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# THE EFFECTS OF INCOME TAX ON THE UNEMPLOYMENT RATE IN THE UNITED STATES

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This study investigates the correlation between state income tax and unemployment rates across the United States. Using panel data in 50 states pertaining to the period from 2006 to 2022 with different regression models, the results suggest that the state corporate and personal income tax rates are positively correlated with the state unemployment rate. Specifically, a 1% decrease in the personal income tax rate may lead to a 0.712% decrease in the state unemployment rate, and a 1% decrease in the corporate income tax rate may cause a drop of 0.328% in the state unemployment rate. In addition, the results show that a personal income tax hike is associated with an increase of 1.532% in the state unemployment rate, and a corporate income tax hike may increase the state unemployment rate by 0.78%. The results of this study are relevant in the context of increasing government spending in the US and the world. Policymakers and government officials may not want to abuse the tax policy to fund the budget deficits.

**Keywords:** unemployment rates, personal income tax, corporate income tax, fixed-effects model, dynamic panel data

JEL Classification: H71, E24, J2

## INTRODUCTION

In the United States, each state has the right to govern its local economy as long as it complies with federal government laws and regulations. As a result, there is obvious heterogeneity in terms of economic policies and performances across the states. A part of it stems from the fact that the states compete with one another in order to attract more firms. A large state can use its fiscal policy (i.e. tax policy) so as to give out-of-state big corporations financial incentives to move in. For example, in 2018, California had a personal income tax rate of 12.3%, whereas Texas had a tax rate of 0%. Although these two states have comparable populations, locations, and the economic size, they have completely opposite tax policies in place. This competition among the states is not likely to end in the future.

There is a rich literature on the impact of the tax policy on economic growth in the United States and

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in the world as well. T. J. Bartik (1994) estimated that the average elasticity for the tax responsiveness for economic growth was - 0.3 across the United States. According to F. Daveri and G. Tabellini (2014), higher labor taxes are associated with a higher unemployment rate. In particular, they estimated that the increase of 14 percent in labor tax rates from 1965 to 1995 in the EU could account for the increase of around 4 percent in the unemployment rate. Nonetheless, there is no ultimate answer to the question, how much does a tax policy affect the economic performance of a state? The argument can go both ways. There are those who may argue that tax revenue provides the state with funds that go towards public education, infrastructure, and other economic development projects. These projects, if the same ultimately show to be successful, may create well-paying jobs and help promote economic growth.

Yet, one may also be doubtful about the efficiency of those projects. According to the data, several US states manage to provide public welfare to their citizens without imposing high tax rates. In the states with lower personal income tax rates, it can be argued that workers have more financial incentives to stay in their jobs. Additionally, households may be able to keep more disposable income and spend more on goods and services. Consequently, high demand for goods and services in these states may create more local jobs. Apart from said, the states with relatively low-income tax rates may have the advantage of attracting more companies and businesses from other states. Therefore, the unemployment rate in these states tends to be lower than in those with higher tax rates.

The differences in the statewide tax policy across the US can be seen in the other parts of the world, including the powerhouse economies such as China, Japan, Germany, France, India, and so on. The findings of this study may be useful for local policymakers in the other countries that share some common government-related characteristics with the US.

Given the fact that the empirical findings in the literature are not robust and consistent, this paper aims to provide more evidence to the debate. In this study, two specific questions are addressed and discussed, namely:

1. Do the states with lower personal or/and corporate income tax rates tend to have lower unemployment rates?

2. Do income tax rate hikes in the US affect the unemployment rate?

The research study conducted in this paper differs from previous research studies from several points of view. First, while the largest number of the papers in the literature have used cross-sectional or pooled time-series data, a panel data set allowing us to take care of heterogeneity issues across the states and lessen the omitted variable bias is used in this paper. Second, different empirical approaches are applied in this paper so as to analyze the impacts of the tax on the unemployment rate. Finally, the data set of this paper is more up-to-date.

The rest of the paper is structured into a few sections. In Section 2, the literature is discussed in the literature review. Section 3 explains the econometric methodology and data. Section 4 deals with the empirical results and discussion and Section 5 includes the concluding remarks.

## LITERATURE REVIEW

Although there are voluminous studies on the impact of tax on economic performance, the answers are inconclusive. Most researchers agree that a tax policy influences firms' decisions to open, expand, or leave a region. Specifically, if the corporate tax rate drops, firms may be able to expand their business as they might receive bigger profits. If firms increase their economic activities, they might create more jobs and spur economic growth in the area. In addition, if personal income taxes fall, households may receive higher disposable incomes and spend more. Therefore, aggregate demand for goods and services might increase, which will lead to higher economic and job growth. C. D. Romer and D. H. Romer (2010) found that federal tax hikes might negatively affect

the output and the unemployment rate. O. M. Zidar (2015) concluded that a 1% tax cut would lead to a 3.4% increase in state employment. Earlier studies had also found connections between state taxes and economic growth. T. J. Bartik (1992) provided a detailed review of the impact of state and local taxes on employment and economic growth. He postulated that an increase in state and local tax rates might lead to a decrease in employment and economic growth. E. Borchers, J. Deskins and A. Ross (2016) found that higher state tax rates and corporation income tax rates might impede small business growth. In another study, T. J. Bartik (1994) estimated the average elasticity of tax responsiveness ranges, moving from -0.1 to -0.6. Other researchers had found similar results using different sets of data and methods (Wasylenko & McGuire, 1985; Munnell & Cook, 1990; McConnell & Schwab, 1990; Papke, 1991). Using data for the OECD countries, B. Heitger (2002) found that tax reduction might lead to an increase in short-term unemployment but a decrease in long-term unemployment.

