

# **Does Tax Revenue Diversification Help States Weather Economic Downturns?**

Evidence from the Great Recession

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## **Executive Summary**

This capstone seeks to build on previous research to assess the validity of the claim that revenue diversification is an effective policy tool for states to use during recessions in order to stabilize their revenue flow. Revenue diversification is defined as the degree to which states take advantage of various tax sources, rather than reliance on a few or one in particular. Previous research, especially by Carroll (2005) and Snyderhoun (1994), has shown that states with higher revenue diversification rates experience lower revenue shortfalls during recessions and other economic downturns on average.

This paper will reassess these claims in terms of the most recent Great Recession to see if the findings are supported, or if the Great Recession's severity nullified the benefits diversification has provided in the past.

A model of diversification is built using the Herfindahl–Hirschman Index, (HHI). The index measures the proportional use by states of the six major tax revenue categories as reported by the United States Census Bureau - property tax, sales tax, personal income tax, corporate income tax, license tax, and an "other" category that includes severance and other miscellaneous smaller taxes.

This model finds little support for the claim that diversification (a higher HHI score) would lead to better fiscal performance during the recession (less revenue decline from 2008-2010). The model did show that states that collect personal income taxes, all else equal, lead to better fiscal performance. Conversely, states that use a corporate income tax actually experienced a larger decline in revenue than those that did not.

The Great Recession had a profound impact on state governments and their budgets. Because economic downturns are recurring events, it is therefore prudent for jurisdictions of all shapes and sizes to plan ahead for them. This research adds to the existing literature on possible strategies for states to employ in order to better weather future economic downturns.

## **Introduction and Background**

The recession that occurred in the United States and most of the world in 2008 was an economic event so profound that it is commonly known as the Great Recession. It was the most severe economic downturn since the Great Depression. Gross Domestic Product in the United States fell 3.9 percent from 2008-2009 (Bloomberg 2009) and the unemployment rate increased from 5.0 percent in December 2007 to 9.9 percent in December 2009 (St. Louis Federal Reserve).

The Great Recession did not just impact the private sector though, as many states and local municipalities saw their tax bases erode as a result. While this recessionary event was extreme in nature, there will inevitably be more recessions in the future. States and other jurisdictions, therefore, should strive for policies that can mitigate the effect that future economic downturns can have on their ability to collect revenue.

In 2005, a study linked revenue diversification by states to their fiscal performance during and after a recession. The article specifically looked at state revenue diversification in the 1990s to see if this was a determinant for fiscal health during and after the 2001 recession and the results indicated a positive relationship (Carroll 2005). The top 25 best diversified states (as measured by the

Herfindahl–Hirschman Index, or HHI) from 1990-2000 saw revenue decline 2.7 percent, on average, from 2001-2002. The HHI model for this study included five broad tax categories. Meanwhile, the bottom 25 saw their revenues decline by 4.7 percent over the same time period, on average. Projected revenue shortfalls for the top 25 states were 2.4 percent from 2003-2010, while the bottom 25 states had average projected revenue shortfalls of 3.7 percent.

Carroll showed that revenue diversification is a determining factor for fiscal performance in economic downturns by using the 2001 recession as a case study. However, that recession was relatively small and concentrated in comparison to the widespread nature of the Great Recession. GDP only fell for two, non-consecutive quarters in the United States and the unemployment rate stayed below 6 percent throughout the recession (and later peaked at 6.3 percent after it had officially ended) (The Economist 2009).

The question for this project is whether the findings of Carroll 2005 held true during the Great Recession, or if the economic downturn was so severe that diversified states lost the protection they appeared to have in 2001.

## **Literature Review**

Revenue diversification on the state and local level has become a topic of increasing interest and research over the past 30 years. In 1972, property tax revenue accounted for 47 percent of municipality revenue. By 1997, it only accounted for 29 percent (Hendrick 2002). This is not to say that tax collection has fallen overall. Rather, states have diversified their revenue portfolios over time. States also rely more upon intergovernmental transfers from the federal government and from user fees. After the Great Depression, states were forced to move away from their reliance on property taxes which leads to the imposition of sales taxes and state level income taxation (Carroll 2005).

