Comparing Corporate Tax Rates and Economic Growth in the Midwestern United States

Isaac O. Strohman

Drake University

College of Public Administration

Author Note:

Isaac O. Strohman is a graduate student at Drake University. Correspondence concerning this article should be sent to isaac.strohman@drake.edu. I have no known conflict of interest to disclose.

Abstract

Public policy makers often propose lowering taxes as a means for stimulating economic growth.

Given the complexities of the tax system and economic forces, it is important to test this theory

empirically to confirm what types of fiscal policy changes are most effective for healthy

economic development. In this research paper, I compare Midwestern states' top statutory

corporate tax rates with their respective annual gross domestic product (GDP) growth each

year from 2000-2017. Using a fixed effects regression model to analyze panel data for twelve

states, I find that the top statutory corporate tax rate does not have a significant effect on GDP

growth during the time examined. This finding is inconsistent with the theory that lower taxes

lead to increased economic growth. However, further empirical testing is necessary to

determine the effects of changing tax rates in both the short- and long-term.

Keywords: Corporate tax rates, gross domestic product, state tax rates, economic

growth, tax policy.

Comparing Corporate Tax Rates and Economic Growth in the Midwestern United States

When considering the primary objectives of government, certain common goals come to mind, such as effective schools, safe neighborhoods, and solid infrastructure. One common goal of government—and arguably the most influential on public perception— is a strong economy. What exactly constitutes a strong economy? Although this answer is obviously complicated, the results of this goal are typically communicated to the public through easily digestible economic indicators that address employment (e.g., unemployment rate and non-farm payroll employment), inflation (e.g., consumer price index), and production (e.g., gross domestic product).

A frequent policy proposal to help boost the economy is lowering taxes. The logic is that lowering taxes should increase earnings, and higher earnings should lead to more investment and growth. Furthermore, the incentive of lower taxes should encourage new businesses to start up or move into the region, leading to additional economic growth.

Economic theory leads to a similar conclusion. A tax creates a wedge between supply and demand curves that results in a deadweight loss, which causes the market to shrink. "Thus, because taxes distort incentives, they cause markets to allocate resources inefficiently" (Mankiw, 2007, p. 163). Therefore, reducing this deadweight loss though a tax reduction should allow for a more efficient market, which should result in additional growth.

This policy was recently implemented at the federal level in 2017, when Congress passed the Tax Cuts and Jobs Act (TCJA). One of the focal points of the TCJA was the reduction of the corporate tax rate from 35% to 21%. Prior to the TCJA, the corporate tax rate in the

United States was one of the highest among OECD countries. A White House briefing from

February of 2018 praised the tax cuts as "expanding on a strong economy" and noted that

"200,000 jobs were added in January, while the unemployment rate remained at its lowest

level in 17 years, 4.1 percent" (2018). When discussing tax reform leading up to the legislation,

then-Speaker of the House Paul Ryan stated the following:

> Most people have not got a pay increase. Most people, half the people in this country,
>
> live paycheck to paycheck, so there is a lot of economic anxiety. And I think just one of
>
> the key solutions is faster economic growth, more jobs. And I think the best thing we
>
> could do to deliver that is tax reform (Hulse, 2017).

Many economists agreed; "the lower rate incentives new investments that will increase

productivity, and lead to higher levels of output, employment, and income in the long run"

(York, 2018, p. 8).

Other economists and analysts do not anticipate such a rosy outcome for the TJCA,

particularly in the long-term. "TCJA will stimulate the economy in the near term. But, most

models indicate that the long-term impact on gross domestic product will be small" (Gale, et al.,

2018, p. 1). "Don't expect the effects on growth to be transformational," remarked economist

Sérgio Rebelo, "but you might expect an extra boost in the economy" (Krakovsky, 2018, p. 3).