Nonetheless, the results are inconclusive. Several studies showed that the impact of taxes on job and economic growth was either small or statistically insignificant (Romans & Subrahmanyam, 1979; Carlton, 1983; Tannenwald, 1996). J. Helms (1985) found that an increase in state and local taxes was associated with a lower economic growth rate if tax review was used for transfer payments. On the other hand, if tax money is used to improve public services, it may support economic growth. In an interesting study, R. Carroll and M. Wasylenko (1994) used data from 1967 to 1988, and found that state and local taxes had had a bigger impact on employment and economic performances before 1982 than they did after that year. E. P. Goss and J. M. Phillips (1994) provided mixed evidence on the matter, having found that the higher personal income taxes of the state were statistically associated with lower job growth, whereas the impact of corporate tax rates was insignificant. A. Estache and B. Gersey (2018) studied the effect of the corporate tax rate policy on the unemployment rate in Europe between 1999 and 2014. They showed that a 1% decrease in the corporate tax rate might lead to a 0.34% increase in the unemployment rate.

R. J. Pjesky (2006) argued that the empirical findings of prior studies were subject to the data and methodologies used. Most of them are sensitive to empirical strategies and time. More recently, C. A. Pissarides (1998) has studied the impact employment tax cuts have on unemployment rates in Europe. He could not conclude that employment tax cuts had an impact on unemployment rates at a significant level. T. Turner and B. Blagg (2018) used the difference-in-differences approach to examine the impact of a personal income tax cut on private-sector employment in the state of Kansas. They found no evidence for the subject-matter relationship.

Although there is a rich literature on the impact of taxes on economic growth, there is no definitive answer. In addition, there are not many studies that examine the impact of personal and corporate income tax rates on unemployment in the United States. This research study contributes to the literature in several ways. First, a more up-to-date data set is used, covering the period of pre- and post-Great Recession of 2008. Second, different impacts of personal income and corporate income taxes on unemployment rates are presented. Finally, Fixed-Effects and Dynamic Panel Data models are used in order to limit the heterogeneity and autocorrelation issues across the states and lessen the omitted variable bias.

## ECONOMETRIC METHODOLOGY AND DATA

Empirical strategies are discussed in this section. This study aims to examine the relationship between income tax rates and the unemployment rate across different states in the US. In addition, the study also aims to evaluate the impact of the income tax hike on the unemployment rate. In most studies in the literature, cross-sectional data are used to analyze the impact of state and local taxes on economic growth. There may be two potential issues to this approach. First, it does not capture the relevant importance of the characteristics of each individual state. Second, the nationwide macroeconomic factors subject to change overtime, such as the business cycle, the federal fiscal

and monetary policy/policies, and so on, may be missed. Therefore, the panel data of all 50 states in the United States from the year 2006 to the year 2022 are included herein so as to avoid the aforementioned potential problems. Regarding the use of the panel data, another question is, what kind of specifications to use (i.e. the fixed-effect or random-effect models). Following J. Helms (1985) and R. Carroll and M. Wasylenko (1994), the estimation of the fixed-effect (FE) model was used as the main results given the fact that it accounts for the heterogeneity issue across the states and lessens the omitted variable bias.

Four different models were used to address the two questions in this study. In the first model, the impact of the state personal income tax rate on the state unemployment rate is examined. The first model is as follows:

$$Unemployment\ Rate_{it} = \beta_0 + \beta_1 (Personal\ Income\ Tax\ Rate)_{it} + \beta_2 (Bachelor's\ Degree)_{it} + \beta_3 (Minimum\ Wage)_{it} + \beta_4 Log(State's\ Population)_{it} + \beta_5 (SNAP\ Benefits)_{it} + \beta_6 (Union\ Workers)_{it} + \theta_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where $Unemployment\ Rate_{it}$ is the official unemployment rate in the state $i$ at the time $t$. $Personal\ Income\ Tax\ Rate_{it}$, $Bachelor's\ Degree_{it}$, $State's\ Population_{it}$, $SNAP\ Benefits_{it}$, $Minimum\ Wage_{it}$, $Union\ Workers_{it}$, are the rate of personal income tax, the ratio of the population who has graduated with a bachelor's degree or a diploma above that degree, the size of the population, the number of the SNAP benefits recipients, the minimum wage level, and the number of the unionized workers in the state $i$ at the time $t$, respectively. $\theta_i$ is used to control the time-invariant unobserved characteristics of the state $i$. $\lambda_t$ is used to control the state-time trends that may affect the unemployment rate in all the states.

