

**Recreational Marijuana Legalization and
Manufacturing Work Hours:
A State-Level Econometric Analysis**

Caleb Johnston

University of Texas at Austin

Originally submitted for Econometrics: December 2024

Revised for Professional Portfolio: June 2026

Abstract

This paper examines whether recreational marijuana legalization is associated with average weekly hours worked by production employees on manufacturing payrolls across U.S. states. Using 2021 state-level data, I estimate an ordinary least squares regression model with controls for education, obesity, minimum wage, average family size, region, and demographic composition. The results show that states with legalized recreational marijuana are associated with approximately 1.2 fewer average weekly manufacturing payroll hours, holding selected state-level controls constant. This relationship is statistically significant at the 10 percent level, but the cross-sectional design, limited number of observations, sector-specific dependent variable, and exclusion of several potential confounders prevent causal interpretation. The findings are best understood as exploratory evidence that cannabis policy may be correlated with broader state-level labor-market patterns, rather than proof that legalization directly reduces work hours.

Introduction

The United States has witnessed a dramatic shift in drug policy in recent years, with an increasing number of states legalizing recreational marijuana for adults. This wave of cannabis legalization represents a broader societal shift in attitudes toward marijuana, transitioning from a historically stigmatized substance to one increasingly seen through the lens of regulation and individual liberty. Since the 1970s, state-level policies have gradually liberalized, reflecting motivations ranging from criminal justice reform and revenue generation to personal freedom.

(Pacula et al. 2017) These evolving policies have inspired debates about their social, economic, and public health implications, becoming one of the most visible state-level policy changes in the United States. As states have moved away from prohibition, scholars and policymakers have debated not only the criminal justice and public health implications of legalization, but also its possible relationship to labor-market behavior. This paper examines one narrow part of that broader debate: whether states with recreational marijuana legalization differ from non-legalization states in average weekly hours worked by production employees on manufacturing payrolls.

This study explores the relationship between the legal status of recreational marijuana and the average weekly hours worked by production employees on manufacturing payrolls. Examining work hours provides one limited indicator of labor-market behavior, but it should not be treated as a complete measure of productivity or labor-market health. Proponents of traditional anti-marijuana laws argue that cannabis induces apathy and lethargy, leading to reduced productivity and labor participation. Conversely, advocates of legalization assert that marijuana can improve physical or mental well-being, enhancing overall productivity. Furthermore, reducing marijuana-related incarcerations could increase workforce participation and boost aggregate productivity. (Evans 2013)

This project asks whether recreational marijuana legalization is associated with differences in average weekly manufacturing payroll hours after accounting for selected state-level economic, demographic, and regional controls. Because the analysis uses cross-sectional state-level data from a single year, the findings should be interpreted as exploratory associations rather than causal estimates. This analysis offers an exploratory contribution to

research on cannabis policy and state-level labor-market outcomes by examining manufacturing payroll hours as a narrower sector-specific measure.

Literature Review

Economists and health professionals have produced mixed findings on the relationship between recreational marijuana legalization and labor productivity. Early research by Popovici et al. (2014) suggested that marijuana use has negligible effects on labor productivity, including hours worked. However, Albino (2017) found evidence that marijuana liberalization reduces overall labor productivity. Hall and Lynskey (2020) expanded on this by highlighting externalities, such as increased demand for public health services and reduced labor participation.

More recent studies have presented conflicting evidence. Abouk et al. (2021) reported that marijuana legalization improves work capacity and increases productivity. Similarly, Dave et al. (2022) found no adverse effects of recreational marijuana laws on labor market outcomes, characterizing the relationship as negligible. These discrepancies underscore the complexity of the topic and the need for further empirical research to clarify the nuanced impacts of marijuana legalization on labor productivity.