Another recent example of tax cuts to boost the economy came in Kansas in 2012. The

governor at the time, Sam Brownback, stated that various tax cuts would be like "a shot of

adrenaline into the heart of the Kansas economy" (Mazerov, 2018, p. 1). This example of

cutting taxes at the state level did not foster economic and job growth as intended.   Mazerov

(2018) points out the following in a report from the Center on Budget and Policy Priorities:

> Kansas' 4.2 percent private-sector job growth from December 2012 (the month before
>
> the tax cuts took effect) to May 2017 (the month before they were repealed) was lower
>
> than all of its neighbors except Oklahoma and less than half of the 9.4 percent job
>
> growth in the United States…Likewise, the number of Kansas residents reporting income
>
> on their federal tax returns from a partnership or "S corporation" (two of the main types
>
> of businesses that the tax cuts exempted from income tax) grew by 4.1 percent between
>
> 2012 and 2015, well below the 5.4 percent growth for the United States and below all of
>
> Kansas' neighbors except Missouri (p. 1).

The tax cuts in Kansas did not increase economic growth as intended, and the legislature rolled

back the tax cuts in 2017. "The Brownback tax cuts, one of the cleanest experiments for

measuring the effects of tax cuts on economic growth in the U.S., were eventually reversed by a

Republican-controlled legislature as a failure" (Gale, 2017).

In 2018, Iowa enacted tax reform that included lowering its top rate for corporate

income tax from 12% to 9.8%, which went into effect this year. Iowa's previous corporate

income tax rate was the highest in the nation, and this decrease was part of a tax reform

package described by many as "pro-growth tax reform" (Hendrickson & Williams, 2021).

However, as Dorman (2018) argues, Iowa has made various tax cuts in the past in the spirit of

economic growth, yet the intended benefits of economic growth and competitiveness remain

unclear.

Clearly, tax rates are controversial in public policy, and tax cuts are often at the forefront of policy makers' economic plans. With differing anecdotal results, it is hard for the public to determine the true impact of tax rates on economic growth, resulting in a need for empirical evidence.

In this research paper, I will test the impact of tax rates on economic growth. I will focus on corporate tax rates at the state level, and analyze the effect of corporate tax rates on GDP growth in the Midwestern United States.

Literature Review

The impact of corporate tax rates—and tax rates in general—on various economic growth indicators is disputed and controversial in the available literature. As Gale, et al. (2015) point out, "among recent studies, every conceivable finding is obtained: tax cuts raise growth, have no effect on growth, reduce growth, or do not generate clear results" (p. 1). Further, the literature tends to be seasoned with influence from a preferred economic school of thought and political partisanship.

Much of the research starts with the logic from classical economic theory; in essence, increased taxes lead to reduced income, thereby reducing investment and economic growth. According to economic theory, one would expect a negative relationship between tax rates and economic growth indicators such as GDP.

Poulson and Kaplan (2008) find a negative relationship between income taxes and economic growth when using aggregate time-series data for all states from 1963-2004. "The analysis reveals that higher marginal tax rates had a negative impact on economic growth in the

states" (Poulson & Kaplan, 2008, p. 67).   Holcombe and Lacombe (2004) conclude that states

that increased their income tax rates had slower growth and lower per capita income.

Romer and Romer (2010) suggest that previous studies on tax rates and growth are

subject to omitted variable bias, and attempt to address this bias by introducing the concept of

exogenous tax changes.   They make a distinction between endogenous tax changes, describing

endogenous tax changes as reactionary changes to "try to return growth to normal," for

instance, in a recession. On the other hand, exogenous changes are tax changes that are

intended to "raise normal growth, not to offset shocks acting to reduce growth relative to

normal" (Romer & Romer, 2010, p. 770). Romer and Romer (2010) examine the narrative

record to determine the motivations for tax changes in the United States from 1945-2007, and

through their model find the following:

> Tax increases appear to have a very large, sustained, and highly significant negative
>
> impact on output. Since most of our exogenous tax changes are in fact reductions, the
>
> more intuitive way to express this result is that tax cuts have very large and persistent
>
> positive output effects" (p. 781).

Romer and Romer (2010) also note that "tax increases to reduce an inherited budget deficit do

not have the large output costs associated with other exogenous tax increases" (p. 799).

However, the consensus is not simply a negative relationship between tax rates and

economic growth. In a time-series analysis of the U.S. corporate tax rate, Hungerford (2013)

finds "no evidence that either the statutory top corporate tax rate or the effective marginal tax

rate on capital income is correlated with real GDP growth" (p. 6).

