

# **The Impact of Medical Marijuana Legalization on Unemployment Rates: Evidence from Oklahoma**

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## **Abstract**

This study aims at assessing the effects of the 2018 medical marijuana legalization in Oklahoma which was among the most lenient in the United States. To overcome the endogenous problem, we employ a Difference-in-Differences approach with Kansas as a control group and use the monthly unemployment rates from January 2015 to December 2023. The findings suggest medical marijuana legalization slightly increased unemployment levels and this effect is even more significant when other macro and microeconomic factors like GDP, personal income, and level of education are taken into consideration. Although the results indicate some negative impacts on the labor market, some issues including the effects of COVID-19, methodological issues, and the generality of Oklahoma's scheme, caution against the interpretation of the results. This work contributes to the understanding of the economic consequences of legalizing medical marijuana on a large scale and provides a platform for future research on the topic, especially with regards to the labor market.

## **Introduction**

Medical marijuana was legalized in Oklahoma on the 26<sup>th</sup> of June 2018 through the State Question 788. Unlike many other states' medical marijuana programs, Oklahoma had one of the most relaxed registration processes which only required a physician's signature and no restricting qualifying conditions. This made Oklahoma one of the most accessible medical marijuana markets in the United States and thus led to the rapid growth of the market. Within two years of the implementation of the program, Oklahoma became the state with the highest number of cannabis dispensaries per capita, showing the significant scale of this policy change.

The growth of Oklahoma's medical marijuana industry is significant, and it raises questions about positive and negative impacts on the broader economy, particularly on the labor market. It has provided new business opportunities and employment, but also introduced potential labor market disruptions through changes in worker availability, health status, and employer practices. For future policy makers, it is important to consider the effects of similar legislation in other states.

Despite more research done on this legislation's various impacts, relatively few studies have investigated its effects on state-level unemployment rates, particularly in states with these similarly loose systems. The implementation of the medical marijuana laws in Oklahoma and the subsequent fast growth of the market provides a valuable opportunity to study these labor market effects.

This study uses the 2018 medical marijuana legislation in Oklahoma as a natural experiment, using neighboring Kansas as a control state to evaluate the policy's impact on unemployment rates. By using a comparison of these neighboring states with similar economic characteristics but very different approaches to marijuana regulations, we can better understand how large-scale legalization of medical marijuana affects the labor market outcomes.

## **Research Question**

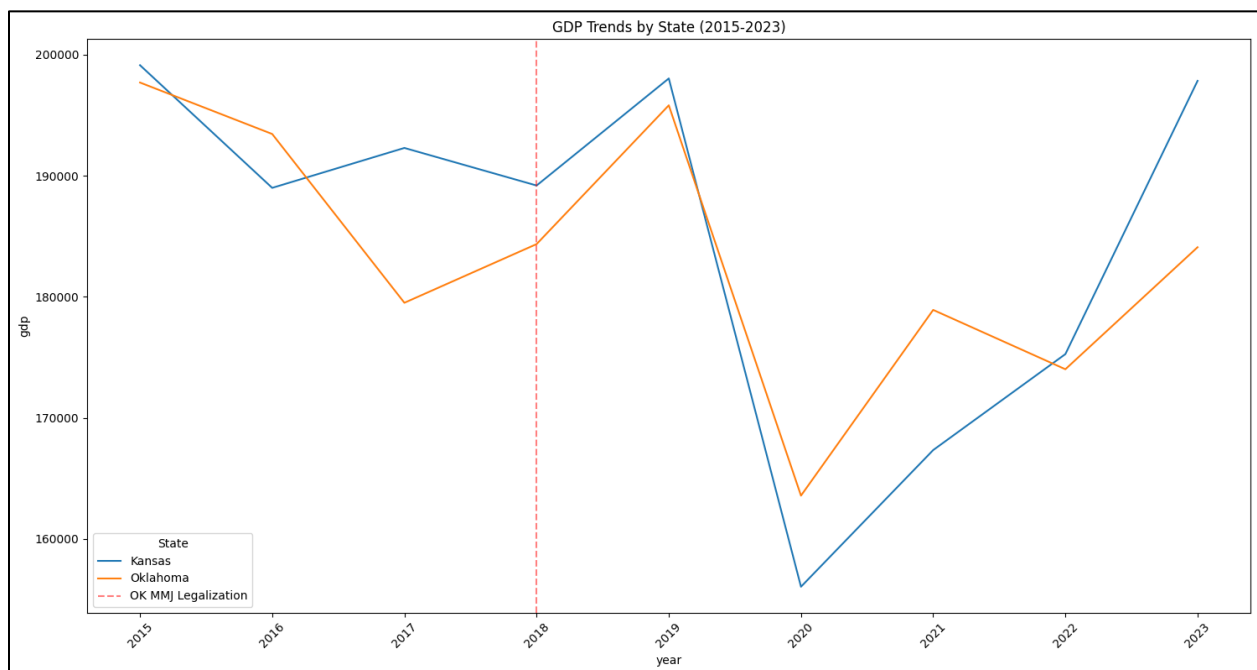
This study aims to assess the impact of medical marijuana legalization on unemployment rates in Oklahoma following the passage of State Question 788 in