This paper contributes to the literature by examining a narrower state-level outcome: average weekly hours worked by production employees on manufacturing payrolls. Unlike studies using individual-level or longitudinal designs, this analysis is exploratory and cannot establish causation. Its contribution is to test whether legalization status is correlated with manufacturing work-hour patterns and to identify the limits of using aggregate state-level data for this

question.

Empirical Model

Because this project uses cross-sectional state-level data from a single year, the analysis should be interpreted as associational rather than causal. The model estimates whether legalization status is correlated with average weekly hours worked after adjusting for selected observable state characteristics. The design cannot rule out unobserved differences between states, policy-selection effects, industry composition, political conditions, or other factors that may be related to both cannabis policy and labor-market behavior.

To estimate the relationship between recreational marijuana legalization and manufacturing work hours, this paper estimates the following linear regression model:

$$\text{ManufacturingHours}_i = \alpha + \beta_1 \text{LegalStatus}_i + \beta_2 \text{Obesity}_i + \beta_3 \text{Education}_i + \beta_4 \text{MinimumWage}_i + \beta_5 \text{AverageFamilySize}_i + \beta_6 \text{South}_i + \beta_7 \text{Midwest}_i + \beta_8 \text{Northeast}_i + \beta_9 \text{BlackPopulation}_i + \beta_{10} \text{HispanicPopulation}_i + \beta_{11} \text{AsianPopulation}_i + \beta_{12} \text{OtherPopulation}_i + \varepsilon_i$$

Dependent Variable

Average weekly hours worked by production employees on manufacturing payrolls, measured at the state level.

Independent Variable of Interest

Legal status of recreational marijuana, measured at the state level.

Control Variables

- Obesity: Proportion of the population classified as obese, measured at the state level.
- Education: Proportion of adults with at least a bachelor's degree, measured at the state level.
- Minimum Wage: State or federal minimum hourly wage, measured at the state level.
- Average Family Size: Mean household size, measured at the state level.
- Geographic Region: South, Midwest, and Northeast dummies; West baseline.
- Demographic Composition: Proportions of Black, Hispanic, Asian, and Other racial groups. White population is excluded as the baseline. These demographic variables should be interpreted as state-level controls; they should not be interpreted as individual-level or causal claims

Data

This study utilizes publicly accessible 2021 state-level data from various reliable sources.

Dependent Variable (Manufacturing Work Hours)

The dependent variable is average weekly hours worked by production employees on manufacturing payrolls, measured at the state level. The data were sourced from the U.S. Bureau of Labor Statistics annual average hours and earnings tables. This variable should be interpreted as a manufacturing-sector labor-hours measure, not as a comprehensive measure of individual

labor supply or average work hours across all workers in a state. More information about the data collection process is available at BLS Annual Average Tables.

Independent Variable (Legal Status of Recreational Marijuana)

The legalization status of recreational marijuana for each state was coded as a binary variable, where “1” indicates legalization and “0” indicates prohibition. Recreational marijuana legalization status was coded according to each state’s legal status in 2021. This information was retrieved from the Insurance Institute for Highway Safety’s state marijuana laws table.

Control Variables

- Obesity Rates: Proportion of adults classified as obese, sourced from the Behavioral Risk Factor Surveillance System (BRFSS). More details can be found at CDC BRFSS.
- Education Levels: Percentage of adults in each state with at least a bachelor’s degree, obtained from the Federal Reserve Bank of St. Louis. Access the dataset at FRED Education Data.
- Minimum Wage: Effective minimum hourly wage (state or federally mandated), sourced from the Tax Policy Center. Further details are available at State Minimum Wages.
- Average Family Size: Mean household size by state, provided by the Statista Research Department and derived from U.S. Census Bureau data. The dataset is accessible at Statista

Family Size.

- Racial Composition: Proportions of Black, Hispanic, Asian, and Other racial groups in the state population (White population excluded as a baseline), sourced from World Population Review. Additional information is available at World Population Review Race Data.