An analysis of panel data conducted by Gale, et al. (2015) shows that "marginal tax rates generally have no impact on employment and statistically significant, but economically small, effects on the rate of firm formation" (p. 21). According to Gale, et al., "the overall impression generated by these results is that state-level economic growth is not closely tied to state-level tax policy" (p. 21).

Mendoza, et al. (1997) test Herberger's (1964) findings by using cross-country panel regressions, and conclude that "tax rates are not statistically-significant determinants of growth" (p. 123). Moreover, Mendoza, et al. (1997) find that "changes around current tax structures would need to be very large to result in noticeable effects on economic *growth*" (p. 124).

Easterly and Rebelo (1993) employ regression analysis on cross-section data, and find that central government surplus, public transportation and communication investment, and private investment have robust associations with economic growth, but "the evidence that tax rates matter for growth is disturbingly fragile" (p. 21).

Other studies find tax rates have uneven effects on growth. Tomljanovich (2004) analyzes states over 27 years, and finds tax rates do impact state growth, "however, these effects only hold in the short run; in the long run, growth rates return to their previous levels, implying that policy makers can influence only output levels through their actions" (p. 319).

Jaimovich and Rebelo (2016) propose a model "in which the effects of taxation on growth are highly nonlinear" (p. 266). Their research shows a nonlinear relationship between

tax rate and growth rate; in other words, every percentage point tax increase or decrease does not have an equal effect on growth rate.

> Taxes have a small impact on long-run growth when taxes rates and other disincentives to investment are low or moderate. But as tax rates rise, the marginal impact of taxation on growth also rises (Jaimovich & Rebelo, 2016, p. 283).

Separately, Jaimovich and Rebelo (2016) note that one of the two general observations of research in the twentieth century regarding economic growth is "the tax rates adopted by different countries are generally uncorrelated with their growth performance" (p. 265).

Although the literature review offers conflicting results, three general findings can be derived. First, a negative relationship exists between tax rates and economic growth. Second, no correlation exists between tax rates and growth. Third, a more complex relationship exists between taxes and growth in which the impact and length of impact depends on changes in the tax rate.

Methodology

Dependent Variable

The dependent variable in my analysis is the annual real GDP growth rate (chained 2012). I chose this dependent variable for a couple of reasons. First, GDP is an important economic indicator and is "thought to be the best single measure of a society's economic well-being" (Mankiw, 2006, p. 92). Therefore, state GDP growth is the best way to compare economic well-being between the states.

Second, the public presentation of economic conditions comes through economic indicators, and GDP is an indicator that is often referenced by government agencies, politicians, and the media. Furthermore, GDP is often used to promote or detract from past economic policy decisions. Since this indicator is a common benchmark in the public eye, it makes sense to use it as the dependent variable to represent economic growth.

To analyze economic growth, I use real GDP data obtained from the Bureau of Economic Analysis (BEA) from 2000 to 2017. I chose this time period for two primary reasons. First, the method for calculating state GDP changed in 1997 (changed from SIC industry definitions to NAICS industry definitions), so starting in 2000 avoids inconsistent GDP calculation (Bureau of Economic Analysis, 2020). Second, the TCJA went into effect on January 1, 2018. The TCJA lowered the federal corporate income tax from 35% to 21%, and was the first change in the federal corporate tax rate since 1993. By using data before 2018, the federal corporate tax rate can remain constant, and I can avoid any impact in 2018 that is related to the change in the federal rate.

Independent Variables

The primary independent variable in the model is the statutory corporate tax rate for the top tax bracket. I use statutory corporate tax rates for the twelve states studied for each year from 2000 to 2017. This data was obtained from the Tax Policy Center (Tax Policy Center, 2021). The decision to use the top statutory rate is based on similar logic used by Jaimovich and Rebelo (2016); the top tax bracket will likely consist of the largest businesses that are the primary economic drivers. According to this assumption, the level of the top tax bracket—and

any changes in this top bracket—will have greater impact on economic growth because it impacts the biggest firms.