In the second model, the relationship between the state corporate tax rate and the state unemployment rate is investigated. The second model is as follows:

$$Unemployment\ Rate_{it} = \beta_0 + \beta_1 (Corporate\ Income\ Tax\ Rate)_{it} + \beta_2 (Bachelor's\ Degree)_{it} + \beta_3 (Minimum\ Wage)_{it} + \beta_4 Log(State's\ Population)_{it} + \beta_5 (SNAP\ Benefits)_{it} + \beta_6 (Union\ Workers)_{it} + \theta_i + \lambda_t + \varepsilon_{it} \quad (2)$$

where $Unemployment\ Rate_{it}$ is the official unemployment rate in the state $i$ at the time $t$. $Corporate\ Income\ Tax\ Rate_{it}$, $Bachelor's\ Degree_{it}$, $State's\ Population_{it}$, $SNAP\ Benefits_{it}$, $Minimum\ Wage_{it}$, $Union\ Workers_{it}$, are the rate of corporate income tax, the ratio of the population who have received bachelor's degrees or a diploma above that degree, the size of the population, the number of the SNAP benefits recipients, the minimum wage level, the number of the unionized workers in the state $i$ at the time $t$, respectively. $\theta_i$ is used to control the time-invariant unobserved characteristics of the state $i$. $\lambda_t$ is used to control the state-time trends that may affect the unemployment rate in all the states.

In the third model, both the state personal income tax rate and the state corporate tax rate are included as the explanatory variables. The third model is as follows:

$$Unemployment\ Rate_{it} = \beta_0 + \beta_1 (Personal\ Income\ Tax\ Rate)_{it} + \beta_2 (Corporate\ Income\ Tax\ Rate)_{it} + \beta_3 (Bachelor's\ Degree)_{it} + \beta_4 (Minimum\ Wage)_{it} + \beta_5 Log(State's\ Population)_{it} + \beta_6 (SNAP\ Benefits)_{it} + \beta_7 (Union\ Workers)_{it} + \theta_i + \lambda_t + \varepsilon_{it} \quad (3)$$

In the fourth model, whether state income tax hikes affect state unemployment rates or was the subject matter of investigation. Dummy variables were used for the tax hikes. The dummy variables have the value 1, if the state increases taxes on personal income or corporate income by more than 2%, or the value is 0 otherwise. The fourth model is as follows:

$$Unemployment\ Rate_{it} = \beta_0 + \beta_1 (Personal\ Income\ Tax\ Hike)_{it} + \beta_2 (Corporate\ Income\ Tax\ Hike)_{it} + \beta_3 (Bachelor's\ Degree)_{it} + \beta_4 (Minimum\ Wage)_{it} + \beta_5 Log(State's\ Population)_{it} + \beta_6 (SNAP\ Benefits)_{it} + \beta_7 (Union\ Workers)_{it} + \theta_i + \lambda_t + \varepsilon_{it} \quad (4)$$

The data were retrieved from different sources, as described in Table 1. The variables used for the purpose of conducting this study are the minimum wage, the average state personal income tax rate, the bachelor's degree attainment, the state's population, the labor union members, the supplemental nutrition assistance program (SNAP) benefit recipients, and the unemployment rate. The dataset includes as many as 850 observations.

**Table 1** The variables and the sources

| Variables | Sources |
|---|---|
| State Unemployment Rate | US Bureau of Labor Statistics |
| State Minimum Wage | US Department of Labor |
| Bachelor's degree Completion Rate | US Census Bureau |
| State Population | US Census Bureau |
| SNAP Benefits Recipients | US Census Bureau |
| State Personal Income Tax Rate | Federation of Tax Administrators |
| State Corporate Income Tax Rate | Tax Policy Center |
| Number of Union Employees | US Bureau of Labor Statistics |

*Source:* Authors

The state unemployment rate is the dependent variable in this study. The main independent variables are the state personal income and corporate income tax rates. The control variables are supposed to affect the supply of and demand for jobs on the market. Specifically, the state minimum wages might affect the equilibrium of the job market. If the minimum wage is higher than the equilibrium wage in a certain industry, it may create involuntary unemployment amongst unskilled workers. The bachelor's degree attainment ratio measures the state's level of human capital. It can be argued that, if the level of human capital in a state is higher, demand for labor in that state higher as well. The number of the labor union members in each state measures how strong the labor union in that particular state is. A stronger union may scare employers out of the state and negatively affect demand for labor. The SNAP benefits recipients variable reflects how comprehensive a state's welfare program is. A more generous welfare program may reduce unemployed workers' incentives to find new jobs, which as a result may lead to a higher unemployment rate. Ultimately, the state's population may affect the supply of labor.

The data for all 50 states in the US were collected for the period from 2006 to 2022. Unfortunately, the data for some variables are not available for the period preceding the year 2006.

## EMPIRICAL RESULTS AND DISCUSSION

Table 2 gives the correlation matrix, and Table 3 provides the summary statistics of all the variables used in this study.