Revenue diversification refers to a revenue structure which “relies on a variety of revenues.” Furthermore, a diversified jurisdiction “requires avoidance of imbalanced use of any one revenue source at the expense of other” sources (Snyderhoun 169). One major debate against this notion involves fiscal illusion. The early view amongst scholars of diversification is that it led to a bigger government, caused inefficient outcomes, and led to increased fiscal illusion. Hendrick defines fiscal illusion as “a systematic misperception of the costs of government, the revenue burdens it places on the public, and other areas of fiscal

performance” (Hendrick 54). While this may be true in some instances, the question still needs to be asked: does diversification truly benefit jurisdictions by reducing revenue volatility?

An initial obstacle to this problem is how to objectively measure revenue diversification. Suyderhound provides a historical overview of such measures. In the 1960s, it was considered adequate for general sales and property taxes to account for about 20 percent of revenues each. This convention was modified in the 1980’s with the emergence of user fees. A new notion was proposed in the 1990s that there is a “Big Three” group of taxes: general sales, income, and property; and that each should account for “20%-48% of revenues” (Suyderhound 1994).

Another option to measure diversification is to create an index with which to compare states. Suyderhound creates such an index using the Herfindahl–Hirschman Index (HHI), which weighs the percent share of each revenue category to produce an index on a 0-1 scale. His research showed that when other categories of revenue are included (in addition to the “Big Three”), some states had lower indexes (especially when corporate income taxes were included).

Bartle empirically showed that states and localities alike have been increasing their diversification over the past half century, especially away from a sole reliance on property taxes. His study explored the alternative revenue sources that states and localities were moving towards. The first is the general sales tax, which was non-existent on the state level prior to the great depression. Mississippi (1930) was the first state to enact one. By 1997, 33 states had “authorize[ed] local governments to use the sales tax” (Bartle 630). As a result, the percentage of revenue from sales tax has nearly doubled over the last 50 years from 3.5 percent in 1948 to 6.2 percent in 1999 (Bartle 2002).

Income taxes are another avenue states may pursue. This is another category of tax that was non-existent on the state level prior to the Great Depression. Bartle looks specifically at income taxes imposed by cities and municipalities, which has been authorized in 13 states as of 2002. Bartle then lumps several other types of taxes into “other local taxes.” These include the motor fuel tax, hotel and hospitality taxes, and local taxes on alcohol and tobacco. All of these categories have increased somewhat as revenue diversification has come into vogue and the property tax has fallen as a share of total revenue. The final category is non-tax revenue sources, which has doubled from 11.2 percent in 1948 to 23.3 percent in 1999. User fees have become very popular in the last half



century, and in some cases they outpace the expenditure associated with them. An example is parking fees eclipsing the cost of the parking structures that collect them (Bartle 2002).

Revenue diversification can help governments mitigate revenue shortfalls in the short and long term. Additionally, they can help overcome the constraints caused by balanced budget requirements, which almost every state has. Jordan & Wagner (2010) explore the effect of diversification on tax effort, specifically in cities in Arkansas. They find that cities rely heavily on property and sales tax revenues. Economic fluctuations related to these two revenue categories were shown to have significant effects on their revenue streams.

Yan (2011) takes the study of diversification one step further by exploring positive and negative externalities by studying diversification's impact on credit ratings. The findings show that diversification does improve the likelihood of positive credit ratings, but only in good economic climates. The relationship is substantially less significant in moderate to poor economic climates. This supports the claim that diversification alone is not a perfect solution.

Carroll (2005) explores this issue further by examining diversification levels during the "boom years" of the 1990's and then measuring fiscal

performance in the 2001 recession. She found that the top 25 most diversified states in the 1990's (as measured by average HHI), had revenue declines of only 2.7 percent from 2001-2002, while the bottom 25 saw revenue declines of almost double, 4.7 percent.