I add population growth as a second independent variable to control for the effects of population growth on economic growth. I use annual population estimate data from the U.S. Census Bureau (U.S. Census Bureau, 2021). Finally, I use dummy variables for state and year to help control for characteristics specific to each state and year.

Regression Model

I start with a simple linear regression model:

$$Y = \beta_0 + \beta_n + \varepsilon$$

Since I am using panel data from twelve states over time, I will use a fixed effects model with dummy variables to address any correlation of the error term.

$$Y_{it} = \beta_0 + \beta_n X_{nit} + \alpha_i + \delta_t + \varepsilon_{it}$$

Changing the notation to clearly identify the variables, the equation becomes:

$$GDPGrowth_{it} = \beta_0 + \beta_1 TaxRate_{it} + \beta_2 PopGrowth_{it} + State_i + Time_t + \varepsilon_{it}$$

On the left-hand side, GDPGrowth represents the dependent variable of percent change in a state's GDP. On the right-hand side, β represents coefficients, TaxRate represents a state's top statutory corporate tax rate, PopGrowth represents the annual population growth, State represents the dummy variable for each state, Time represents the dummy variable for time, and ε represents the error term.

Reviewing the Data on Tax Rates and Growth

Corporate Tax Rates

Table 1 shows the top statutory corporate tax rates for all twelve states in the Midwest from 2000-2017. Iowa had the highest corporate tax rate throughout the period observed. South Dakota and Ohio both had no corporate tax rate as of 2017.

Six states did not change their corporate tax rate for the top tier during the period examined, as shown in Figure 1. These states were Iowa, Minnesota, Missouri, Nebraska, South Dakota, and Wisconsin. In this group, Iowa and Minnesota had the highest corporate tax rates at 12% and 9.80%, respectively, and South Dakota had no corporate tax.

Six states in the sample changed their top statutory corporate tax rate during the period examined, as shown in Figure 2. These states were Kansas, North Dakota, Illinois, Indiana, Michigan, and Ohio. Notably, Ohio lowered their marginal corporate tax rate from 8.5% to zero effective in 2009, and North Dakota gradually lowered their top corporate tax rate from 10.50% in 2000 to 4.31% by 2017. Three of the states—Illinois, Indiana, and Michigan—had higher statutory corporate tax rates in 2017 than in 2000.

GDP

Table 2 shows the annual real GDP growth for each state in the Midwest, along with the average GDP growth during the eighteen-year period observed. Average real GDP growth for the twelve states from 2000-2017 was 1.84%. North Dakota and South Dakota had the highest averages at 4.53% and 2.93%, respectively. The state with the lowest average was Michigan at 0.40%.

Comparing the Data

Economic theory likely leads to some expectations based on the data in Tables 1 and 2. First, one might expect a short-term increase in economic growth following a decrease in the corporate tax rates. This would be in line with exogenous growth theory, which "predicts that fiscal policy, in particular changes in tax rates, cannot affect long-run growth rates, merely transitional dynamics" (Tomljanovich, 2004, p. 319). Another expectation may be that the states with consistent, predictable, and low tax rates are likely to demonstrate stronger economic growth over time. Ultimately, a negative relationship of some form is expected; higher tax rates should lead to decreased production, and vice versa.

At first glance, GDP data in Table 2 appears inconsistent with expectations based on the tax rates presented in Table 1. For instance, the states with no corporate tax are Ohio and South Dakota. Ohio's average GDP growth from 2000-2017 was just 0.98%, and the average real GDP since the tax rate dropped to zero in 2011 was 1.88%, just around the average for all Midwest states. Meanwhile, South Dakota's average real GDP growth was 2.93%, the second highest in the Midwest during the period observed, providing an example of relatively high, sustained economic growth occurring in a no-tax environment.

On the other hand, the two states with highest corporate tax rates, Iowa and Minnesota, had average real GDP growth of 2.11% and 1.97%, respectively; both were above the average for Midwest states.

A notable outlier in the GDP data is North Dakota, which had average real GDP growth of 4.53%, far above the other Midwestern states. From 2010 to 2012, North Dakota

experienced annual real GDP growth figures of 7.59%, 11.15%, and 22.31%. Importantly, North

Dakota experienced significant economic changes during this time.

