
I want to submit an abstract for: Conference Presentation

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Keywords
Cannabis; Per Capita Consumption; Legalization; NSDUH; Underreporting

Research Question
What effect does recreational legalization have on states’ reported cannabis consumption?

Methods
We use a reduced form econometric model to estimate the effects of cannabis legalization on per capita consumption, and we use Monte Carlo simulations to forecast cannabis consumption.

Results
We find that recreational legalization (before stores open) causes roughly a 5% increase in reported consumption, and opening legal recreational stores does not significantly effect consumption.

Abstract
Relevance
U.S. federal law prohibits use, possession, sale, and distribution of cannabis. So it is not surprising that the illegal market dominates cannabis sales nationally. The illegal market also accounts for the majority of sales in some states where medicinal or recreational cannabis has been legalized. Because data on illegal production and sales do not exist, the quantity of illegal cannabis consumed can only be estimated with a high degree of uncertainty.

In order to estimate the efficacy of policy to shift demand from the illegal cannabis market to the legal market, accurate estimates of cannabis consumption are required. Past studies have used the National Survey on Drug Use and Health (NSDUH) data to determine cannabis consumption (Kilmer et al., 2013; Kilmer et al., 2019; Orens et al., 2018; MacDonald and Rotermann, 2018). However, respondents to this federally administered survey are likely to underreport cannabis consumption—and these past studies adjust reported consumption, accordingly.

One factor of underreporting is the denial of use or misreporting of frequency of use—an unsurprising outcome when individuals are asked to report use of an illegal substance to the federal government. But the aforementioned studies acknowledge they do not adjust underreporting over time (or they make no mention of it). However, fear of criminal penalty is a primary factor influencing underreporting. Therefore, we expect underreporting to decline following recreational legalization of cannabis.

We aim to provide more accurate estimates of states’ cannabis consumption by accounting for the effects of recreational legalization on underreporting. In turn, we use these consumption estimates combined with cultivation data to determine the legal market share of cannabis in California. This is a step towards our eventual goal of assessing the effects of states’ policies on the legal market share of cannabis.

**Methodology**

We rely on data NSDUH to develop a panel dataset of total cannabis consumption for 2002–2020. We use a reduced form econometric model to estimate the effects of cannabis legalization on per capita consumption, and we use Monte Carlo simulations to forecast cannabis consumption for 2021. We combine state tax data with consumption estimates to determine the sizes of the illegal and legal cannabis markets in California. Following the approach of Kilmer et al (2013), we combine NSDUH data of frequency of cannabis consumption with estimates of cannabis consumption per use-day (Orens et al., 2018) to estimate cannabis consumption per capita for each state. Data are available as combined 2-year estimates for 2002–2020 from the Substance Abused & Mental Health Services Administration Restricted Online Data System (SAMHSA, 2022). We adjust survey results for underreporting and apply estimates of daily consumption quantities stratified by monthly consumption frequency to determine annual cannabis consumption volume.

We estimate how much underreporting changes after legalization, and we account for this change in our estimates of per capita consumption. We accomplish this by treating recreational legalization—prior to recreational stores opening—as a shock to reported cannabis consumption in our fixed-effects model. We use this same model to determine the relationship between select demographic characteristics and taxes with per capita consumption.

We make an ex post adjustment to cannabis consumption in states with recreational legalization, then use Monte Carlo simulations to predict distributions of per capita consumption in 2021. We combine our mean consumption per capita estimates and predictions for California with the state’s cultivation and visitor data to estimate the market share of legal cannabis. Cannabis in California is subject to cultivation taxes, excise taxes, state retail taxes, and additional local taxes that vary by jurisdiction. The California Department of Tax and Fee Administration provides quarterly cultivation tax revenue totals, and cultivation tax revenues by fiscal year stratified by cultivation taxes on flower, dry-weight leaves, and fresh plant material. Because cultivation taxes are levied on the volume of cannabis entering the market, we are able to reasonably estimate the total volume of legal cannabis supplied in the state.

**Preliminary Results**

Our estimates of states’ cannabis consumption are similar to peer-reviewed estimates of consumption for California, Colorado, and Washington. For other states, there is no source to compare our estimates other than...
those produced by firms with a vested interest in the market—and we have found such estimates to be substantially higher than peer-reviewed estimates. Therefore, our estimates are the first of their kind for most U.S. states.

We find that recreational legalization (before stores open) causes roughly a 5% increase in consumption, which we interpret as a change in underreporting. We find that opening legal recreational stores does not have a statistically significant effect on per capita consumption.

Combining our estimates of consumption with California cultivation data, we are able to determine the share of legal cannabis cultivation in total demand. Despite stores being open since January 2018, we estimate that legal cultivation only accounts for 27-46% of demand, with an average estimate of 34%. In other words, roughly two-thirds of the cannabis demand in California is met by the illegal market.

Potential for Generating Discussion

The legal and illegal cannabis markets are rapidly changing and evolving as more states are decriminalizing or legalizing cannabis to some degree every year. This rapid growth, coupled with a lack of data, makes cannabis an especially interesting and difficult market to research. Estimates of states’ legal markets are few and far between, and estimates of illicit market sizes are practically nonexistent.

Not only are our estimates of cannabis consumption novel, but our findings of the effects of legalization on reported consumption have important health and policy implications. NSDUH data are relied on to estimate the health effects of cannabis use, so it is essential to understand how legalization affects reported consumption. This consideration is especially important for states weighing the consequences of recreational legalization.

Going forward we aim to estimate the legal share of cannabis in more states to shed light on how states’ policies—which vary greatly in terms of taxes and barriers to entry—effectively or ineffectively shift consumption from the illicit to legal cannabis market.

References