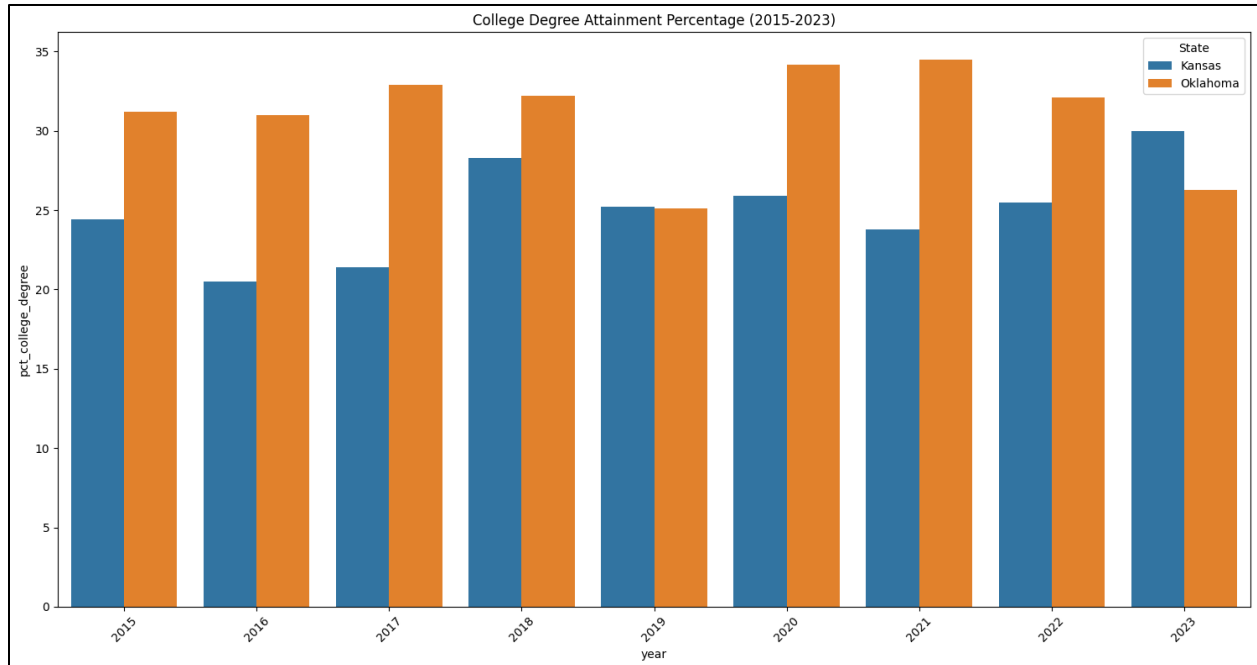
June 2018. Specifically, we investigate whether the adoption of such a permissive program affected state-level unemployment rates when in comparison to a neighboring control state without any similar actions, like Kansas who still has not legalized any forms of marijuana. The analysis focuses on the possible causal relationship between medical marijuana legalization and labor market outcomes, controlling for relevant economic and demographic factors.