This seems to support the notion that diversification has positive outcomes for states in terms of weathering recessions. Carroll also finds support for Yan's claim that revenue diversification alone cannot guarantee positive fiscal health. Alabama, for example, was fairly diversified yet still experienced significant revenue shortfalls in a way similarly diversified states did not.

Carroll's study focuses on the 2001 recession, which was relatively small and concentrated. GDP only fell for two, non-consecutive quarters in the United States and the unemployment rate stayed below 6 percent throughout the recession (and later peaked at 6.3 percent after it had officially ended) (The Economist 2009). For my research, I will slightly modify Carroll's framework and reapply it to the Great Recession of 2008 to test whether these findings hold when the economic downturn in question is more severe and widespread throughout the economy.

## Research Design

This model is designed to measure whether greater declines in state tax revenue during the Great Recession were related to a state's lack of tax revenue diversification. To accomplish this, the model will employ a Herfindahl–Hirschman Index, or HHI, to measure diversification on the state level. The HHI model creates proportions of each of six types of taxes – property taxes, sales taxes, license taxes, personal and corporate income taxes, as well as an “other” category that includes all other miscellaneous taxes, including severance taxes. It was important to create a broad “other” category because HHI assumes that the “perfect” state would have revenue diversified evenly amongst the states where the proportion of each tax =  $1/n$ . The census provides 27 categories of tax types, however few would argue that a perfect distribution of  $1/27^{\text{th}}$  total revenue to each is optimal.

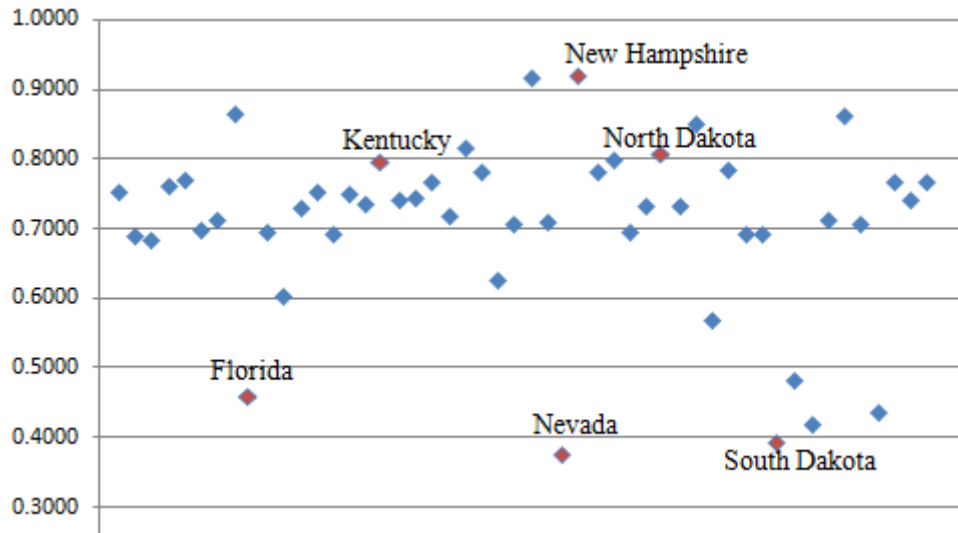
All of the revenue totals for the model were gathered from data available through the United States Census Bureau. The Census has conducted "The Annual Survey of State Government Tax Collections" annually since 1951. This report “contains statistics on the tax collections of all 50 state governments, including receipts from compulsory fees” (Census.gov).

$$\text{HHI} = \frac{1 - \sum_{i=1}^6 R_i^2}{1 - \frac{1}{6}}$$

The HHI uses a sum of squares model that is then corrected to produce a 0-1 index output, as shown in the formula below. It follows then that a hypothetical state which relied 100 percent on property taxes and did not use any of the other tax structures would have an HHI value of 0. On the other hand, a hypothetical state that was “perfectly” diversified tax structure, where every category collected exactly 1/6 or 16.6667 percent of revenue, the HHI value would be exactly one.

