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Alcohol and marijuana: Substitutes or complements and a deeper evaluation of marijuana prohibition

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Alcohol and Marijuana: Substitutes or Complements and a deeper evaluation of Marijuana's

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I.   Abstract

This paper first looks to determine whether alcohol and marijuana are substitutes or complements. This economic relationship between alcohol and marijuana could influence policy decisions regarding marijuana's legal status in the United States. My method is a meta study and evaluates the current literature on alcohol and marijuana's economic connection. I find that more empirical research is needed before we can definitively say whether alcohol and marijuana are substitutes or complements. Second, the paper compares the prohibitions of alcohol and marijuana and gives reasons why the United States should learn from its experience during alcohol prohibition and legalize marijuana.

II.   Introduction

In the past 7 years we have seen multiple states legalize the recreational use of marijuana while even more have legalized the medicinal use of marijuana despite the continued Federal ban on the substance. My first objective is to determine whether alcohol and marijuana are substitutes or complements. Marijuana's connection to alcohol is crucial for determining whether its legalization will be beneficial or harmful. It is widely recognized that alcohol use is harmful to society. Marijuana is also harmful, but much less so than alcohol (Nutt et al. 2010). If alcohol and marijuana are substitutes, then some of its ills could be reduced as those who would have previously used alcohol now use marijuana. On the other hand, if alcohol and marijuana are complements, the harm attributed to alcohol will increase as those who use alcohol will now be further intoxicated by their use of marijuana.

Through evaluation of the literature, I find evidence that alcohol and marijuana's economic relationship can vary by type of alcohol and type of person. Evidence suggests beer and marijuana are complements and that alcohol in general and marijuana are substitutes for young

people. Most of the existing literature is from a time when marijuana was illegal everywhere, so the data is not as reliable as one would like. With legal marijuana now in many states it is likely that better studies will be forthcoming. Consequently, I recommend more research be conducted before any decisions be made on the relationship between alcohol and marijuana.

Research on the economic connection between alcohol and marijuana led me to a broader evaluation of marijuana, specifically compared to alcohol in the United States. The current prohibition of marijuana can be compared to the prohibition of alcohol in the United States during the 1920s. Both prohibitions resulted in low deterrence of drug use, high costs of enforcement, and increased criminal activity. I find that while the United States was quick to realize the failure of Prohibition, it has yet to correct the mistake of continued prohibition of marijuana. In the second part of my paper, I detail some of this history of alcohol and marijuana use in the United States, as well as discussing the damage prohibition of these substances caused.

III.   Definition of Complements and Substitutes

Substitutes and complements are characterizations of demand for goods. Two goods are substitutes if a higher price of one good leads to an increase in demand for the other good. More intuitively, substitutes are goods that people view as similar, like butter and margarine or Coke and Pepsi. Two goods are complements if when the price of one good increases, the demand for the other good decreases. These are goods that are typically consumed together, like bread and butter or pizza and beer.

IV.   Literature Review

Current research on the economic connection between alcohol and marijuana is conflicting. Some studies have found evidence suggesting substitutability between alcohol and marijuana; other studies have found evidence suggesting a complementarity between the two substances.

The conflicting literature leads one to ask what the true relationship between alcohol and marijuana is.

a. Evidence that alcohol and marijuana are substitutes

Thies and Register (1993) evaluated the recent trend of states decriminalizing marijuana in the 1980s and found evidence that alcohol and marijuana were substitutes. One method used was an OLS regression on data from the National Longitudinal Survey of Youth (NLSY) (Thies and Register 1993, 4). The authors found lower consumption of marijuana after decriminalization in 1988, but also found an increase in the amount of binge drinking (Thies and Register 1993, 8). A weakness associated with Thies and Register (1993) is the relatively weak connection between marijuana and alcohol they find. While marijuana consumption went down slightly, the only alcohol variable that increased was binge drinking. Binge drinking is a small component of alcohol consumption, making the connection found between alcohol and marijuana relatively weak.