Table 1 presents the descriptive statistics for the variables used in this study. The weekly mean hours worked by production employees on manufacturing payrolls ranged from 35.9 hours in New Mexico to 43.0 hours in Louisiana, with an unweighted state mean of 40.62 hours and a standard deviation of 1.62 hours. The proportion of states with legalized recreational marijuana was 44%, while 56% of states prohibited its use. This binary variable highlights the significant variation in cannabis policies across the United States.

Table 1. Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Manufacturing weekly hours	50	40.62	1.62	35.90	43.00
Recreational legalization	50	0.44	0.50	0	1
Obesity rate	50	33.52	3.98	25.00	40.60
Bachelor's degree rate	50	34.42	5.46	24.10	46.60
Minimum wage	50	9.34	2.14	7.25	13.69
Average family size	50	3.10	0.13	2.79	3.51
South	50	0.32	0.47	0	1
Midwest	50	0.24	0.43	0	1
Northeast	50	0.18	0.39	0	1
West	50	0.26	0.44	0	1
Black population share	50	10.55	9.48	0.56	37.68
Hispanic population share	50	6.76	6.68	0.97	33.32
Asian population share	50	6.28	7.26	0.99	48.29
Other population share	50	13.00	7.86	4.50	49.97

**Note: Manufacturing weekly hours measures average weekly hours worked by production employees on manufacturing payrolls. Population-share variables are percentages. Region variables are binary indicators. West is included for descriptive purposes but omitted from the regression model as the regional baseline.*

Empirical Results

Table 2 reports the estimated relationship between recreational marijuana legalization and average weekly manufacturing payroll hours. The coefficient on legalization is negative and statistically significant at the 10 percent level. In the model, legalization is associated with approximately 1.2 fewer average weekly manufacturing payroll hours, holding selected state-level controls constant. Because the design is cross-sectional and observational, this estimate should be interpreted as an association rather than evidence of a causal effect.

Several demographic composition controls are statistically significant in the model. These coefficients should be interpreted only as state-level associations, not as evidence about individual workers or racial groups. They may reflect broader differences in state economies, manufacturing-sector composition, age structure, geography, immigration patterns, or other omitted factors.

Other controls, including obesity, minimum wage, education, average family size, and regional indicators, do not reach conventional levels of statistical significance in the main specification. Their coefficients should therefore be interpreted cautiously and should not be treated as strong evidence of independent relationships with manufacturing work hours.

Table 2. Regression Results

Variable	Coefficient	Standard Error	P-value
Recreational legalization	-1.216*	0.699	0.090
Obesity rate	-0.057	0.112	0.612
Bachelor's degree rate	0.076	0.067	0.265
Minimum wage	-0.027	0.158	0.896
Average family size	0.947	2.281	0.681
South	0.979	1.069	0.367
Midwest	1.117	0.809	0.176
Northeast	-0.347	0.801	0.667
Black population share	0.040	0.038	0.311
Hispanic population share	-0.114**	0.049	0.024
Asian population share	-0.270***	0.079	0.001
Other population share	0.260***	0.093	0.008
Constant	35.883***	7.874	0.000

Model statistic	Value
------------------------	--------------

Observations	50
R-squared	0.518
Adjusted R-squared	0.362
Root MSE	1.298

*Note: The dependent variable is average weekly hours worked by production employees on manufacturing payrolls. West is omitted as the regional baseline. Standard errors are reported in the second column. *p < .10, **p < .05, ***p < .01.

Additional Diagnostic Tests

Table 3. Additional Diagnostic Tests

Diagnostic	Result	Interpretation
Breusch-Pagan test	p = 0.773	No evidence of heteroskedasticity
VIF test	max VIF = 15.61	Multicollinearity concern
Skewness/kurtosis test	p = 0.019	Distributional concern for dependent variable
Ramsey RESET	p = 0.337	No clear functional-form issue detected

Note: The VIF result indicates multicollinearity, particularly involving the “other race” population-share variable. The Ramsey RESET result does not rule out omitted-variable bias or other limitations of the cross-sectional design.