For the 50 states over the time period of 2002-2008, the range of HHI scores was .9184 in New Hampshire to .3743 in Nevada. The mean was .7083 and the standard deviation was .1245. Figure 1 is a scatter plot of average HHI scores for each state. The data table in the appendix provides average HHI scores for each state.

**Figure 1**  
Average HHI scores for all 50 states from 2002-2008



Revenue change for this model is measured as the difference between total tax revenue in 2008 (the beginning of the recession) and 2010 (the end of the recession), as a percentage of total revenue in 2010. There was substantial variation in the revenue change data. The mean was -11.18 percent and the range was -93 percent in Alaska and +13 percent in North Dakota. Because Alaska was such an outlier in the revenue change category, the top and bottom states were trimmed in the model. For comparison, the second lowest revenue change was Louisiana and it was only -26 percent.

Only two states saw revenue increase from 2008-2010, North Dakota, where a substantial oil boom is occurring (Economist 2013), and New Hampshire, the state with the highest HHI score. Three states saw no change in their revenues, Arkansas, South Dakota, and Oregon. For the other 45 states, revenues fell during the recession. Therefore, this model is truly testing whether HHI caused state revenues to fall less dramatically than they otherwise would have.

The model then incorporates several dummy variables for five categories of taxes, property, sales, personal income, corporate income, and severance taxes, because some states do not employ them at all and therefore will show a value of 0 in the HHI model. Licenses were not included as a dummy variable because there are so many different types of licenses that are included in the “license” category of the HHI model. The annual scores are then averaged from 2002 through 2008. This provides a straightforward metric of revenue diversification for each state in the time period between the two most recent recession events.

The political ideologies of the states are measured in the final two variables. Berry, et al provides ideology scores for both citizens and governments on the state level annually from 1960 through 2010, coded on a 1-100 scale where 1 is more right leaning and 100 is more left leaning. The model for this paper uses each state’s average score from 2002 through 2008 to show the relative political

ideology for each state in the time period between the two most recent recession events on both the citizen and institutional level.

The model uses the average over the time span and not simply the score for 2008 alone so that it can be paired with the HHI time scale. Decisions about revenue choices are long term choices for states, so the average ideology scores over the time leading up to the recession paint a better picture of the political climate of each state.

**Figure 2: Summary of Variables**

<b>Variable</b>	<b>Mean</b>	<b>St. Dev.</b>
Revenue Change	-9.97%	.0677 (6.77%)
HHI	.7067	.126
Citizen Ideology	53.96	14.88
Intitutional Ideology	49.32	19.65
<b>Dummy Variables</b>		<b>Used in States</b>
Property Tax		37
Sales Tax		45
Personal Income		43
Corporate Income		46
Severance Taxes		35

## **Analysis and Discussion**

The model was statistically trimmed to narrow the sample to 48 states. Alaska, a major outlier that does not follow a conventional financial policy, was dropped and the state with the highest revenue change, North Dakota, was dropped as well for consistency. Alaska had a revenue change of -93 percent from 2008-2010 while the second largest decline, in Louisiana, was only -26 percent.

The model was run as a robust regression to account for the heteroskedasticity the outliers would cause and the poor fit the ensuing model would therefore have. Even while dropping the two largest outliers, the model was not homoskedastic.

The overall regression is tested using the Lagrange Multiplier test, which is the sample size times the coefficient of determination, or  $r^2$ . The fit of the model, even after trimming, is still fairly weak, showing that there is considerable variation, both in state revenue flows over the two year period in question, as well as in how states operate generally. Interestingly, the F test used in this model does not work properly if any observation is perfectly fitted to the linear model. In this case, Florida is, probably by random chance.