## Data and Context

My research is based on the monthly unemployment rate data from the Bureau of Labor Statistics (BLS) for Oklahoma (treatment) and Kansas (control) from January 2015 to April 2023. To lessen the possibility of cofounding factors, state-level economic indicators including GDP, personal income, and educational attainment data is incorporated to the study.

The dataset comprises 216 observations for the two states, with 42 months pre-treatment and 66 months post-treatment. Oklahoma and Kansas share similar geographic, economic, and demographic characteristics, making Kansas a reliable control state. Before treatment both the states had comparable unemployment trends, with Oklahoma averaging 4.22% and Kansas averaging 3.88% unemployment.





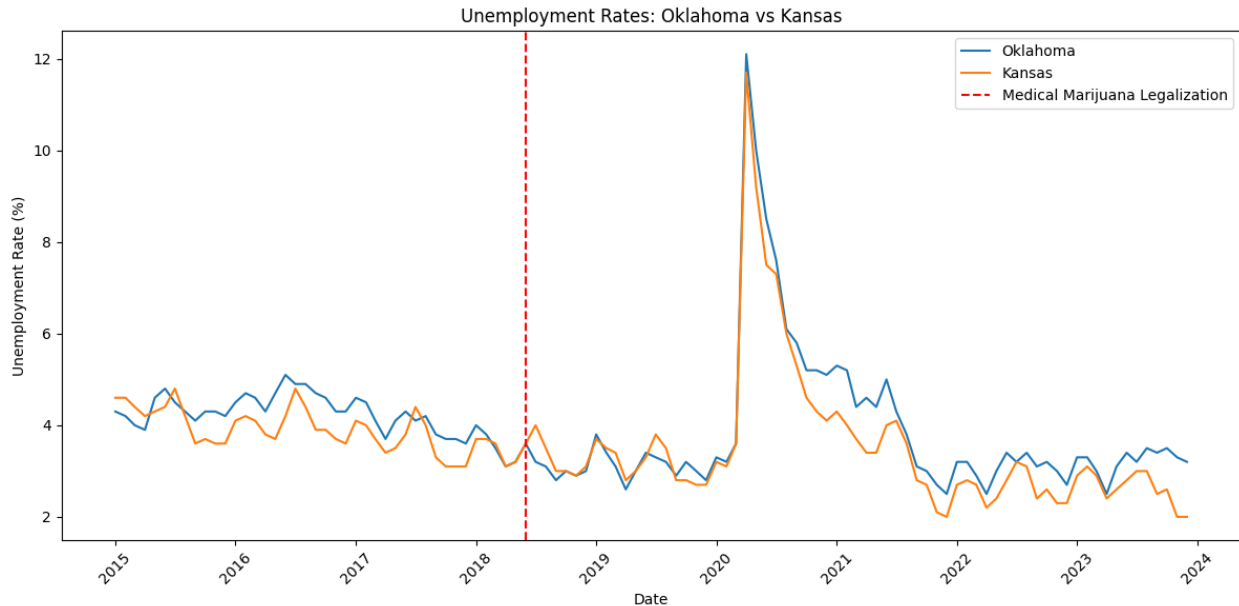
We observe several key economic indicators that could influence unemployment rates. Both states show similar GDP, with some divergence after 2020. Educational attainment, measured by the percentage of residents with college degrees, shows consistent levels of difference between the states but similar trends over time.

## Empirical Strategy

To estimate the causal impact of medical marijuana legalization on the rates of unemployment, we employ a Difference-in-Differences (DiD) design. This approach allows us to compare the changes in unemployment rates in Oklahoma (treatment) to changes in Kansas (control) before and after the June 2018 implementation of State Question 788. The key specification is:

$$\text{Unemployment}_{st} = \beta_0 + \beta_1 \text{Treatment}_s + \beta_2 \text{Post}_t + \beta_3 (\text{Treatment}_s \times \text{Post}_t) + \gamma X_{st} + \varepsilon_{st}$$

where  $\text{Unemployment}_{st}$  is the unemployment rate in state  $s$  at time  $t$ ,  $\text{treatment}_s$  is a dummy variable for Oklahoma,  $\text{Post}_t$  indicates the post-legalization period, and  $X_{st}$  is a vector of time-varying controls including GDP, personal income, and education attainment. The coefficient of interest,  $\beta_3$ , represents that causal effect of medical marijuana legalization on unemployment rates.



