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How Does the State Corporate Tax Rate Influence Unemployment?

An Econometric Analysis

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**Introduction**

The current US economy has been experiencing a phenomenon called the “Trump Bump” in that many investors expect the Trump administration and the conservative congress to make pro-business changes in the Federal tax structure. While this expectation is effecting the entire country, each state’s business climate is reacting differently. Though there are many inherent differences between each state, many states in the US have made job creation a priority of their state government. Business owners claim that state corporate income tax rates have a large effect on economic growth and specifically job creation. Each state varies widely from others and corporate income tax rates range from 0% in South Dakota to 12% in Iowa. That much variation in tax rates leads to the question: “What effects do state corporate income taxes have on job creation?”

Current literature suggests that a lower state corporate income tax does indeed have a significant effect on job creation. Many empirical studies have examined the relationship between corporate taxes and a variety of economic indicators including: changes in unemployment, investment, income, and firm location. A study on tax cuts by Shuai and Chmura in 2013 showed that tax cuts have a temporary benefit that last no more than 1 year after the tax cut is enacted. Another study by Mofidi and Stone in 1990 using data from 1962 to 1982, proposes that state expenditure of tax revenue significantly effects economic growth, measured by manufacturing investment increases and unemployment decreases.

While conclusive that decreases in state taxes increase employment, the current literature does not consider the effect of state spending on unemployment insurance or include data from after the 2012, 2014, and 2016 changes in many state’s legislatures.

Data from the Federal Reserve Economic Database(FRED), the Bureau of Labor Statistics, and the Bureau of Economic Analysis (BEA), will be used o study how state corporate tax rates effect changes in unemployment. Since each state is unique a few control variables are necessary, including: state’s minimum wage, whether the legislature is republican controlled, state expenditure on unemployment insurance, and social security compensation made by employers. Controlling for these variables in panel data should help explain errors and make the regression estimators less biased.

This study would benefit state law makers who have recently made job creation a focus of economic policy making. It would also benefit business owners and entrepreneurs who are seeking the best place to start or headquarter their business. Should an entrepreneur with a lot of talent stay in Iowa or move to South Dakota? Should a state trying to increase job creation lower its corporate income tax? These questions will be answered through this study.

**Data**

This study uses panel data to analyze changes in each state’s data from 2010 to 2016. The data starts in 2010 to avoid the spikes in unemployment from the 2008-2009 recession. Each state’s unemployment data found from the Bureau of Labor statistics will be used to measure job creation since a decrease in unemployment is an indicator of job creation. The main exogenous variable is the state corporate tax from the US Tax Foundation database. This is different than the Federal Corporate tax of approximately 35%. Each state can impose an additional corporate income tax, so most states impose a flat tax rate for all corporations, but some use a progressive system. Assuming that the most hiring firms are in the highest tax bracket, only included the highest tax bracket in the data for states that use a progressive tax system. While most states employ the corporate tax rate or have no corporate taxes, Ohio, Texas, and Washington do not impose a corporate tax but instead use the gross receipts tax. For this reason, those states have been excluded from the data set.

In addition to the simple bivariate data set, data for control variables was also collected. Each state’s minimum wage data found from the Bureau of Labor Statistics and a binary variable for whether the state had a republican controlled legislature are added to the model as control variables. As stated earlier, this study shows the effect of adding the additional variables of unemployment insurance paid by the government and social security compensation paid by the employer. Both of these variables come from the Bureau of Economic Analysis and are measured in percent changes from the previous year.

Research was then started by looking at the data. Table 1 shows the summary statistics and intuitive estimates for the sign of each estimator for each variable related to the model. It is expected to see that as corporate income taxes increase, unemployment will increase as well or vice versa.

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| --- | --- | --- | --- | --- | --- |
| **Table 1: Summary Statistics for 329 observations** | | | | | |
| **Variable** | **Mean** | **Standard Deviation** | **Minimum** | **Maximum** | **Expected Sign** |
| **Unemployment Rate** | 6.443 | 2.093 | 2.70 | 13.70 | ~ |
| **Corporate Tax rate (%)** | 6.784 | 2.390 | 0.00 | 12.00 | + |
| **Minimum Wage** | 7.506 | 0.808 | 5.15 | 10.00 | + |
| **Republican Controlled Legislature** | 0.502 | 0.501 | 0.00 | 1.00 | - |
| **Unemployment Insurance (% change)** | -16.542 | 17.587 | -67.90 | 45.40 | + |
| **Social Security Compensation (% change)** | 3.307 | 2.598 | -3.90 | 21.20 | + |

Figure 1 shows a scatter plot of the corporate tax and unemployment data from 2010 to 2016. As the trend line in red shows, there doesn’t seem to be a large causal relationship between the two data sets.