The model shows no support for the claim that a state's HHI score leads to better revenue outcomes for states, as seen in Figure 2, with a P value of 0.47. This was true in the adjusted (without outliers) robust regression, as well as when all 50 states were included in the model. Property tax also shows no relationship to revenue outcomes. This could be because property taxes are distributed predominantly at the local level, and possibly because the recession was characterized by a housing bubble.

One of the major findings of this model is the importance of income taxes to state fiscal health. States that have a personal income tax saw revenue losses in the recession that were 8.85 percent less than states with no personal income tax. Conversely, states with a corporate income tax saw revenue losses of 7.65 percent more than states with no corporate income tax.

Citizen ideology was nearly significant at the 90 percent confidence level. However, its impact therein was minimal at best, showing a decrease in revenue losses of 0.18 percent in states with higher ideology coefficients (i.e. those that are more left leaning). Institutional ideology had a starkly different outcome in the model and showed no relationship to revenue outcomes. It is interesting to note the difference between citizen ideology scores and institutional ideology scores for states. Their ranges differ, where citizen ideology ranges from 26.02 to 87.56

while institutional ideology ranges from 10.9 to 80.2. They do not perfectly correlate, with a correlation of 63%.

**Figure 3**

**Regression Results for the Relationship to Revenue Change 2008-2010**

n=48       $r^2 = 0.2441$

\* Statistically Significant Relationship

Variable	Coefficient	Std. Err.	T	P>t	95% Conf.	
HHI	-0.075615	0.0922012	-0.82	0.417	-0.2621095	0.1108796
Property Tax	-0.0005697	0.0207086	-0.03	0.978	-0.0424568	0.0413175
Sales Tax	-0.0551224	0.0347051	-1.59	0.12	-0.12532	0.0150752
*Person Income	0.0885695	0.0339202	2.61	0.013	0.0199595	0.1571795
*Corporate Income	-0.0765016	0.0310822	-2.46	0.018	-0.1393713	-0.0136319
Other	0.0119365	0.0307866	0.39	0.7	-0.0503354	0.0742083
Citizen Ideology	0.0018912	0.0011488	1.65	0.108	-0.0004326	0.0042149
Institutional Ideology	0.0000739	0.0007155	0.1	0.918	-0.0013734	0.0015212
Constant	-0.1184496	0.0973695	-1.22	0.231	-0.315398	0.0784988

## **Conclusion and Policy Implications**

The findings of this study appear to be contrary to previous research, especially that of Carroll (2005). When measuring the difference between total state revenue in 2008 and 2010 as a percentage of overall revenue in 2010, a state's HHI score leading up to the recession was not a statistically significant determinant. However, other factors were, especially the implementation of certain types of taxes by the states. Income taxes appeared to be the strongest determinants of fiscal outcomes. States that have a personal income tax saw revenue losses in the recession that were 8.85 percent less than states with no personal income tax. Conversely, states with a corporate income tax saw revenue losses of 7.65 percent more than states with no corporate income tax.

Policy makers should not necessarily draw the conclusion that these results mean that revenue diversification is a folly. It seems, rather, that the breadth and depth of the Great Recession was so profound that the protection from revenue shortfalls that states enjoyed in 2001 were unable to overcome the steep declines in the economy.

Although the overall HHI score was not a statistically significant determinant leading up to the recession, the top 25 states with the highest HHI scores saw their revenues decrease by 7.6 percent from 2008-2010, while the bottom 25 saw their revenue decline 14.7 percent over the same period, or almost double. This finding is still very important and it supports the earlier findings of Carroll and Snyderhoun.

These results show that revenue diversification can help states better manage their revenue streams, especially during economic downturns. However, diversification is not a pure, standalone solution. Each state is different and different proportions of taxation will be appropriate for each. For instance, North Dakota had the highest HHI score, but does not have a personal income tax at all – the strongest determinant, according to the model, of a smaller revenue shortfall. However, their state was endowed with numerous natural resources that they are able to use instead. On the other hand, Montana had a high HHI score of .9175, and yet saw their revenue decline by 15 percent during the recession.