Real per capita GDP has been rising steadily for the past decade in North Dakota, even

as incomes around the rest of the country have fluctuated. Particularly high growth

started in 2007, when increased production of oil and natural gas in the Bakken region

was made possible by advancements in horizontal drilling and hydraulic fracturing

practices. Between 2007 and 2012, annual crude oil production in the state increased

fivefold, and annual natural gas gross withdrawals more than tripled (U.S. Energy

Information Administration, 2013).

The economic growth in North Dakota appears to demonstrate elements of exogenous growth

theory; a technological advancement in the industry led to significant economic growth.   It also

could be a case that supports Jaimovich and Rebelo's (2016) nonlinear model, since North

Dakota had a 350 basis point decrease in their corporate tax rate in 2004, a relatively large

decrease that preceded enormous economic growth. Ultimately, the unusually high economic

growth in North Dakota influences the analysis, and demonstrates how economic forces

outside of fiscal policy can have an enormous impact on growth, leaving tax policy as a mere

afterthought.

Michigan presents another interesting example of economic forces that supersede

effects of fiscal policy. Michigan's annual real GDP growth rates during the recession years of

2008 and 2009 were -5.55% and -8.78%, respectively, which were the lowest in the Midwest

during the Great Recession. Michigan was hit particularly hard given the collapse of the auto

industry during the recession. Michigan's corporate tax rate decreased to zero in 2011, then

increased to 6% in 2012, significantly higher than where the rate began in 2000. Since the

increase to 6%, Michigan averaged GDP growth of 1.78% through 2017. Economic stabilization

and growth occurred despite an increase in the corporate tax rate.

With varying case-by-case results when comparing tax rates and real GDP growth, I will

turn to fixed effects regression analysis for the panel data. Using dummy variables for state and

year, I hope to better control for state- and year-specific characteristics.

Empirical Results

Figure 3 shows the scatterplot of state GDP growth and state corporate tax rate. The fit

line is essentially flat, and there does not appear to be a clear positive or negative relationship

between the variables in this scatter plot. Notably, there is some variance around the 5%

corporate tax rate. This appears to be caused by Michigan and North Dakota, both states that

changed tax rates during the period observed. These two states had corporate tax rates around

5% at different times—Michigan from 2008-2010, and North Dakota in 2012 and 2013.

Table 3 shows the regression results using the methodology described previously. The

R-squared value is .467 and is significant at the 0.05 level, indicating the predictor variables

explain roughly 47 percent of the variation in the dependent variable. Corporate tax rate has a

coefficient of -0.002, demonstrating a slight negative relationship with change in real GDP;

however, the variable is not significant.

Therefore, based on this model, it appears a state's corporate tax rate is not a good

predictor of the state's real GDP growth.

Conclusion

Through a regression analysis of panel data from 2000-2017, I find the top statutory corporate tax rate does not have a significant effect on state annual GDP growth. This conclusion is similar to those found by Hungerford (2013), Gale, et al. (2015), and others, and reinforces the notion that "history shows no real link between tax rates and economic growth" (Krakovsky, 2018).

Further research should be conducted to compare the effects of consistent tax rates and changing tax rates on state economic growth, particularly relating to any short-term or long-term effects. I introduced data for states that changed their corporate tax rate, but more empirical evidence is needed in this area.

Additionally, this research can be enhanced in a couple ways. First, it may be useful to use state per capita GDP indexed to national per capita GDP as the dependent variable to better handle the business cycle over time. Second, the model can be improved by analyzing additional tax rates, tax revenue data, and state government spending data, and incorporating them into the model as independent variables. State-specific business taxes beyond the corporate income tax can be better analyzed by using tax revenue data.

Finally, another area warranting additional research is business formation. The model I have presented could be used with business formation as the dependent variable, perhaps using additional tax rates as independent variables.