The baseline OLS regression results are the starting point. Table 4 provides the empirical results for the OLS regressions for all the four models discussed in the previous section. According to the third column of Table 4, one of the main variables of interest (the personal income tax rate) has a coefficient 0.710 and is statistically significant at a 10% level. The other variable, i.e. the corporate income tax rate, has a coefficient 0.551 and is also statistically significant at a 10% level. This result suggests that a 1% increase in the personal income tax rate is on average associated with an increase of 0.71% in the state unemployment rate. In addition, a 1% increase in the corporate income tax rate is correlated with an increase of 0.551% in the state unemployment rate. Furthermore, the bachelor's degree completion rate has a coefficient of -0.115 and is statistically significant at a 1% level, which on its part suggests that a 1% increase in the bachelor's degree completion rate may lead to a decrease of 0.115% in unemployment. The minimum wage variable has a coefficient of 0.115 and is statistically significant at a 10% level, which suggests that a dollar increase in the state's minimum wage is associated with a 0.115% increase in the state unemployment rate. The state's population coefficient is -0.021 and is statistically significant at a 1% level, which indicates that a 10% increase in the state's population is associated with a 0.0086% decrease in the state unemployment rate. SNAP's coefficient is 0.022, the number of the union employees coefficient is 0.12, and both are statistically significant at a 1% level, which suggests that an increase of 1,000 people in the SNAP program and the union is associated with an increase of 0.022% and 0.12% in the unemployment rate, respectively. The results of the models 1 and 2 are consistent with those of the model 3.

The results given in the fourth column of Table 4 suggest that a personal income tax hike from the year before is associated with an increase of 1.418% in the state unemployment rate. In addition, a hike in the

**Table 2** The correlation matrix

| | Minimum wage | Bachelor's degree completion rate | State's population | SNAP benefits recipients | Personal income tax rate | Number of union employees | Unemployment rate | Corporate income tax rate |
|---|---|---|---|---|---|---|---|---|
| Minimum wage | 1 | | | | | | | |
| Bachelor's degree Completion Rate | 0.462 | 1 | | | | | | |
| State's population | 0.102 | 0.127 | 1 | | | | | |
| SNAP benefits recipients | 0.119 | 0.042 | 0.935 | 1 | | | | |
| Personal income tax rate | 0.077 | 0.162 | 0.035 | -0.033 | 1 | | | |
| Number of Union Employees | 0.214 | 0.233 | 0.843 | 0.732 | 0.209 | 1 | | |
| Unemployment rate | 0.020 | -0.226 | 0.193 | 0.286 | 0.016 | 0.180 | 1 | |
| Corporate income tax rate | 0.040 | 0.177 | -0.054 | -0.104 | 0.506 | 0.079 | 0.018 | 1 |

*Source:* Authors

**Table 3** The summary statistics

| | Observations | Mean | S.D. | Minimum | Maximum |
|---|---|---|---|---|---|
| Minimum wage | 850 | 7.31 | 1.20 | 2.65 | 11.5 |
| Bachelor's degree completion rate | 850 | 28.62 | 5.14 | 16.5 | 44.5 |
| Log(State's population) | 850 | 62.26 | 69.61 | 52.66 | 394.46 |
| SNAP benefits recipients | 850 | 79.41 | 86.33 | 2.25 | 441.65 |
| Personal income tax rate | 850 | 5.24 | 3.04 | 0 | 12.3 |
| Number of Union Employees | 850 | 298.35 | 449.33 | 15 | 2740 |
| Unemployment rate | 850 | 5.91 | 2.19 | 2.4 | 13.6 |
| Corporate income tax rate | 850 | 6.34 | 2.82 | 0 | 12 |

*Source:* Authors

corporate income tax is correlated with an increase of 0.415% in the state unemployment rate.

To sum up, all the variables have coefficient values and signs as expected. The OLS regression results, however, are subject to methodological concerns. As pointed out in J. Helms (1985), OLS regression might produce biased results because it does not take into account the unobserved heterogeneous characteristics across states in the nation. Therefore, the nature of the panel data set was taken advantage of so as to minimize the potential bias of the OLS regressions. The random-effect and fixed-effect regressions were applied to all the four aforementioned models for the purpose of robustness checks. In addition to that, the J. Hausman (1978) specification test was done in order to identify which regression procedure is more appropriate.

**Table 4** The OLS regression results
(Dependent variable = State unemployment rate)

| Independent variables | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Intercept | 7.607 | 7.424 | 7.403 | 6.915 |
| | (0.514) | (0.524) | (0.534) | (0.537) |
| Personal income tax rate/hike | 0.875* | | 0.710* | 1.418* |
| | (0.446) | | (0.362) | (0.723) |
| Corporate income tax rate/hike | | 0.653* | 0.551* | 0.415* |
| | | (0.343) | (0.306) | (0.223) |
| Bachelor's degree completion rate | -0.111*** | -0.115*** | -0.115*** | -0.113*** |
| | (0.017) | (0.017) | (0.017) | (0.017) |
| Minimum wage | 0.107*** | 0.115* | 0.115* | 0.119* |
| | (0.069) | (0.068) | (0.068) | (0.067) |
| Log(State's population) | -0.025*** | -0.024*** | -0.021*** | -0.025*** |
| | (0.0039) | (0.0048) | (0.0051) | (0.0049) |
| SNAP benefits recipients | 0.021*** | 0.019*** | 0.022*** | 0.023*** |
| | (0.0031) | (0.0029) | (0.0030) | (0.0031) |
| Number of union employees | 0.11*** | 0.14*** | 0.12*** | 0.15*** |
| | (0.04) | (0.041) | (0.038) | (0.042) |
| State fixed effects | No | No | No | No |
| State time trends | No | No | No | No |
| $R^2$ | 0.39 | 0.42 | 0.48 | 0.45 |
| N | 850 | 850 | 850 | 850 |

Notes: *** p < 0.01, ** p < 0.05, * p < 0.1; the numbers in parentheses are robust standard errors.