**Research Design**

After looking at the data, analysis was started by using the simple bivariate regression model to understand the basic causal relationship between corporate tax rates and unemployment.

A screenshot of a cell phone

Description generated with very high confidenceThe bivariate regression model shows that a 1% increase in tax leads to a 0.0336% increase in unemployment. But when preforming a 2-sided T-test, it also shows that taxes have no statistically significant effect on unemployment.

These results are contrary to this paper’s original assumptions that corporate tax increases will lead to a decrease in unemployment, but the bivariate regression model fails for a few reasons. First, the bivariate regression model fails to account for a very large error term, ε*state,year.* Tax rate is correlated with the error term which makes inference from the model incorrect. Second, there are many factors that effect both state unemployment and state corporate tax rate that need to be controlled for to avoid omitted variables bias on the estimator of tax rate. Additionally, the R-squared value is 0.0015 which shows that variation in tax rates explains almost none of the variation in unemployment. While a low R-squared value could just mean that x has no effect on y, a near zero R-squared value is indicative of a poorly designed model.

While the bivariate model produces a biased estimator and yields incorrect inference, a few things can be learned from it. Figure 2 shows the Average Unemployment Rates versus Average Corporate Tax Rates graphically as time series data for the 7-year span. This shows that there has only been a small negative change in average corporate tax rates in the last 7 years. So as the model is fixed, the unbiased estimate will still be very small. This confirms the results of Figure 1 that show the effect of taxes on unemployment will be very small since the line of best fit is very flat.

The model can be improved by adding the control variables of minimum wage and republican legislature. Since this does not include every variable in the data set this will be called the half model.

This results in the following model:

Minimum wage was chosen as an additional x variable because, according to the Tax Policy Center, a corporation’s payroll is one of the factors that determines corporate income tax. Additionally, the binary variable of whether a republican legislature was in control or not is added because republican legislatures typically adopt pro-corporation tax plans.

The half model is further developed into the full model by adding the variables of unemployment insurance paid by the state government and social security compensation paid by the employer. This full model is as follows:

While these models are better than the simple bivariate mode, the Gauss-Markov assumptions still need to be tested to know the model’s estimates provide the best linear unbiased estimates for the correlation coefficient of taxes.

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| --- | --- | --- |
| **White Test for Heteroscedasticity** | | |
| **Model** | **X2 statistic** | **p-value** |
| **Half** | 27.02 | 0.0007 |
| **Full** | 50.96 | 0.0001 |

The first assumption to test is the homoscedasticity assumptions. A White Test with a null hypothesis that homoscedasticity exists shows that heteroscedasticity exists for both models. Therefore, the variance in the error terms changes as the tax rate changes. This is compensated for by using Eicker-White standard errors and using feasible generalized least squares.

A further source of bias and improper inference in panel data is serial correlation. Using a Woolridge test for autocorrelation in panel data reveals that there is no serial correlation for either model. As shown below, the p-value of the F test is high enough that the null hypothesis (that there is no serial correlation) is not rejected. The model does not require any corrections for serial correlation.

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| --- | --- | --- |
| **Woolridge Test for Serial Correlation** | | |
| **Model** | **F-Stat** | **P-Value** |
| **Half** | 0.93 | 0.3399 |
| **Full** | 0.022 | 0.8839 |

Another assumption is that the error term, , is distributed normally. We will just assume that this is violated but the law of large numbers states that with increasing sample sizes the error terms will be distributed normally. Violations of this assumption will have marginal, if any, effects on inference, so this violation can be ignored.

The final and most important assumption, that the correlation between the error terms for each tax rate is zero, can be tested and corrected for using fixed effects. A fixed effects regression will control all the individual factors in each state that have a fixed effect on unemployment. It is assumed that all the other factors that affect both corporate tax and unemployment are time invariant. After using fixed effects, all of the Guass-Markov assumptions are fulfilled.

**Empirical Results**

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| --- | --- | --- | --- | --- |
| **Half Model Regression Results** | | | | |
| ***Variable*** | **Coefficient** | **Standard Error** | **T Statistic** | **P>T** |
| *Tax* | -0.0619 | 0.06376 | -0.97 | 0.337 |
| *Minimum wage* | -0.649 | 0.16528 | -3.93 | 0 |
| *Republican Legislature* | -1.6858 | 0.23211 | -7.26 | 0 |
| *\_cons* | 12.5803 | 1.33891 | 9.4 | 0 |

Since both models have been corrected to fulfill the Gauss-Markov assumptions, empirical results of the models can now be analyzed. The results of the half model using Ecker-White standard errors and correcting for fixed effects yields the following results.