Model diagnostics, illustrated in Table 3, produced mixed results. The Breusch-Pagan test did not indicate heteroskedasticity, while the VIF test suggested multicollinearity, particularly involving the “other race” population-share variable. The skewness/kurtosis test raised a

distributional concern for the dependent variable, so I estimated an alternative logged specification. The Ramsey RESET test did not detect clear functional-form misspecification, though it does not rule out omitted-variable bias or other limitations of the cross-sectional design.

Alternative Specifications

Table 4 reports an alternative specification using the natural logarithm of average weekly hours worked by production employees on manufacturing payrolls as the dependent variable. The model includes 50 observations and produces an R-squared of 0.525 and an adjusted R-squared of 0.371. The coefficient on recreational marijuana legalization remains negative and statistically significant at the 10 percent level; in the logged model, legalization is associated with approximately 3.1 percent lower average weekly manufacturing hours, holding selected controls constant. This result suggests that the main association is not entirely dependent on the original scale of the dependent variable, though the estimate remains associational rather than causal.

Table 4. Alternative Specification Using Logged Manufacturing Work Hours

Variable	Coefficient	Standard Error	p-value
Recreational marijuana legalization	-0.031*	0.017	0.081
Obesity rate	-0.002	0.003	0.581
Bachelor's degree rate	0.002	0.002	0.266
Minimum wage	-0.000	0.004	0.942
Average family size	0.026	0.057	0.654
South	0.026	0.027	0.341
Midwest	0.029	0.020	0.158
Northeast	-0.008	0.021	0.695
Black population share	0.001	0.001	0.332
Hispanic population share	-0.003**	0.001	0.019
Asian population share	-0.007***	0.002	0.001
Other population share	0.007***	0.002	0.007
Constant	3.581***	0.197	0.000

Model statistic	Value
Observations	50
R-squared	0.525
Adjusted R-squared	0.371

*Note: The dependent variable is the natural logarithm of average weekly hours worked by production employees on manufacturing payrolls. West is omitted as the regional baseline. Standard errors are reported in the second column. *p < .10, **p < .05, ***p < .01.

Discussion and Conclusion

This paper finds a modest negative association between recreational marijuana legalization and average weekly hours worked by production employees on manufacturing payrolls in 2021 state-level data. In the main specification, states with legalized recreational marijuana are associated with approximately 1.2 fewer average weekly manufacturing payroll hours, holding selected state-level controls constant. This relationship is statistically significant at the 10 percent level, but it should be interpreted as an exploratory association rather than evidence that legalization causes reductions in work hours.

Relationship to Existing Literature

These findings sit within a mixed literature on cannabis policy and labor-market outcomes. Some prior studies find negligible or positive relationships between marijuana legalization and employment-related outcomes, while others identify possible negative associations with productivity, labor participation, or public-health externalities. The finding in this paper is more consistent with studies identifying negative associations, but the research design is more limited

than individual-level or longitudinal approaches. For that reason, the result should be treated as suggestive rather than definitive.

Demographic Controls

The model also includes demographic composition controls to account for observable state-level differences. Some of these controls are statistically significant, but they should not be interpreted as causal evidence about individual workers or racial groups. These associations may reflect broader differences in state economies, manufacturing-sector composition, age structure, geography, immigration patterns, or other omitted variables. Further research using individual-level data would be needed to evaluate these mechanisms more directly.

Limitations and Future Research

This study has several limitations. First, the cross-sectional design prevents causal inference. Second, the use of state-level aggregate data creates a risk of ecological fallacy, meaning state-level associations should not be interpreted as individual-level behavior. Third, the dependent variable measures manufacturing payroll hours rather than total labor supply, employment, or average work hours across all workers. Fourth, the binary legalization variable oversimplifies differences in policy timing, implementation, enforcement, taxation, dispensary access, and medical marijuana policy. Fifth, the model uses only 50 state-level observations with several controls, limiting statistical power. Sixth, 2021 labor-market data may reflect pandemic-era disruptions. Finally, the VIF test indicates multicollinearity, which may affect the stability of some coefficient estimates.