*Source:* Authors

## Robustness Checks

### *Random-effect models*

Before using the panel data models to estimate the impact of state income taxes on unemployment rates, unit root tests had been done in order to check if the panels were stationary or not. The Levin-Lin-Chu, Harris-Tzavallis, and Im-Pesaran-Shin tests were performed. Table 5 shows the results of these tests, which suggest that the panels are stationary. Therefore, the panel data models can be used for estimations.

Table 6 shows the estimation results obtained by performing the random-effect regressions. According to Table 6, most coefficients have the same signs and significance levels, as is shown in Table 4. Specifically, the personal income tax rate, the corporate income tax rate, the personal income tax hike, and the corporate income tax hike have positive coefficients and are statistically significant at a 10% level across all the models.

### *Fixed-effect models*

Table 7 provides the results obtained from the fixed-effect regressions performed. This specification includes the year and state-fixed effects. These results are in line with what is presented in the tables 4 and 6. In particular so, the personal income tax rate and the corporate income tax rates have positive coefficients and are statistically significant at a 1% level across all the models. According to the third column of Table 7, a 1% increase in the personal income tax rate is associated with a 0.712% increase in the state

**Table 5** The panel unit root tests

| Variable | Levin-Lin-Chu | | Im-Pesaran-Shin | |
|---|---|---|---|---|
| | Adjusted t* | p-value | t-bar | p-value |
| Personal income tax rate | -4.366 | 0.000 | -3.615 | 0.000 |
| Corporate income tax rate | -2.96 | 0.002 | -2.521 | 0.000 |
| State unemployment rate | -2.734 | 0.003 | -2.815 | 0.000 |
| State minimum wage | -5.551 | 0.000 | -1.987 | 0.0057 |
| Bachelor's degree completion rate | -6.257 | 0.000 | -2.322 | 0.000 |
| State's population | -12.478 | 0.000 | - 2.447 | 0.000 |
| SNAP benefits recipients | -9.462 | 0.000 | -2.825 | 0.000 |
| Number of the union employees | -8.124 | 0.000 | -2.953 | 0.000 |

*Source:* Authors

**Table 6** The random-effect GLS regression results
(Dependent variable = State unemployment rate)

| Independent variables | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Intercept | 12.097 | 11.727 | 11.688 | 11.289 |
| | (0.782) | (0.805) | (0.816) | (0.881) |
| Personal income tax rate/Hike | 0.417* | | 0.481* | 0.543* |
| | (0.212) | | (0.245) | (0.291) |
| Corporate income tax rate/Hike | | 0.329* | 0.302* | 0.945* |
| | | (0.176) | (0.167) | (0.506) |
| Bachelor's degree completion rate | -0.287*** | -0.284*** | -0.293*** | -0.267*** |
| | (0.032) | (0.031) | (0.0032) | (0.0311) |
| Minimum wage | 0.122 | 0.129 | 0.134 | 0.112 |
| | (0.084) | (0.084) | (0.084) | (0.084) |
| Log(State's population) | -0.041*** | -0.038*** | -0.043*** | -0.046*** |
| | (0.006) | (0.0055) | (0.0061) | (0.0063) |
| SNAP benefits recipients | 0.029*** | 0.030*** | 0.030*** | 0.030*** |
| | (0.003) | (0.003) | (0.003) | (0.003) |
| Number of the union employees | 0.21*** | 0.24*** | 0.22*** | 0.28*** |
| | (0.07) | (0.06) | (0.063) | (0.066) |
| State fixed effects | No | No | No | No |
| State time trends | No | No | No | No |
| $R^2$ | 0.449 | 0.458 | 0.559 | 0.54 |
| N | 850 | 850 | 850 | 850 |

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; the numbers in parentheses are robust standard errors.

*Source:* Authors

unemployment rate. Additionally, a 1% increase in the corporate income tax rate is associated with a 0.328% increase in the state unemployment rate. The other explanatory variables have the same signs and significance levels, as is given in the tables 4 and 6.

In addition to the foregoing, whether the random-effect specification is more appropriate than the fixed-effect one or not was checked. The Hausman (1978) specification test was used to do the task. The result is $\chi^2(7) = 175.54$ and Prob. > $\chi^2 = 0.000$; the random-effect specification is thus rejected. So, it can be argued that fixed-effect regressions might provide appropriate results.

