

George Kalchev, PhD¹

¹Lake Superior State University, MI, Lukenda School of Business

Abstract

An increasing number of states are legalizing recreational use of marijuana. There are concerns about its impact on road safety. This empirical study uses the experience from Michigan, California and Colorado to test whether marijuana legalization has had any significant impact on cannabinoid-related fatal crashes. A Poisson difference-in-difference style estimation is applied in a panel data setting. MI, CA and CO are used as the treatment group, where recreational marijuana has been legalized. The control groups are the states of Ohio, Indiana and Texas, which did not have recreational marijuana legalized at the time. The treatment effect is found to be significant, thus legalization and retailing of marijuana have statistically significantly increased the number of cannabinoid-related fatal crashes in the states that have legalized it in the period of study.

Introduction

An increasing number of states in the US are legalizing medical and recreational marijuana, even though it remains federally illegal. According to the Routledge Handbook of Post-Prohibition Cannabis Research (2022), about 90 % of the US population has access to medical cannabis markets. About 24 states have legalized recreational marijuana. The state of Michigan legalized recreational marijuana in December, 2018, but actual commercial retail began in December, 2019. There is some time lag until retailers get registered and start selling. More recently, Ohio legalized recreational marijuana in 2023. As marijuana becomes legally available, one of the concerns is that it may impact driving safety. In fact, the federal government classifies it as Schedule I banned substance that can impair cognitive skills with danger of abuse and without medical benefits.

Many studies suggest that marijuana hampers the cognitive skills required to drive in a safe manner (Blows et al., 2005; Larkin, 2015). It may numb some cognitive skills and reaction time. In states that have legalized it, it remains illegal to drive under the influence of marijuana. It is not coincidental that in Michigan, when you can buy marijuana from a dispensary, you have to put it sealed in your car. Similar to alcohol, you cannot have open containers with marijuana in your vehicle. The California Association of Highway Patrolmen opposed the recreational legalization of cannabis. Thus it is a legitimate concern whether the legalization of marijuana and its increased availability have contributed to less safe roads. As some people call for its federal legalization, that calls for careful examination for the risks that poses, including the ones for road safety.

Methods and Data

I have obtained data on fatal accidents in the states from the Department of Transportation's National Center for Statistics & Analysis (NCSA) within the National Highway Traffic Safety Administration. They provided fatal motor crashes data for each state on a monthly basis starting in 2010 to 2021. The focus is on the states of Michigan, Colorado, California, Ohio, Texas and Indiana. The first three experienced recreational legalization during the period of study, the latter three did not. The data include total number of fatal crashes per month, fatal crashes involving drugs, fatal crashes involving cannabinoids, fatalities, etc. For crashes involving drugs, at least one of the drivers involved in the crash tested positive.

Michigan: legal retail of cannabis from December 2019; CA from January 2018; and Colorado from January 2014.

Poisson panel data estimation is used due to the dependent variable being a count variable. The three explanatory variables are dummies for the legalization of marijuana in the three states: CA, CO and MI. They are equal to 1 for periods of legalization in those states. The estimation equation is:

$$\hat{y}_{it} = \alpha_i + \gamma_t + \beta_1 \text{Leg} * \text{CA} + \beta_2 \text{Leg} * \text{CO} + \beta_3 \text{Leg} * \text{MI} + \varepsilon_{it}$$

Where \hat{y}_{it} = number of cannabinoid-related fatal accidents and number of total fatal accidents

Contact

George Kalchev
Lake Superior State University
Email: gkalchev@lssu.edu
Website: www.lssu.edu
Phone: 906 6352044

Results

Poisson Panel Data Estimation, fixed effects

Cannabinoid-related accidents	Coefficient	Standard Error	P> z
CA legalization	0.3858	0.0293	0.000
CO legalization	0.9348	0.0836	0.000
MI legalization	0.4066	0.0626	0.000

Rate Ratios:

CA legalization	1.47	increase in marijuana-related accidents: 47%
CO legalization	2.54	154%
MI legalization	1.50	50%

Total fatal accidents	Coefficient	Standard Error	P> z
CA legalization	0.2021	0.0105	0.000
CO legalization	0.2811	0.0286	0.000
MI legalization	0.1459	0.0240	0.000

Rate Ratios		increase in total accidents
CA legalization	1.22	22%
CO legalization	1.325	33%
MI legalization	1.157	16%

Discussion

We see substantial increases in cannabinoid-related car crashes in all three states that have legalized marijuana. The periods of legalization are associated with 47%, 154% and 50% increase in marijuana-related accidents respectively in CA, CO and MI. All the variables are highly significant.

The availability of marijuana for recreational use in dispensaries seems to be associated with higher number of accidents, both overall and cannabis-related. We do not study if marijuana consumption increased in this period, but just note the increase in accidents.

In the second estimation, we note that the number of total car accidents has also risen during periods of legalization, but *not* as much. The percentage increase is 22% in CA, 33% in CO and 16% in MI. While total accidents have risen, the increase in marijuana-related accidents is more dramatic. It seems that cannabinoid-related accidents account for the majority of increase in the total number of accidents.

Further study is warranted as to what explains that increase, especially the dramatic rise in CO. Perhaps the longer period of legalization there (from January 2014) has contributed to higher incidence rate. The longer exposure to cannabis retail may have contributed to that. That may be concerning.

Conclusions

The dramatic increases in cannabis-related fatal crashes in states that legalized marijuana, as compared to the control group, signal that road safety may be a concern for legalization.

If the results are confirmed, the legalization appears to be associated with a much higher number of cannabis-related car accidents in this analysis. That may be a serious concern policy-makers should consider.

References

- Abbring, J. and van den Berg, G. J. (2003). "The Nonparametric Identification of Treatment Effects in Duration Models." *Econometrica*, 71 (5), 1491-1517.
- Ammerman, S., Ryan S., and Adelman, W. P. (2015). "The Impact of Marijuana Policies on Youth: Clinical, Research and Legal Update." *Pediatrics* 135 (3).
- Arrelano, M. (1987). "Practitioner's Corner: Computing Robust Standard Errors for Within-groups Estimators." *Oxford Bulletin of Economics and Statistics*. 49 (4), 431-434.
- Bennett, E. (2018). "Extending Ethical Consumerism Theory to Semi-Legal Sectors: Insights from Recreational Cannabis." *Agriculture and Human Values* 35 (2): 295-317.
- Bertrand, M., Duflo, E. and Mullainathan, S. (2004). "How Much Should We Trust Difference-in-Differences Estimates." *Quarterly Journal of Economics* 119: 249-275.
- ...