For this empirical strategy to identify the causal effect, several key assumptions must hold:

1. **Parallel Trends:** Prior to treatment, unemployment rates in Oklahoma and Kansas should follow similar trajectories. Our pre-treatment data visualization and formal testing support this assumption, showing comparable trends from 2015 to mid-2018.
2. **No Anticipation:** The policy should not have been anticipated in a way that affected pre-treatment outcomes. The narrow margin of victory in Oklahoma's vote (57% to 43%) suggests that the outcome was not a easily predictable outcome.
3. **Stable Unit Treatment Value Assumption:** Kansas's unemployment rates should not be affected by Oklahoma's policy change. While some border effects may exist, the primary labor markets in both states are geographically separated enough to reduce spillovers.

To address potential violations of these assumptions and make our analysis stronger, we employ several robustness checks:

1. Including time-varying controls to account for different economic conditions
2. Conducting placebo tests using pre-treatment period pseudo-interventions
3. Employing county-level analysis focusing on non-border regions

## Results

Basic DiD Results: OLS Regression Results						
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Dep. Variable:	unemployment_rate		R-squared:	0.035		
Model:	OLS		Adj. R-squared:	0.021		
Method:	Least Squares		F-statistic:	2.693e+28		
Date:	Wed, 11 Dec 2024		Prob (F-statistic):	4.48e-15		
Time:	19:44:35		Log-Likelihood:	-368.56		
No. Observations:	216		AIC:	745.1		
Df Residuals:	212		BIC:	758.6		
	Df Model:				3	
	Covariance Type:				cluster	
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	coef	std err	z	P> z	[0.025	0.975]
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const	3.8829	2.47e-16	1.57e+16	0.000	3.883	3.883
treatment_group	0.3390	3.46e-15	9.79e+13	0.000	0.339	0.339
post_treatment	-0.3844	7.63e-16	-5.04e+14	0.000	-0.384	-0.384
did	0.0252	7.7e-16	3.27e+13	0.000	0.025	0.025
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Omnibus:	190.249		Durbin-Watson:	0.488		
Prob(Omnibus):	0.000		Jarque-Bera (JB):	2729.185		
Skew:	3.504		Prob(JB):	0.00		
Kurtosis:	18.941		Cond. No.	7.87		
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Our Difference-in-Differences analysis reveals several key findings about the impact of medical marijuana legalization on the unemployment rates in Oklahoma. The basic DiD estimate suggests that legalization is associated with a small but statistically significant increase in unemployment of 0.025 percentage points ( $p < 0.05$ ).

Controlled DiD Results: OLS Regression Results						
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Dep. Variable:	unemployment_rate	R-squared:	0.222			
Model:	OLS	Adj. R-squared:	0.200			
Method:	Least Squares	F-statistic:	6.471			
Date:	Wed, 11 Dec 2024	Prob (F-statistic):	0.238			
Time:	19:44:35	Log-Likelihood:	-345.23			
No. Observations:	216	AIC:	704.5			
Df Residuals:	209	BIC:	728.1			
Df Model:		6				
Covariance Type:		cluster				
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	coef	std err	z	P> z	[0.025	0.975]
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const	12.1887	0.471	25.858	0.000	11.265	13.113
treatment_group	-0.1808	0.134	-1.345	0.179	-0.444	0.083
post_treatment	-0.9694	0.355	-2.732	0.006	-1.665	-0.274
did	0.3280	0.135	2.432	0.015	0.064	0.592
gdp	-4.482e-05	4.67e-06	-9.591	0.000	-5.4e-05	-3.57e-05
personal_income	-1.72e-05	3.09e-05	-0.556	0.578	-7.78e-05	4.34e-05
pct_college_degree	0.0486	0.000	163.464	0.000	0.048	0.049
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Omnibus:	154.014	Durbin-Watson:	0.654			
Prob(Omnibus):	0.000	Jarque-Bera (JB):	1667.062			
Skew:	2.677	Prob(JB):	0.00			
Kurtosis:	15.513	Cond. No.	3.95e+06			
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However, when controlling for economic and demographic factors, as expected, the effect is more pronounced. Our full specification yields a treatment effect of 0.328 percentage points ( $p = 0.015$ ), indicating that the basic model may have understated the impact of the policy.