## *Dynamic panel data models*

Since a panel data set containing a large number of groups (N=50) and a small period (T=13) are used in this research study, a concern may rise about the autocorrelation issue with respect to the fixed-effect model estimations. The one way to address the issue is to use dynamic panel data (DPD) models. P. Balestra and M. Nerlove (1966), M. Nerlove (1971), and G. Maddala (1971) are the first to have proposed the use of such models. The papers by M. Arellano and S. Bond (1991), M. Arellano and O. Bover (1995), R. Blundell and S. Bond (1998), and D. Roodman (2009) provide more insights into how DPD can be used to address the autocorrelation issue in a panel data set with a large N and a small T. The System GMM approach suggested by M. Arellano and O. Bover (1995) was applied in this study and the following four specifications were estimated, namely:

$$\begin{aligned} Unemployment\ Rate_{it} &= \beta_0 + \beta_1 (Unemployment\ Rate)_{i(t-1)} + \\ &\beta_2 (Unemployment\ Rate)_{i(t-2)} + \beta_3 (Personal\ Income\ Tax\ Rate)_{it} + \\ &\beta_4 (Bachelor's\ Degree)_{it} + \beta_5 (Minimum\ Wage) + \\ &\beta_6 Log(State's\ Population)_{it} + \beta_7 (SNAP\ Benefits)_{it} + \\ &\beta_8 (Union\ Workers)_{it} + \theta_i + \lambda_t + \varepsilon_{it} \end{aligned} \quad (5)$$

**Table 7** The fixed-effect regression results
(Dependent variable = State unemployment rate)

| Independent variables | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Intercept | 28.278 | 28.999 | 28.026 | 27.743 |
| | (0.782) | (1.526) | (1.557) | (1.765) |
| Personal income tax rate/Hike | 0.815*** | | 0.712*** | 1.532*** |
| | (0.075) | | (0.076) | (0.569) |
| Corporate income tax rate/Hike | | 0.445* | 0.328* | 0.780* |
| | | (0.246) | (0.182) | (0.445) |
| Bachelor's degree completion rate | -0.817*** | -0.816*** | -0.815*** | -0.832*** |
| | (0.054) | (0.055) | (0.055) | (0.055) |
| Minimum wage | 0.80*** | 0.803*** | 0.799*** | 0.8*** |
| | (0.092) | (0.0935) | (0.093) | (0.092) |
| Log(State's population) | -0.12*** | -0.116*** | -0.125*** | -0.128*** |
| | (0.023) | (0.021) | (0.022) | (0.023) |
| SNAP benefits recipients | 0.038*** | 0.039*** | 0.038*** | 0.039*** |
| | (0.003) | (0.003) | (0.0029) | (0.0031) |
| Number of the union employees | - 0.42** | - 0.45** | - 0.47** | - 0.43** |
| | (0.19) | (0.18) | (0.17) | (0.20) |
| State fixed effects | Yes | Yes | Yes | Yes |
| State time trends | Yes | Yes | Yes | Yes |
| $R^2$ | 0.562 | 0.555 | 0.593 | 0.564 |
| N | 850 | 850 | 850 | 850 |

Notes: *** p < 0.01, ** p < 0.05, * p < 0.1; the numbers in parentheses are robust standard errors.

*Source:* Authors

$$Unemployment\ Rate_{it} = \beta_0 + \beta_1\ (Unemployment\ Rate)_{i(t-1)} + \beta_2\ (Unemployment\ Rate)_{i(t-2)} + \beta_3\ (Corporate\ Income\ Tax\ Rate)_{it} + \beta_4\ (Bachelor's\ Degree)_{it} + \beta_5\ (Minimum\ Wage) + \beta_6\ Log(State's\ Population)_{it} + \beta_7\ (SNAP\ Benefits)_{it} + \beta_8\ (Union\ Workers)_{it} + \theta_i + \lambda_t + \varepsilon_{it} \quad (6)$$

$$Unemployment\ Rate_{it} = \beta_0 + \beta_1\ (Unemployment\ Rate)_{i(t-1)} + \beta_2\ (Unemployment\ Rate)_{i(t-2)} + \beta_3\ (Personal\ Income\ Tax\ Rate)_{it} + \beta_4\ (Corporate\ Income\ Tax\ Rate)_{it} + \beta_5\ (Bachelor's\ Degree)_{it} + \beta_6\ (Minimum\ Wage) + \beta_7\ Log(State's\ Population)_{it} + \beta_8\ (SNAP\ Benefits)_{it} + \beta_9\ (Union\ Workers)_{it} + \theta_i + \lambda_t + \varepsilon_{it} \quad (7)$$

$$Unemployment\ Rate_{it} = \beta_0 + \beta_1\ (Unemployment\ Rate)_{i(t-1)} + \beta_2\ (Unemployment\ Rate)_{i(t-2)} + \beta_3\ (Personal\ Income\ Tax\ Hike)_{it} + \beta_4\ (Corporate\ Income\ Tax\ Hike)_{it} + \beta_5\ (Bachelor's\ Degree)_{it} + \beta_6\ (Minimum\ Wage) + \beta_7\ Log(State's\ Population)_{it} + \beta_8\ (SNAP\ Benefits)_{it} + \beta_9\ (Union\ Workers)_{it} + \theta_i + \lambda_t + \varepsilon_{it} \quad (8)$$

where $Unemployment\ Rate_{it}$, $Unemployment\ Rate_{i(t-1)}$, and $Unemployment\ Rate_{i(t-2)}$ are the official unemployment rates in the state *i* at the time *t*, *t-1* and *t-2*, respectively.