This model has clearly shown that diversification must be coupled with other sound fiscal policies to have any impact on a state's fiscal health during economic downturns. Alternative policies, which were not tested in this model, include increasing user fees and utilizing budget stabilization funds. Most

importantly, this study has reinforced the notion that every state is unique, and should structure its revenue stream to mirror its population. Revenue structure and diversification is but one tool that states can use in order to assure that state governments have the revenues necessary to provide the services that the citizens in their jurisdictions depend upon.

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**Data Table Page 1**

State	HHI	Revenue	Property	Sales	Per Inc	Corp Inc	Severance
Alabama	0.7536	-7.7%	1	1	1	1	1
Alaska	0.6890	-93.1%	1	0	0	1	1
Arizona	0.6851	-22.7%	1	1	1	1	1
Arkansas	0.7618	0.4%	1	1	1	1	1
California	0.7693	-9.5%	1	1	1	1	1
Colorado	0.6992	-12.2%	0	1	1	1	1
Connecticut	0.7144	-13.0%	0	1	1	1	0
Delaware	0.8646	-6.1%	0	0	1	1	0
Florida	0.4592	-18.0%	1	1	0	1	1
Georgia	0.6956	-22.2%	1	1	1	1	0
Hawaii	0.6043	-6.4%	0	1	1	1	0
Idaho	0.7302	-23.7%	0	1	1	1	1
Illinois	0.7543	-7.6%	1	1	1	1	1
Indiana	0.6931	-9.6%	1	1	1	1	1
Iowa	0.7495	-1.2%	0	1	1	1	0
Kansas	0.7355	-10.3%	1	1	1	1	1
Kentucky	0.7947	-5.4%	1	1	1	1	1
Louisiana	0.7420	-25.6%	1	1	1	1	1
Maine	0.7440	-8.5%	1	1	1	1	0
Maryland	0.7692	-3.3%	1	1	1	1	0
Massachusetts	0.7187	-9.8%	1	1	1	1	0
Michigan	0.8175	-11.6%	1	1	1	1	1
Minnesota	0.7820	-6.5%	1	1	1	1	1
Mississippi	0.6253	-7.6%	1	1	1	1	1
Missouri	0.7072	-12.5%	1	1	1	1	1

**Data Table Page 2**

State	HHI	Revenue	Property	Sales	Per Inc	Corp Inc	Severance
Montana	0.9175	-14.7%	1	0	1	1	1
Nebraska	0.7100	-9.4%	1	1	1	1	1
Nevada	0.3743	-5.4%	1	1	0	0	1
New Hampshire	0.9184	0.9%	1	0	1	1	0
New Jersey	0.7824	-18.1%	1	1	1	1	0
New Mexico	0.7996	-21.3%	1	1	1	1	1
New York	0.6970	-2.3%	0	1	1	1	0
North Carolina	0.7337	-6.0%	0	1	1	1	1
North Dakota	0.8062	12.6%	1	1	0	1	1
Ohio	0.7324	-10.6%	1	1	1	1	1
Oklahoma	0.8500	-17.6%	0	1	1	1	1
Oregon	0.5687	-0.2%	1	0	1	1	1
Pennsylvania	0.7844	-6.5%	1	1	1	1	0
Rhode Island	0.6929	-7.5%	1	1	1	1	0
South Carolina	0.6928	-16.5%	1	1	1	1	0
South Dakota	0.3927	0.0%	0	1	1	1	1
Tennessee	0.4822	-9.7%	0	1	1	1	1
Texas	0.4205	-15.2%	0	1	0	0	1
Utah	0.7128	-16.6%	0	1	1	1	1
Vermont	0.8639	-1.3%	1	1	1	1	0
Virginia	0.7087	-11.6%	1	1	1	1	1
Washington	0.4373	-11.5%	1	1	0	0	1
West Virginia	0.7681	-1.6%	1	1	1	1	1
Wisconsin	0.7428	-3.8%	1	1	1	1	1
Wyoming	0.7675	-11.4%	1	1	0	0	1