In 1997, Chaloupka and Laixuthai found the consumption of alcohol and probability of binge drinking went down among high school seniors in states with decriminalized marijuana (Chaloupka and Laixuthai 1997, 260). The authors used data from the Monitoring the Future (MTF) surveys conducted in 1982 and 1989, and then used a weighted least squares regression to evaluate the data (Chaloupka and Laixuthai 1997, 268-270). A 2001 study found the increased drinking age in the 1980s led to a decrease in the use of alcohol as well as an increase in the use of marijuana among high school seniors (DiNardo and Lemieux 2001, 1004). The authors used a log-linear regression and a bivariate probit model to evaluate data from Monitoring the Future (DiNardo and Lemieux 2001, 1003-1005). A weakness associated with Chaloupka and Laixuthai (1997) and DiNardo and Lemieux (2001) is the Monitoring the Future (MTF) data. The

individuals polled are high school seniors and are asked about their use of alcohol and illegal drugs. While no parents are present for these surveys, high school seniors may lie about their use of illegal drugs and alcohol due to the stigma attached to those drugs.

A 2012 study used the legal drinking age of 21 in the United States as a natural discontinuity to evaluate the economic connection between alcohol and marijuana. The authors found that after an individual turns 21, the probability of using marijuana decreased by 2 percentage points. The authors also found at age 21 the consumption of alcohol increased by 10 percentage points (Crost and Guerrero 2012, 116). A strength of Crost and Guerrero (2012) is the acknowledgement of potential under-reporting of substance use in the survey data. Many empirical studies take the survey data as being accurate, which can lead to making incorrect conclusions about a population.

A 2013 study found medical marijuana laws led to a 5 percent reduction in beer consumption among 18-29 year olds (Anderson, Hansen, and Rees 2013, 357). Anderson et al used data from the Fatality Analysis Reporting System (FARS) from 1990-2010 and a log-linear regression model to evaluate the data (Anderson, Hansen, and Rees 2013, 345). The authors also found states with medical marijuana laws saw a drop in traffic fatalities that had at least one driver with a positive Blood Alcohol Content (BAC) level (Anderson, Hansen, and Rees 2013, 359). The authors attributed this drop to the substitution away from alcohol to marijuana. However, the authors stressed that this drop does not mean driving while under the influence of marijuana is safer than driving under the influence of alcohol. Instead social stigmas may explain the drop, as alcohol is typically consumed in public places, while marijuana is consumed at one's home (Anderson, Hansen, and Rees 2013, 359). A weakness of Anderson, Hansen, and Rees (2013) is it ignores different specifications of states' medical marijuana laws. In the first part of their

analysis on alcohol use after medical marijuana laws go into effect, the authors do not account for any differences in the states with these laws. States' medical marijuana laws can vary widely. This is likely to have effects on substance consumption. This weakness was pointed out and evaluated in Pacula et al. (2013).

A 2017 paper found legalization of marijuana in Washington state led to a reduction in the consumption of alcohol and other drugs (Dragone et al. 2017, 11). The authors also found evidence that legalization of recreational marijuana led to a reduction in crime in counties bordering Oregon (Dragone et al. 2017, 13). The legalization of marijuana in Washington led to an increase in consumption of marijuana by 2.5 percentage points and a reduction in consumption of other drugs by 0.5 percentage points. The legalization of marijuana also led to a reduction in the consumption of alcohol, both normal and binge drinking, by 2 percentage points (Dragone et al. 2017, 10-11). The increase in consumption of marijuana and decrease in consumption of alcohol suggests Washington residents substitute marijuana for alcohol. The authors attribute the drop in crime to the substitution, as alcohol and other illegal drugs like cocaine tend to make people more aggressive and more likely to commit crime. A strength of Dragone et al. (2017) is the finding of a clear substitution relationship between marijuana and alcohol. A weakness of the study is that the authors were only evaluating Washington counties along the border with Oregon, so it is difficult to say these results would be true for the United States as a whole.

A 2018 working paper found evidence that alcohol and marijuana are substitutes in Washington state following the state's legalization of recreational marijuana (Miller and Seo 2018, 1). The authors used data directly from Washington following legalization of recreational marijuana. Using a complex two-part regression model, they found that a 1% increase in the

price of alcohol is associated with a 1.66% increase in the quantity of marijuana sold. They also estimate that legalization of marijuana led to a 12% decrease in the amount of alcohol demanded (Miller and Seo 2018, 16-17). A strength of Miller and Seo (2018) is its evaluation of the economic connection between alcohol and marijuana in a state with recreational marijuana laws. It is one of the first studies that evaluates legal, recreational marijuana's effect on the economic connection between alcohol and marijuana. A weakness of Miller and Seo (2018) is it only evaluates the state of Washington. Therefore, we are unable to apply these conclusions to other states, as there could be geographical or political explanations for the evidence of substitution.

