset's California cities' S&P bond ratings would improve if their tax rates more closely resembled the median values of the dataset's Texas cities.

There are several areas in which future study could expand. This paper's hand-collected dataset of 96 cities could be enlarged in order to better capture data across all 50 states as well as greater samples of cities within each state. In addition, further research on which financial ratios are most relevant to business tax rates could be conducted. Furthermore, a more complex model should be developed in order to capitalize on some of the significant variable relationships that this paper presents in order to develop better outcome predictability.

## 5. Appendix

TABLE 2

*Summary of Business Tax Rate Information*

Panel A. Summary of Tax Rates

| Variable | N | Mean (%) | SD (%) | First Quartile (%) | Median (%) | Third Quartile (%) | Min (%) | Max (%) |
|---|---|---|---|---|---|---|---|---|
| Sales Tax[a] | 96 | 6.33 | 2.69 | 6.00 | 7.00 | 8.05 | 0.00 | 9.50 |
| Property Tax | 96 | 2.64 | 1.80 | 1.36 | 2.23 | 3.08 | 0.67 | 9.65 |
| Transient Occupancy Tax | 96 | 9.43 | 3.76 | 6.50 | 9.00 | 12.00 | 2.00 | 17.65 |
| Cable Tax | 96 | 3.32 | 2.79 | 2.43 | 5.00 | 6.00 | 0.00 | 12.00 |
| Cellular Tax | 96 | 4.54 | 2.67 | 3.00 | 5.00 | 6.00 | 0.00 | 12.00 |
| Telephone Tax | 96 | 4.84 | 2.50 | 3.63 | 5.00 | 6.25 | 0.00 | 12.00 |
| Electric Tax | 96 | 4.81 | 2.78 | 3.00 | 5.00 | 6.00 | 0.00 | 12.50 |
| Gas Tax | 96 | 4.75 | 2.77 | 2.92 | 5.00 | 6.00 | 0.00 | 10.00 |
| Water Tax | 96 | 4.08 | 3.48 | 0.00 | 4.75 | 6.00 | 0.00 | 15.54 |
| Individual Income Tax | 96 | 5.65 | 4.22 | 1.54 | 5.30 | 8.09 | 0.00 | 13.30 |
| Corporate Income Tax | 96 | 6.21 | 3.50 | 4.82 | 7.10 | 8.77 | 0.00 | 12.00 |

Notes: [a] These tax rates were aggregated from 2012 city, county, and state codes

Panel B. Sales Tax Rates by State

| State | N | Mean (%) | SD (%) | First Quartile (%) | Median (%) | Third Quartile (%) | Min (%) | Max (%) |
|---|---|---|---|---|---|---|---|---|
| Alaska | 3 | 1.67 | 2.89 | 0.00 | 0.00 | 5.00 | 0.00 | 5.00 |
| Arizona | 4 | 9.23 | 0.18 | 9.08 | 9.20 | 9.38 | 9.05 | 9.45 |
| California | 10 | 8.16 | 0.51 | 7.75 | 8.13 | 8.75 | 7.37 | 8.75 |
| Colorado | 4 | 7.63 | 0.26 | 7.45 | 7.56 | 7.81 | 7.40 | 8.00 |
| Delaware | 2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Florida | 4 | 6.50 | 0.58 | 6.00 | 6.50 | 7.00 | 6.00 | 7.00 |
| Hawaii | 1 | 4.50 | 0.00 | 4.50 | 4.50 | 4.50 | 4.50 | 4.50 |
| Illinois | 3 | 8.58 | 0.80 | 8.00 | 8.25 | 9.50 | 8.00 | 9.50 |
| Indiana | 2 | 7.00 | 0.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| Iowa | 2 | 6.50 | 0.71 | 6.00 | 6.50 | 7.00 | 6.00 | 7.00 |
| Kansas | 2 | 7.99 | 0.95 | 7.30 | 7.98 | 8.65 | 7.30 | 8.65 |
| Kentucky | 2 | 6.00 | 0.00 | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| Maine | 2 | 5.00 | 0.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| Massachusetts | 2 | 6.25 | 0.00 | 6.25 | 6.25 | 6.25 | 6.25 | 6.25 |
| Maryland | 2 | 6.00 | 0.00 | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| Michigan | 3 | 6.00 | 0.00 | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| Minnesota | 2 | 7.53 | 0.35 | 7.28 | 7.53 | 7.78 | 7.28 | 7.78 |

| State | N | Mean (%) | SD (%) | First Quartile (%) | Median (%) | Third Quartile (%) | Min (%) | Max (%) |
|---|---|---|---|---|---|---|---|---|
| Montana | 2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Nevada | 3 | 7.65 | 0.51 | 7.10 | 7.75 | 8.10 | 7.10 | 8.10 |
| New Hampshire | 2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| New Mexico | 4 | 7.55 | 0.49 | 7.22 | 7.50 | 7.88 | 7.00 | 8.19 |
| New York | 3 | 8.54 | 0.48 | 8.00 | 8.75 | 8.88 | 8.00 | 8.88 |
| North Carolina | 2 | 7.38 | 0.18 | 7.25 | 7.38 | 7.50 | 7.25 | 7.50 |
| Ohio | 4 | 7.19 | 0.55 | 6.88 | 7.00 | 7.50 | 6.75 | 8.00 |
| Oregon | 4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pennsylvania | 3 | 7.00 | 1.00 | 6.00 | 7.00 | 8.00 | 6.00 | 8.00 |
| South Dakota | 2 | 4.00 | 0.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Texas | 4 | 8.25 | 0.00 | 8.25 | 8.25 | 8.25 | 8.25 | 8.25 |
| Utah | 3 | 6.70 | 0.18 | 6.50 | 6.75 | 6.85 | 6.50 | 6.85 |
| Vermont | 1 | 7.00 | 0.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| Washington | 4 | 8.87 | 0.48 | 8.495 | 8.75 | 9.25 | 8.49 | 9.5 |
| Wisconsin | 3 | 5.53 | 0.06 | 5.50 | 5.50 | 5.60 | 5.50 | 5.60 |
| Wyoming | 2 | 5.50 | 0.71 | 5.00 | 5.50 | 6.00 | 5.00 | 6.00 |