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Table 1

Top Statutory Corporate Tax Rates in the Midwest by State

Year	Illinois	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Nebraska	North Dakota	Ohio	South Dakota	Wisconsin
2000	7.30%	3.40%	12.00%	7.35%	2.20%	9.80%	6.25%	7.81%	10.50%	8.50%	0.00%	7.90%
2001	7.30%	3.40%	12.00%	7.35%	2.10%	9.80%	6.25%	7.81%	10.50%	8.50%	0.00%	7.90%
2002	7.30%	3.40%	12.00%	7.35%	2.00%	9.80%	6.25%	7.81%	10.50%	8.50%	0.00%	7.90%
2003	7.30%	3.40%	12.00%	7.35%	1.90%	9.80%	6.25%	7.81%	10.50%	8.50%	0.00%	7.90%
2004	7.30%	8.50%	12.00%	7.35%	1.90%	9.80%	6.25%	7.81%	10.50%	8.50%	0.00%	7.90%
2005	7.30%	8.50%	12.00%	7.35%	1.90%	9.80%	6.25%	7.81%	7.00%	8.50%	0.00%	7.90%
2006	7.30%	8.50%	12.00%	7.35%	1.90%	9.80%	6.25%	7.81%	7.00%	8.50%	0.00%	7.90%
2007	7.30%	8.50%	12.00%	7.35%	1.90%	9.80%	6.25%	7.81%	7.00%	8.50%	0.00%	7.90%
2008	7.30%	8.50%	12.00%	7.35%	4.95%	9.80%	6.25%	7.81%	6.50%	8.50%	0.00%	7.90%
2009	7.30%	8.50%	12.00%	7.05%	4.95%	9.80%	6.25%	7.81%	6.50%	0.26%	0.00%	7.90%
2010	7.30%	8.50%	12.00%	7.05%	4.95%	9.80%	6.25%	7.81%	6.40%	0.26%	0.00%	7.90%
2011	9.50%	8.50%	12.00%	7.00%	0.00%	9.80%	6.25%	7.81%	6.40%	0.00%	0.00%	7.90%
2012	9.50%	8.50%	12.00%	7.00%	6.00%	9.80%	6.25%	7.81%	5.20%	0.00%	0.00%	7.90%
2013	9.50%	8.00%	12.00%	7.00%	6.00%	9.80%	6.25%	7.81%	5.15%	0.00%	0.00%	7.90%
2014	9.50%	7.50%	12.00%	7.00%	6.00%	9.80%	6.25%	7.81%	4.53%	0.00%	0.00%	7.90%
2015	7.75%	6.50%	12.00%	7.00%	6.00%	9.80%	6.25%	7.81%	4.31%	0.00%	0.00%	7.90%
2016	7.75%	6.50%	12.00%	7.00%	6.00%	9.80%	6.25%	7.81%	4.31%	0.00%	0.00%	7.90%
2017	7.75%	6.25%	12.00%	7.00%	6.00%	9.80%	6.25%	7.81%	4.31%	0.00%	0.00%	7.90%