Overall, this analysis contributes to research on cannabis policy and labor-market outcomes by

examining a narrower sector-specific measure: manufacturing payroll hours. The results suggest that legalization status may be correlated with broader state-level labor-market patterns, but they do not provide direct evidence for prohibition, legalization, taxation changes, or other regulatory interventions. Stronger evidence, especially from individual-level and longitudinal designs, would be necessary before drawing firm conclusions about the labor-market consequences of recreational marijuana legalization.

References

- About, R., Ghimire, K. M., Maclean, J. C., & Powell, D. (2021). *Does marijuana legalization affect work capacity? Evidence from workers' compensation benefits* (NBER Working Paper No. 28471). National Bureau of Economic Research.
<https://doi.org/10.3386/w28471>
- Albino, D. K. (2017). *The marijuana policy impact on labor productivity*. Department of Economics, University of Connecticut. <https://doi.org/10.13140/RG.2.2.16231.98721>
- Centers for Disease Control and Prevention. (n.d.). *BRFSS prevalence & trends data*. U.S. Department of Health and Human Services. Retrieved June 11, 2026, from <https://www.cdc.gov/brfss/brfssprevalence/index.html>
- Dave, D. M., Liang, Y., Muratori, C., & Sabia, J. J. (2022). *The effects of recreational marijuana legalization on employment and earnings* (NBER Working Paper No. 30813). National Bureau of Economic Research. <https://doi.org/10.3386/w30813>
- Evans, D. G. (2013). The use of cannabis for medical purposes. *The Journal of Global Drug Policy and Practice*, 7(1).
<https://www.dfaf.org/wp-content/uploads/2018/11/Vol-7-Issue-1.pdf>
- Hall, W., & Lynskey, M. (2020). Assessing the public health impacts of legalizing recreational cannabis use: The US experience. *World Psychiatry*, 19(2), 179–186.
<https://doi.org/10.1002/wps.20735>

Insurance Institute for Highway Safety. (n.d.). *Marijuana laws*. Retrieved June 11, 2026, from <https://www.iihs.org/research-areas/alcohol-and-drugs/marijuana-laws-table>

Pacula, R. L., & Smart, R. (2017). Medical marijuana and marijuana legalization. *Annual Review of Clinical Psychology*, 13, 397–419.
<https://doi.org/10.1146/annurev-clinpsy-032816-045128>

Popovici, I., & French, M. T. (2014). Cannabis use, employment, and income: Fixed-effects analysis of panel data. *The Journal of Behavioral Health Services & Research*, 41(2), 185–202. <https://doi.org/10.1007/s11414-013-9349-8>

Statista Research Department. (2023, June 2). *Average size of U.S. families in 2021, by state*.

Statista. <https://www.statista.com/statistics/242262/average-size-of-us-families-by-state/>

Tax Policy Center. (2021, January 15). *Hourly minimum wage by state and territory* [PDF].

Urban Institute and Brookings Institution.

www.taxpolicycenter.org/sites/default/files/statistics/pdf/state_min_wage_2021.pdf

U.S. Bureau of Labor Statistics. (2021). *Table 3. Average hours and earnings of production employees on manufacturing payrolls, by state* [Annual averages].
<https://www.bls.gov/sae/tables/annual-average/2021/table-3-average-hours-and-earnings-of-production-employees-on-manufacturing-payrolls-by-state.pdf>

U.S. Census Bureau. (n.d.). *Bachelor's degree or higher by state*. FRED, Federal Reserve Bank of St. Louis. Retrieved June 11, 2026, from

<https://fred.stlouisfed.org/release/tables?eid=391444&rid=330>

World Population Review. (2021). *US states by race 2021*.

<https://worldpopulationreview.com/states/states-by-race>