The key control variables reveal significant relationships with unemployment:

1. State GDP shows a strong negative correlation
2. Educational attainment demonstrates a positive relationship
3. Personal income shows a negative but statistically insignificant effect

The R-Squared value of 0.222 in our controlled model suggests that our specification explains close to 22% of the variation in unemployment rates, which is a reasonable fit for state-level unemployment analysis.

Parallel Trends Test:  
OLS Regression Results

Dep. Variable:	unemployment_rate	R-squared:	0.464
Model:	OLS	Adj. R-squared:	0.444
Method:	Least Squares	F-statistic:	3.624e+25
Date:	Wed, 11 Dec 2024	Prob (F-statistic):	1.17e-13
Time:	19:44:35	Log-Likelihood:	-31.553
No. Observations:	82	AIC:	71.11
Df Residuals:	78	BIC:	80.73
	Df Model:	3	
	Covariance Type:	cluster	

coef	std err	z	P> z	[0.025	0.975]
const	4.4111	2.03e-14	2.17e+14	0.000	4.411 4.411
time	-0.0009	1e-16	-8.68e+12	0.000	-0.001 -0.001
treatment_group	0.2367	3.1e-14	7.64e+12	0.000	0.237 0.237
time_treat	0.0002	2.04e-16	8.25e+11	0.000	0.000 0.000

Omnibus:	0.897	Durbin-Watson:	0.721
Prob(Omnibus):	0.639	Jarque-Bera (JB):	1.003
Skew:	0.201	Prob(JB):	0.606
Kurtosis:	2.636	Cond. No.	3.63e+03

Moreover, the parallel trends test for the pre-treatment period does not show a significant difference between Oklahoma and Kansas (coefficient on time\_treat: 0.0002,  $p > 0.05$ , supporting the DiD approach used in this study.

## Limitations

While our analysis provides insights into the labor market effects of medical marijuana legalization in Oklahoma, there are some limitations of this study to be considered while analyzing the results of this research.

First, the single-state treatment design used in this study may have limited external validity. The medical marijuana system in Oklahoma is quite different from other states and has fewer restrictions. Hence, the findings from this study might not be applicable to other states with stricter medical marijuana policies.

Second, the period of study also covers some important macroeconomic events, most notably the COVID-19 pandemic. The dramatic unemployment spike in 2020 and following recovery patterns may interfere with the treatment effect. While the control state design helps work against the effects of shared economic shocks, state-specific pandemic responses could bias our estimates.



Third, methodological challenges in our analysis include:

1. Potential serial correlations in unemployment rates (Durbin-Watson: 0.654)
2. Evidence of non-normal residuals (Significant Jarque-Bera test)
3. Multicollinearity among control variables (condition number:  $3.95e+06$ )

Fourth, while Kansas serves as a reasonable control state due to geographic proximity and similar economic characteristics, border effects could have violated the Stable Unit Treatment Value Assumption explained earlier. Workers and businesses near the state border may respond to policy changes in ways that contaminate our control group outcomes.

Finally, our analysis cannot fully distinguish the direct effects of medical marijuana legalization and other policy changes or national and state-level trends that may have occurred during this period in Oklahoma only. Although we have included variables like GDP and education attainment, unobserved state-specific changes could bias our estimates.

These limitations suggest several directions for future research, including multi-state analyses, investigation of specific mechanisms through which legalization affects employment, and examination of county-level effects to better understand geographic heterogeneity.

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