As shown above, the results of this half model regression show us that a 1% increase in taxes yields a 0.0619% decrease in unemployment. To test the accuracy of this estimator a hypothesis test with the null hypothesis that taxes have no effect on unemployment needs to be performed. The hypothesis test yields a p-value of 0.337

Since the p- value of 0.337 is so high, the null hypothesis that tax rates have no effect on unemployment fails to be rejected. As taxes do not have a statistically significant effect on unemployment, an f-test will show if any of the variables in the model have a statistically significant effect on unemployment. The f-test yielded a p-value of zero, so at least one of the variables matters.

The full model yields similar results. The regression shows that a 1% increase in taxes yields a 0.0657% decrease in unemployment. However, a hypothesis test with null hypothesis that taxes have no effect on unemployment yields a p value of 0.313 which means that there is no statistically significant effect of taxes on unemployment. Additionally, since one of the variables in the half model had a significant effect on unemployment an f test can be performed on just the 2 additional variables: unemployment insurance and Social Security compensation. This f test yields the results that neither change in unemployment insurance nor change in employer social security compensation have any effect on unemployment in the full model. This shows that the addition of both variables to the full model does not improve the model.

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| --- | --- | --- | --- | --- |
| **Full Model Regression Results** | | | | |
| **Variable** | **Coefficient** | **Standard Error** | **T- Statistic** | **P>T** |
| tax | -0.0657396 | 0.0643849 | -1.02 | 0.313 |
| Minimum Wage | -0.6475949 | 0.1655058 | -3.91 | 0 |
| Republican Legislature | -1.713797 | 0.2508019 | -6.83 | 0 |
| Unemployment Insurance | -0.0040948 | 0.0061039 | -0.67 | 0.506 |
| Social Security Compensation | -0.0240139 | 0.0460757 | -0.52 | 0.605 |
| \_cons | 12.62161 | 1.359871 | 9.28 | 0 |

Additionally, the R-squared value, while not zero, for the half and full models is 0.1487 and 0.15 respectively. This shows that the addition of extra variables doesn’t help explain more variance in unemployment by explaining variance in the x variables.

Even though the full model drastically improves upon the simply bivariate model, there are still potential sources of error. While unrelated to the model, the first and most obvious source of error could be explained by the fact that most states do not change their tax rate by large amounts or very frequently. This source of error could be fixed by expanding the sample size to include times when most states changed their tax rates in the 80’s and 90’s. A larger sample with 40 years of data could decrease the amount of error in the current model but probably not by a very significant amount. Also, as seen in the summary statistics, variance in unemployment has been very low since the 2008 recession, so it is hard to see the effect of taxes when the variance of unemployment is so low.

Even though fixed effects were used, there is still potential for omitted variable bias. Each state has a different method for determining its corporate tax rate. It was assumed that a corporation’s pay roll has a significant effect on the tax rate but differences in states would suggest that other state specific factors are included. Specifically, an additional control variable measuring corporate profits would help explain unemployment.

Another source of error could be from measurement error in unemployment insurance and Social Security compensation. The data for unemployment insurance and social security compensation measured the change from year to year in both variables. If the data had been a percentage of state spending the results might be different.

**Conclusion**

With all the debate on the federal level about corporate taxes, should state governments discuss lowering corporate taxes to increase jobs? Do state corporate taxes influence job creation? The answer to both questions is probably not. State corporate taxes may influence other economic indicators in each state, but they do not have a large effect on job creation. Also, to answer the questions of policy makers consider lowering unemployment insurance to incentivize job finding, it was also found that those variables have no statistically significant effect on unemployment.

The question “Do state corporate income taxes influence job creation?” deserves continued research. Many corporations exist in multiple states and are headquartered in states with lower tax rates. Additional research could be done to discover the effects of multi state corporations versus single state corporations and how they react differently to the state corporate tax rate. Research on the state corporate tax rates effect on other economic indicators such as state GDP or average wage in the state would also be interesting.

While previous literature on the topic of state corporate income taxes suggests that state corporate taxes have a small impact on job creation in the state, this paper’s research shows that this has not been the case in the last few years. The federal corporate income tax seems to play a much larger role in each individual state than the state corporate income tax. So as state governments decide whether to follow the federal government in decreasing corporate taxes as a way to spur job creation, it can be concluded that the state governments should find other methods that have a more direct effect on state unemployment.

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