

A Proposal to Research the Effect of Recreational Marijuana Establishments on School Outcomes

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The legalization of marijuana is a hotly debated topic, but for many local politicians and policy makers in states that have already legalized recreational marijuana, or are expected to, the big question is whether they should ban retail marijuana establishments (RMEs) or not. One of the most debated topics is the effect that legalization would have on education, but there is a distinct lack of evidence to support that RMEs harm or improve student performance. What is the effect of RMEs on school outcomes? I propose to use standardized test scores and graduation rates for high schools in the Denver Public Schools system to measure school outcomes and to use the number of RMEs open in a school's boundary to measure recreational marijuana establishments. I would then utilize a difference in differences strategy to identify the causal effect of RMEs on school outcomes.

The argument of proponents of allowing RMEs say that they would drive marijuana consumers to purchase from legal dispensaries instead of black market dealers, which would cause some of the dealers to go out of business. Since dispensaries are limited to selling to adults this would limit the supply of marijuana to children and reduce their use, which would cause school outcomes to improve. The opponents of legalization say that recreational marijuana establishments will increase the supply of marijuana generally, and that some of this will be resold to children which will then decrease their school performance.

There is some evidence for the latter view as the introduction of medical marijuana laws has increased the supply of high-grade marijuana (Anderson, Hansen, and Rees 2013). There is evidence for the former view as well in that RMEs increase local housing prices (Cheng, Mayer, and Mayer 2018; Conklin, Diop, and Li 2020) and school outcomes are capitalized in housing prices (Black 1999). However, neither of these views have conclusive evidence from the existing literature that RMEs would harm or improve school outcomes and a definitive answer requires a more direct approach.

The dependent variables of interest would be standardized test scores and graduation rates. This data would be at the school level for high schools in the Denver Public Schools system, and would cover both the pre-legalization and post-legalization time periods. The independent variable of interest would be the number of retail marijuana establishments operating within a highschool's designated boundary for each year. This data would be collected from the Colorado Department of Revenue, which maintains a record of all licensed retail marijuana establishments in Colorado.

The most straightforward way to try and answer our question would be to collect cross-sectional data and then run a naive OLS regression of the form:

$$SchoolOutcome_i = \alpha + \beta RME_i + \gamma X_i + \varepsilon_i$$

Where SchoolOutcome is the outcome of interest for school i , Beta is the coefficient of interest, RME is the number of retail marijuana establishments operating in the boundary of school i , and X is a vector of school level controls including racial makeup, average income, and parental education levels. Unfortunately Beta is going to be biased from any number of sources, both observable and unobservable. An example is that parents can move to be in the school they prefer, so parents who highly value education may avoid schools with many retail marijuana

establishments nearby if they associate them with poor educational outcomes. This would bias our estimate downward.

However, using a difference in differences (DD) strategy we can take advantage of the likely parallel trends in school outcomes between the high schools in the Denver Public Schools system. The functional form would follow thusly:

$$SchoolOutcome_{it} = \beta RME_{it} + \gamma X_{it} + \eta_i + \delta_t + \varepsilon_{it}$$

Where SchoolOutcome is the outcome of interest for school i in year t, Beta is the coefficient of interest, RME is the number of retail establishments in school i's borders in year t after recreational marijuana establishments are opened and zero otherwise, X is a vector of school and parent characteristics that vary over time including the number of RMEs, eta is a vector of school fixed effects, and delta is a vector of year fixed effects.

There are two main assumptions that would be relied upon for this identification strategy to identify a causal relationship. The first is the Parallel Trends Assumption and the second is that there aren't any other events or forces that affect the schools' outcomes correlated with the number of RMEs in their borders. If the schools who have high numbers of RMEs in their borders and those with few or none within their borders start on different trends then our DD estimator would be biased. If there was some other policy or event that was correlated with the number of RMEs within a school's boundary and also affected school outcomes then our DD estimator would not just be the causal effect of RMEs on school outcomes but it would also be picking up the effect of this other policy or event.

By looking at schools solely within the Denver Public Schools system both issues are ameliorated since all the schools share similar student bodies, bureaucracies, and local government institutions. I will also test the Parallel Trends Assumption by running an event study to see if the schools in the Denver Public Schools system were on the same trend for school outcomes before RMEs were allowed to open.

The most obvious threat to causal identification is selection effects from parents who change their school selection based on the presence of RMEs in their original choice school's boundary. The response to this would be two-fold. The first is the event study which will show us the effect for each year, which would allow us to see the short run effects. This is important since students typically stay at a school till completion rather than switch in the middle (for example switching high schools between 10th and 11th grades). Thus, if selection effects are strong then these effects would "phase in" over time and the first few years after RMEs were allowed to operate would show us the causal effect of RMEs on school outcomes. The second response to this threat would be to control for the number of students in each school's boundary that participate in the Denver Public Schools' choice program, data that the school district makes public.

References

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