Research suggests medical marijuana laws have negative impact on innovation

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Since 1996, 38 states and the District of Columbia have legalized the use of medical marijuana, a policy trend that health experts estimate has contributed to a nearly 70% increase in marijuana usage in the U.S.

Research on marijuana laws has tended to focus on public health aspects, but a new study by two A. B. Freeman School of Business researchers investigates their influence on a critical component of business: innovation.

Stephanie Cheng, assistant professor of accounting, and Yuchen Zhang, assistant professor of management, in collaboration with co-authors Pengkai Lin and Ricky

Tan, analyzed 17 years of patent activity in states with medical marijuana laws to determine that the legalization of marijuana has an adverse effect on the overall output and quality of regional innovation. Their paper, "'High' Innovators? Marijuana Legalization and Regional Innovation," appeared in the March 2023 issue of *Production and Operations Management*.

The line of inquiry grew out of an earlier paper by Cheng that looked at impacts of medical marijuana laws from a capital market perspective. In that study, Cheng and her co-authors, Lin and Freeman School Professor of Accounting Gus De Franco, found that the passage of medical marijuana laws increased states' borrowing costs and led to higher marijuana-consumption-related expenditures for police, corrections and public welfare.

The paper and its methodology caught the attention of Zhang, whose research focuses on entrepreneurship and innovation.

"Technological innovation is one of the most important driving forces in regional economic development," Zhang says. "Stephanie's paper showed that marijuana has widespread impacts, so I thought we could dig deeper and further explore its effects on innovation."



Stephanie Cheng and Yuchen Zhang

Cheng and Zhang analyzed patent activity in 20 states that passed medical marijuana laws between 1996 and 2013. In counties that legalized medical marijuana, the authors found that total forward citations — the number of times patents originating in the county were cited in subsequent patents — were 9.2% lower compared to counties without medical marijuana laws.

Forward citations are a good proxy for overall innovation output because they reflect not just the number of patents to emerge from a location but also their quality.

“Forward citations are a way to gauge the value of a patent because they show the patent’s influence on subsequent innovation,” Zhang explains. “A patent with a lot of citations indicates that the patent is more influential and thus higher quality. A patent with fewer citations, on the other hand, indicates that it’s less influential and lower quality.”

To further pin down the factors driving the decrease in citations, Cheng and Zhang also looked at patent counts and average citations per patent. While the number of patents filed in counties with medical marijuana laws didn’t vary significantly with those in states without marijuana laws, the average number of citations per patent was 11.1% lower, suggesting a significant reduction in patent quality.

The effects weren’t all negative. Medical marijuana laws appeared to have a positive impact on the number of patents filed involving collaboration among inventors, consistent with behavioral research suggesting that marijuana use may foster increased social interaction. That modest positive effect on the number of patents, however, was not enough to counteract the steep decline in patent quality, resulting in a net negative effect on the overall output of collaborative innovation.

Cheng and Zhang caution that their findings are based on empirical rather than experimental evidence and apply only in the narrow context of patent activity, but they hope the paper leads to additional research on the topic.

“If there’s one message that we want to get across with this paper, it’s that lawmakers should be more mindful and careful when considering implementing marijuana-related policies,” says Zhang. “If medical marijuana laws are associated with negative impacts in terms of, for example, local innovation and municipal borrowing costs, we probably need to take a step back to consider all possible economic and social implications.”

“These public health policies have multifaceted effects on our lives, our work and our productivity,” adds Cheng. “It’s a big topic, and we really hope that this paper helps generate more research on similar important public health issues in the business community.”

“High” Innovators? Marijuana Legalization and Regional Innovation, co-authored by Stephanie Cheng, Yuchen Zhang, Pengkai Lin and Yinliang Tan, appeared in the March 2023 issue of *Production and Operations Management*.