Table 8 shows the results obtained by applying the System GMM approach. According to the third column of Table 8, a 1% decrease in the personal income tax rate is associated with a 1.595% decrease in the state unemployment rate. In addition, a 1% decrease in the corporate income tax rate is associated with a 0.917% decrease in the state unemployment rate, the results being similar to those obtained from the other fixed-effect models in terms of the coefficient signs and significance levels.

One of the concerns with this approach is the condition of no correlation in the error terms. The Arellano and Bond test was used for the zero autocorrelation in the first-differenced errors so as to check this requirement. Table 9 reports the test results. According to Table 9, the null hypothesis cannot be rejected at the second order. It indicates no serial correlation in the error terms and the estimates are consistent.

To sum up, the results obtained upon performing all the regressions are indicative of the fact that an increase in the personal income tax rate is associated with an increase in the state unemployment rate in the US In addition, an increase in the corporate income tax rate may not affect the state unemployment rate.

## CONCLUSION

State income tax rates are different from one state to another in the US. Yet, there has not been much research on how they affect the state unemployment rate. This study investigates the way how the state personal and corporate income tax rates correlate with the state unemployment rate. A panel data set that covers all 50 states in the period from 2006 to 2022 was used.

The empirical results suggest that the state personal and corporate income tax rates are positively correlated with the state unemployment rates, which is the answer to the first research question. More precisely, the results suggest that a 1% decrease in the personal income tax rate is associated with a 0.712% decrease in the state unemployment rate, and a 1% decrease in the corporate income tax rate may cause the state unemployment rate to drop by 0.328%. When the second research question is concerned, the results show that a personal income tax hike in the USA may lead to an increase of 1.532% in the unemployment rate, and a corporate income tax hike in the USA may raise the unemployment rate by 0.78%.

This finding may have a policy implication regarding tradeoffs in state tax policies. The states with higher income tax rates may have more funding for public welfare but at the price of a higher unemployment rate. If a state decides to raise income taxes so as to provide more public goods, it may want to allocate more resources to the education and infrastructure systems and so forth, rather than simply to transfer payments. The better education and infrastructure systems may in turn help to attract more corporations and support local businesses. The benefits may mitigate the social cost of higher tax levied. The findings provided in this study may teach the other countries that have a similar governance structure as the US a lesson.

However, this study has certain limitations. The data used in this study refer back to as early as 2006, although it would be better if the data for several

**Table 8** The Arellano and Bover dynamic panel data regression results (Dependent variable = State unemployment rate)

| Independent variables | Model 5 | Model 6 | Model 7 | Model 8 |
|---|---|---|---|---|
| Intercept | 16.426 | 16.183 | 15.827 | 15.94 |
| | (1.562) | (2.091) | (1.934) | (2.518) |
| State unemployment rate$_{(t-1)}$ | 0.846*** | 0.844*** | 0.841*** | 0.851*** |
| | (0.046) | (0.045) | (0.047) | (0.042) |
| State unemployment rate$_{(t-2)}$ | -0.404 | -0.418 | -0.405 | -0.416 |
| | (0.327) | (0.525) | (0.426) | (0.325) |
| Personal income tax rate/Hike | 1.227** | | 1.595** | 1.228* |
| | (0.556) | | (0.725) | (0.626) |
| Corporate income tax rate/Hike | | 0.876* | 0.917* | 1.844* |
| | | (0.472) | (0.509) | (1.024) |
| Bachelor's degree completion rate | -0.491*** | -0.489*** | -0.497*** | -0.492*** |
| | (0.057) | (0.054) | (0.056) | (0.051) |
| Minimum wage | 0.186** | 0.166* | 0.171* | 0.186* |
| | (0.095) | (0.097) | (0.094) | (0.097) |
| Log(State's population) | 0.149 | 0.185 | 0.191 | -0.102 |
| | (0.189) | (0.177) | (0.186) | (0.170) |
| SNAP benefit recipients | -0.021 | -0.005 | 0.017 | 0.008 |
| | (0.043) | (0.049) | (0.047) | (0.042) |
| Number of the union employees | 2.363* | 1.867 | 1.76* | 2.236* |
| | (1.312) | (2.367) | (0.975) | (1.208) |
| State fixed effects | Yes | Yes | Yes | Yes |
| State time trends | Yes | Yes | Yes | Yes |
| N | 750 | 750 | 750 | 750 |

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; the numbers in parentheses are robust standard errors.

*Source:* Authors

**Table 9** The Arellano-Bond test for autocorrelation in the panel data

| Order | Prob. > z | | | |
|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 |
| 1 | 0.012 | 0.015 | 0.019 | 0.021 |
| 2 | 0.241 | 0.282 | 0.224 | 0.215 |

*Source:* Authors

controlled variables were available for the period(s) prior to the year 2006, which would improve the reliability of the results of this research study. In addition to this, there may be certain issues caused by multicollinearity amongst several explanatory variables in some of the models used in this study. For the purpose of future research, this research study can be expanded in several directions so as to include more data that cover more relevant variables or use an alternative dataset for robustness checks. It would also be interesting for a comparison study amongst different economies in the world.