Panel C. Property Tax Rates by State

| State | N | Mean (%) | SD (%) | First Quartile (%) | Median (%) | Third Quartile (%) | Min (%) | Max (%) |
|---|---|---|---|---|---|---|---|---|
| Alaska | 3 | 1.42 | 0.29 | 1.10 | 1.51 | 1.65 | 1.1 | 1.65 |
| Arizona | 4 | 2.96 | 1.19 | 1.99 | 2.91 | 3.93 | 1.69 | 4.32 |
| California | 10 | 1.2 | 0.11 | 1.11 | 1.21 | 1.28 | 1.1 | 1.41 |
| Colorado | 4 | 2.61 | 1.01 | 1.94 | 2.74 | 3.28 | 1.26 | 3.69 |
| Delaware | 2 | 2.62 | 0.96 | 1.94 | 2.62 | 3.3 | 1.94 | 3.3 |
| Florida | 4 | 2.76 | 1.09 | 2.11 | 2.46 | 3.42 | 1.8 | 4.33 |
| Hawaii | 1 | 9.10 | 0.00 | 9.10 | 9.10 | 9.10 | 9.10 | 9.10 |
| Illinois | 3 | 2.84 | 2.33 | 1.01 | 2.06 | 5.46 | 1.01 | 5.46 |
| Indiana | 2 | 3.99 | 1.31 | 3.06 | 3.99 | 1.91 | 3.06 | 4.91 |
| Iowa | 2 | 3.79 | 0.13 | 3.69 | 3.79 | 3.88 | 3.69 | 3.88 |
| Kansas | 2 | 2.10 | 1.15 | 1.28 | 2.10 | 2.91 | 1.28 | 2.91 |
| Kentucky | 2 | 4.19 | 1.04 | 3.45 | 4.19 | 4.92 | 3.45 | 4.92 |
| Maine | 2 | 1.88 | 0.21 | 1.73 | 1.88 | 2.02 | 1.73 | 2.02 |
| Massachusetts | 2 | 3.01 | 0.13 | 2.91 | 3.01 | 3.10 | 2.91 | 3.10 |
| Maryland | 2 | 1.71 | 0.83 | 1.12 | 1.71 | 2.29 | 1.12 | 2.29 |
| Michigan | 3 | 6.42 | 1.91 | 4.73 | 6.03 | 8.49 | 4.73 | 8.49 |
| Minnesota | 2 | 2.23 | 0.86 | 1.32 | 2.23 | 2.83 | 1.62 | 2.83 |

| State | N | Mean (%) | SD (%) | First Quartile (%) | Median (%) | Third Quartile (%) | Min (%) | Max (%) |
|---|---|---|---|---|---|---|---|---|
| Montana | 2 | 3.49 | 0.37 | 3.22 | 3.49 | 3.75 | 3.22 | 3.75 |
| Nevada | 3 | 1.10 | 0.08 | 1.01 | 1.15 | 1.15 | 1.01 | 1.15 |
| New Hampshire | 2 | 2.33 | 0.16 | 2.22 | 2.33 | 2.44 | 2.22 | 2.44 |
| New Mexico | 4 | 2.47 | 0.52 | 2.13 | 2.65 | 2.82 | 1.72 | 2.88 |
| New York | 3 | 3.57 | 0.70 | 2.77 | 3.87 | 4.06 | 2.77 | 4.06 |
| North Carolina | 2 | 2.04 | 0.74 | 1.52 | 2.04 | 2.56 | 1.52 | 2.56 |
| Ohio | 4 | 1.36 | 0.00 | 1.36 | 1.36 | 1.36 | 1.36 | 1.36 |
| Oregon | 4 | 1.83 | 0.36 | 1.58 | 1.80 | 2.08 | 1.44 | 2.29 |
| Pennsylvania | 3 | 8.41 | 1.18 | 7.31 | 8.26 | 9.65 | 7.31 | 9.65 |
| South Dakota | 2 | 3.00 | 0.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Texas | 4 | 2.89 | 0.31 | 2.70 | 2.78 | 3.09 | 2.68 | 3.34 |
| Utah | 3 | 1.41 | 0.02 | 1.40 | 1.40 | 1.43 | 1.40 | 1.43 |
| Vermont | 1 | 2.15 | 0.00 | 2.15 | 2.15 | 2.15 | 2.15 | 2.15 |
| Washington | 4 | 1.23 | 0.13 | 1.13 | 1.24 | 1.34 | 1.07 | 1.38 |
| Wisconsin | 3 | 2.55 | 0.62 | 1.84 | 2.89 | 2.92 | 1.84 | 2.92 |
| Wyoming | 2 | 0.67 | 0.00 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 |

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