Table 2

Annual Real GDP Growth (Chained 2012) in the Midwest by State

Year	Illinois	Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri	Nebraska	North Dakota	Ohio	South Dakota	Wisconsin
2000	3.65%	3.95%	4.73%	2.69%	2.01%	6.83%	2.72%	3.75%	3.78%	2.10%	6.86%	3.00%
2001	0.25%	-1.99%	-1.17%	0.19%	-3.33%	-0.12%	-0.73%	2.30%	1.72%	-1.43%	0.79%	1.28%
2002	0.71%	2.43%	2.77%	1.36%	2.72%	2.30%	1.40%	1.61%	5.29%	2.35%	10.58%	2.07%
2003	1.45%	3.80%	4.00%	1.59%	1.72%	4.35%	2.52%	5.54%	6.03%	1.62%	1.87%	2.79%
2004	2.95%	3.43%	8.29%	0.66%	0.38%	4.24%	2.16%	2.40%	0.92%	2.33%	3.00%	3.27%
2005	1.89%	0.35%	2.82%	3.38%	1.39%	2.78%	1.83%	3.44%	3.22%	1.81%	4.07%	2.41%
2006	2.55%	2.13%	1.50%	5.39%	-1.57%	0.03%	0.43%	2.75%	4.13%	-0.48%	1.71%	1.75%
2007	0.97%	2.64%	4.38%	5.17%	-0.55%	0.45%	0.05%	2.24%	4.67%	0.01%	4.98%	0.52%
2008	-1.56%	-0.29%	-1.79%	2.40%	-5.55%	0.79%	2.71%	0.52%	7.91%	-1.58%	3.27%	-1.32%
2009	-2.62%	-6.97%	-2.35%	-3.66%	-8.78%	-3.52%	-2.52%	0.29%	2.89%	-4.95%	1.11%	-2.80%
2010	1.55%	6.39%	2.65%	1.08%	5.50%	3.52%	1.58%	3.70%	7.59%	2.69%	1.19%	3.11%
2011	1.83%	0.39%	1.37%	2.66%	2.62%	2.28%	-1.04%	4.96%	11.15%	3.13%	6.39%	2.09%
2012	2.01%	0.38%	3.74%	1.43%	1.78%	1.37%	0.98%	-0.08%	22.31%	0.80%	1.41%	1.43%
2013	-0.13%	2.07%	0.04%	-0.29%	1.57%	2.35%	0.97%	1.33%	1.47%	1.81%	0.43%	0.40%
2014	2.22%	3.25%	4.90%	2.69%	1.32%	2.92%	0.48%	3.29%	7.96%	3.76%	1.63%	2.32%
2015	1.60%	-0.63%	2.96%	2.64%	2.63%	1.53%	1.29%	3.13%	-2.63%	1.49%	2.07%	2.21%
2016	-0.17%	1.51%	-0.62%	3.10%	1.98%	1.61%	-0.04%	0.78%	-7.14%	0.88%	0.80%	1.06%
2017	0.82%	2.03%	-0.30%	1.28%	1.40%	1.77%	1.11%	1.92%	0.30%	1.31%	0.63%	0.97%
Average	**1.11%**	**1.38%**	**2.11%**	**1.87%**	**0.40%**	**1.97%**	**0.88%**	**2.44%**	**4.53%**	**0.98%**	**2.93%**	**1.48%**

*Average real GDP growth for the Midwest from 2000-2017 was 1.84%

Table 3

OLS Results: Annual GDP Growth Rate 2000-2017 (Using Dummy Variables for State and Year)

Explanatory Variables	
CorpTaxRate	-0.002
PopGrowth	1.509*
R-Squared	0.467
N	215

*Denotes coefficient significant at the p<.05 level

Figure 1

State Corporate Tax Rates Unchanged from 2000-2017
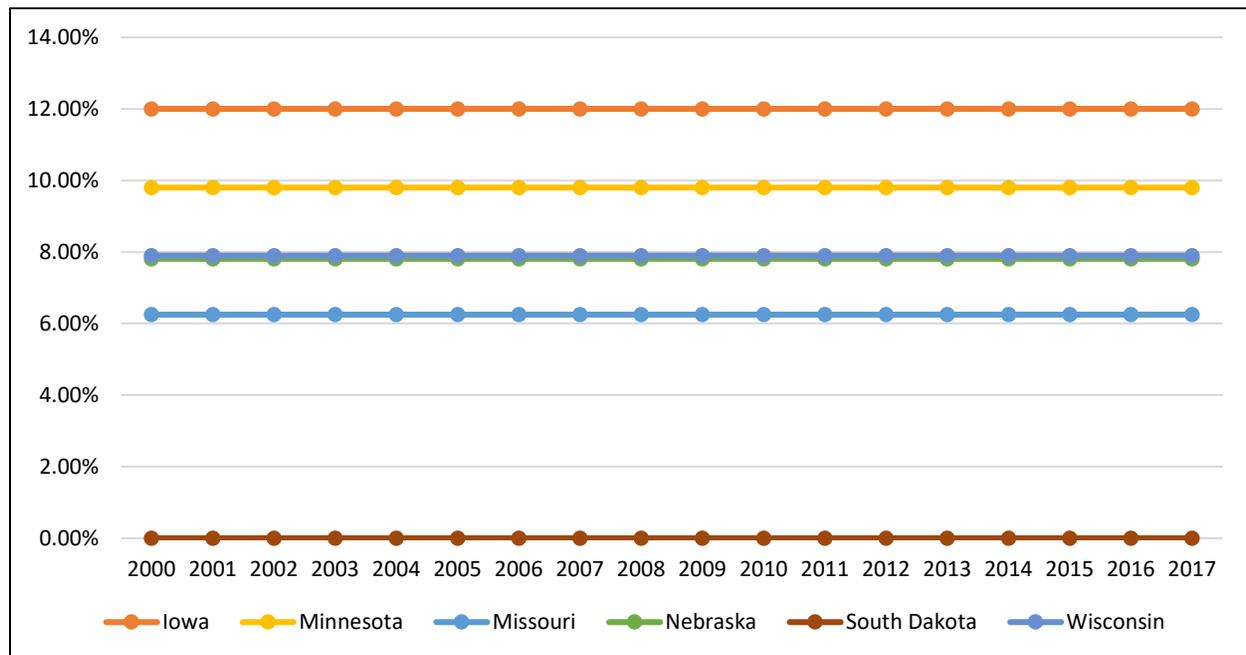
Figure 2