## REFERENCES


Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), 277-297. doi:10.2307/2297968

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29-51. doi:10.1016/0304-4076(94)01642-D

Balestra, P., & Nerlove, M. (1966). Pooling cross section and time series data in the estimation of a dynamic model: The demand for natural gas. *Econometrica*, *34*(3), 585-612. doi:10.2307/1909771

Bartik, T. J. (1992). The effects of state and local taxes on economic development: A Review of Recent Research. *Economic Development Quarterly*, *6*(1), 102-110. doi:10.1177/089124249200600110

Bartik, T. (1994). Taxes and local economic development: What do we know and what can we know? *Proceedings of the Annual Conference on Taxation Held under the Auspices of the National Tax Association-Tax Institute of America*, *87*, 102-106. https://www.jstor.org/stable/42912329

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115-143. doi:10.1016/S0304-4076(98)00009-8

Borchers, E., Deskins, J., & Ross, A. (2016). Can state tax policies be used to grow small and large business? *Contemporary Economic Policy*, *34*(2), 312-335. doi:10.1111/coep.12149

Carlton, D. (1983). The location and employment choices of new firms: An econometric model with discrete and continuous endogenous variables. *The Review of Economics and Statistics*, *65*(3), 440-449. doi:10.2307/1924189

Carroll, R., & Wasylenko, M. (1994). Do state business climates still matter? Evidence of a structural change. *National Tax Journal*, *47*(1), 19-37. doi:10.1086/ntj41789051

Daveri, F., & Tabellini, G. (2014). Unemployment, growth and taxation in industrial countries. *Economic Policy*, *15*(30), 48-104. doi:10.1111/1468-0327.00057

Estache, A., & Gersey, B. (2018). Do corporate income tax rates cuts create jobs? The European experience. *ECARES Working Paper 2018-01*. Brussels, BE: European Center for Advanced Research in Economics and Statistics.

Goss, E. P., & Phillips, J. M. (1994). State employment growth: The impact of taxes and economic development agency spending. *Growth and Change*, *25*(3), 287-300. doi:10.1111/j.1468-2257.1994.tb00145.x

Hausman, J. (1978). Specification tests in econometrics. *Econometrica*, *46*(6), 1251-1271. doi:10.2307/1913827

Heitger, B. (2002). The impact of taxation on unemployment in OECD countries. *Cato Journal*, *22*(2), 333-354.

Helms, J. (1985). The effect of state and local taxes on economic growth: A time series-cross sectional analysis. *The Review of Economics and Statistics*, *67*(4), 574-582. doi:10.2307/1924801

Maddala, G. (1971). The likelihood approach to pooling cross section and time series data. *Econometrica*, *39*(6), 939-953. doi:10.2307/1909668

McConnell, V., & Schwab, R. (1990). The impact of environmental regulation on industry location decisions: The motor vehicle industry. *Land Economics*, *66*(1), 67-81. doi:10.2307/3146684

Munnell, A. H., & Cook, L. M. (1990). How does public infrastructure affect regional economic performance? *New England Economic Review 11-33*. Boston, MA: Federal Reserve Bank of Boston.

Nerlove, M. (1971). Further evidence on the estimation of dynamic economic relations from a time series of cross sections. *Econometrica* , *39*(2), 359-382. doi:10.2307/1913350

Papke, L. (1991). Interstate business tax differentials and new firm location. *Journal of Public Economics*, *45*(1), 47-68. doi:10.1016/0047-2727(91)90047-6

Pissarides, C. A. (1998). The impact of employment tax cuts on unemployment and wages: The role of unemployment benefits and tax structure. *European Economic Review*, *42*(1), 155-183. doi:10.1016/S0014-2921(97)00090-1

Pjesky, R. J. (2006). What do we know about taxes and state economic development? A replication and extension of five key studies. *Journal of Economics Insight*, *32*(1), 25-40.

Romans, T., & Subrahmanyam, G. (1979). State and local taxes, transfers and regional economic growth. *Southern Economic Journal*, *46*(2), 435-444. doi:10.2307/1057417

Romer, C. D., & Romer, D. H. (2010). The macroeconomic effects of tax changes: Estimates based on a new measure of fiscal shocks. *American Economic Review*, *100*(3), 763-801. doi:10.1257/aer.100.3.763

Roodman, D. (2009). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics*, *71*(1), 135-158. doi:10.1111/j.1468-0084.2008.00542.x

Tannenwald, R. (1996). State business tax climate: How should it be measured and how important is it? *New England Economic Review*, 23-38.

Turner, T., & Blagg, B. (2018). The short-term effects of the Kansas income tax cuts on employment growth. *Public Finance Review*, *46*(6), 1024-1043. doi:10.1177/1091142117699274

Wasylenko, M., & McGuire, T. (1985). Jobs and taxes: The effect of business climate on states' employment growth rates. *National Tax Journal*, *38*(4), 497-514. doi:10.1086/ntj41792110

Zidar, O. M. (2015). Tax cuts for whom? Heterogeneous effects of income tax changes on growth and employment. *Journal of Political Economy*, *127*(3), 1437-1472. doi:10.1086/701424

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