Recreational Marijuana on Traffic Fatalities

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Research Question

What is the effect of Recreational Marijuana Legalization (RML) on Traffic Fatalities at the state level?

Literature Review

- Hansen, Benjamin, Keaton Miller, and Caroline Weber. 2020a. "Early Evidence on Recreational Marijuana Legalization and Traffic Fatalities." Economic Inquiry, 58(2): 547-568.

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- Santaella-Tenorio, Julian, Katherine Wheeler-Martin, Charles J. DiMaggio, Alvaro Castillo-Carniglia, Katherine M. Keyes, Deborah Hasin, and Magdalena Cerdá. 2020. "Association of Recreational Cannabis Laws in Colorado and Washington State with Changes in Traffic Fatalities, 2005-2017." JAMA Internal Medicine, 180(8): 1061-1068.

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- Aydelotte, Jayson D., Lawrence H. Brown, Kevin M. Luftman, Alexandra L. Mardock, Pedro G. R. Teixeira, Ben Coopwood, and Carlos V. R. Brown. 2017. "Crash Fatality Rates After Recreational Marijuana Legalization in Washington and Colorado." American Journal of Public Health, 107(8): 1329- 1331.

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Data at State-Year Level(2010-2019)

- FARS from 2010-2019 using accident, accident auxiliary, and person data files
- U.S census: population, median age, male/female population
- BEA: Income by state
- BLS: Unemployment Rate
- Highway statistics: Number of licensed driver, Vehicle miles driven
- Still working on Drug Per Se Law, Seat Belt Law, Texting Law, Beer Tax etc.

Variables

Table 1: Dependent Variables for the FARS analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
Fatalities Total	510	11.97	4.57	2.36	27.46
Fatalities Male	510	17.02	6.52	3.66	37.53
Fatalities Female	510	7.04	2.82	1.08	16.99
Fatalities (BAC>0)	510	2.6	1.29	.16	8.98
Fatalities (BAC>0.1)	510	2.04	1.09	.16	7
Fatalities Weekday	510	7.09	2.77	1.26	16.65
Fatalities Weekend	510	4.85	1.88	.61	10.81
Fatalities Daytime	510	6.03	2.5	.58	16.65
Fatalities Nighttime	510	5.83	2.27	1.42	13.26
Fatalities Marijuana	510	.83	.63	0	3.2

Table 2: Dependent Variables for the FARS analysis (Not per 100 000 population yet)

Variable	Obs	Mean	Std. Dev.	Min	Max
Fatalities 16-19	510	45.87	47.64	0	255
Fatalities 20 29	510	148.22	170.11	3	956
Fatalities 30 39	510	101.23	112.37	2	634
Fatalities 40 49	510	93.17	101.64	0	559
Fatalities 50 59	510	103.54	111.35	1	624
Fatalities 60plus	510	165.42	171.48	2	933

Table 3: Independent Variables for FARS analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
Licensed Drivers	510	4277328.2	4567630.3	384940	27213650
Vehicle's miles	510	60499.05	62692.02	3527.27	348795.71
Income	510	47101.83	5966.01	34755	67277
Median Age	510	38.07	2.41	29.3	45
Population	510	6259790.8	7062044.5	564487	39512223
MML	510	.45	.49	0	1
RML	510	.08	.26	0	1
Number of accidents	510	628.31	672.81	14	3569

Hypothesis

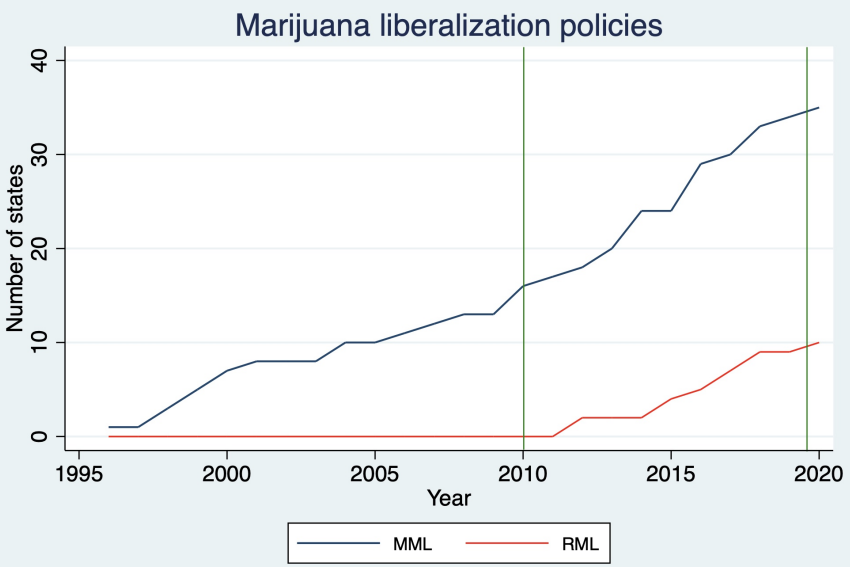

Figure 1: Time trends in marijuana liberalization policies as of 2019

Whether RML decrease or increase total traffic fatality, and traffic fatalities involving alcohol, involving marijuana, different age groups, time of day, day of week.

Regression Model

$$ln(trafficfatalities_{st}) = \beta_0 + \beta_1 MML + \beta_2 RML + X_{st}\beta_3 + \mu_s + \eta_t + \Phi_s * t + \epsilon_{st}$$

Replace MML, RML by MMD, RMD

Potential Robustness Checks

- Dependent variables transformation. (fatalities per licensed driver population, fatalities per vehicle miles traveled, logistic model $ln\frac{fatal}{1-fatal}$)
- Synthetic control
- Sample restricted to RML state and neighbor states
- Different statistical inference for clustered data (cluster-robust variance matrix estimator(standard method), wild cluster bootstrap, DID_MULTIPLEGT stata module)

Note

Sun and Abraham (2020) have shown that the coefficients in the second regression are not robust to heterogeneous treatment effects across groups and over time,1 and could be misleading even under an additive dynamic treatment effect model with constant effects.
https://arxiv.org/pdf/2007.04267.pdf
https://ideas.repec.org/c/boc/bocode/s458643.html
Dynamic effects vs instantaneous effect