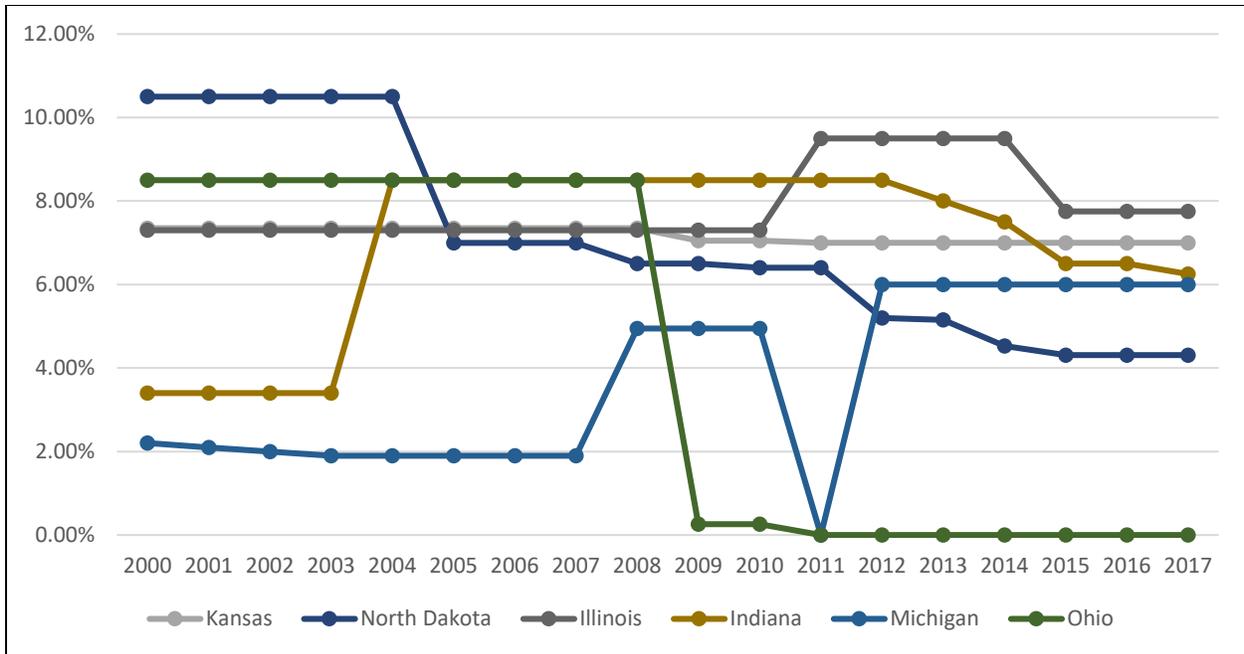*State Corporate Tax Rates with Changes between 2000 and 2017*

Figure 3

Scatter Plot of Annual State Real GDP Growth by State Corporate Tax Rate