To summarize the findings, older studies found substitution between binge drinking and marijuana use (Thies and Register 1993, Chaloupka and Laixuthai 1997). Two studies evaluating the drinking age of 21 found evidence of substitution among young people, however the studies are conflicting on whether young people substitute from alcohol into marijuana, or marijuana into alcohol (DiNardo and Lemieux 2001, Crost and Guerrero 2012). A study found traffic fatalities decreased when medical marijuana laws were implemented, as well as a decrease in the amount of beer consumed in those states (Anderson, Hansen, and Rees 2013). A recent study evaluating the relationship between alcohol and marijuana found crime dropped in Washington border counties after the passing of recreational marijuana laws, as well as a decrease in consumption of alcohol (Dragone et al 2017). Another study found a 12% drop in alcohol demand following the legalization of marijuana in Washington (Miller and Seo 2018).

      b.   Evidence that alcohol and marijuana are complements

While some studies argue alcohol and marijuana are substitutes, others find alcohol and marijuana to be complements. A 1998 empirical study found that when the tax on beer was increased, both alcohol and marijuana consumption decreased (Pacula 1998, 576). The author

found if the beer tax were doubled, the probability of alcohol consumption would decrease by 3.2% and the probability of marijuana consumption would decrease by 11.4% (Pacula 1998, 583). Pacula used data from the National Longitudinal Survey of Youth (NLSY) for the years 1979 and 1984 and evaluated it using a two-part econometric model. The first part of the model was a probit regression and the second was a log-linear OLS regression (Pacula 1998, 562-563). A weakness of Pacula (1998) is the use of beer prices as the proxy for alcohol prices in the model. Beer is the most commonly consumed alcoholic drink among young people, but the model would be a better reflection of reality if wine and hard liquor prices were also accounted for. What the model says is beer and marijuana are complements and this is used as evidence to suggest a complementary relationship between alcohol and marijuana. For a similar study, I would suggest running different regressions that include separate independent variables representing wine prices and hard liquor prices and seeing if this complementary relationship continues to exist.

A 1999 empirical study found further evidence of a complementary relationship between alcohol and marijuana (Saffer and Chaloupka 1999, 401). The authors estimated the demand curves for illegal drugs, specifically marijuana, cocaine, and heroin. They used data from the National Household Surveys on Drug Abuse (NHSDA) in the years 1988, 1990, and 1991 (Saffer and Chaloupka 1999, 402). The study used a probit regression to find a negative relationship between marijuana use and the price of alcohol in one regression. The authors also found negative relationships between marijuana use and the price of cocaine and heroin (Saffer and Chaloupka 1999, 406-407). A strength of Saffer and Chaloupka (1999) is using a combination of beer, wine, and distilled spirits prices to create a general price of alcohol dependent variable. This is an improvement on Pacula (1998) which only used beer prices as

alcohol prices. A weakness of Saffer and Chaloupka (1999) is the lack of evidence suggesting a complementary relationship between alcohol and marijuana. In the five regressions run, only one coefficient was negative and significant (Saffer and Chaloupka 1999, 407-408). The lack of more significant, negative regression coefficients is a red flag for drawing any conclusions about the economic relationship between alcohol and marijuana.

In a 2004 empirical study, marijuana use was found to be negatively correlated with college campus bans on alcohol. A negative relationship was also found between the price of marijuana and consumption of alcohol and marijuana (Williams et al. 2004, 26). This relationship was found using data from the Harvard School of Public Health College Alcohol Study (CAS) for the years 1993-1999 and using a probit model to determine the probability of a college student using alcohol or marijuana (Williams et al. 2004, 19). The authors concluded this was evidence of a complementary relationship between alcohol and marijuana. A weakness of Williams et al. (2004) is the use of beer price as a proxy for alcohol price, like Pacula (1998). The authors justify this by saying beer is the most commonly consumed alcoholic beverage by college students. Leaving out wine and liquor prices weaken this model. Another weakness of Williams et al. (2004) is the use of campus bans on alcohol as a way to measure its effect on marijuana usage. Campuses with bans on alcohol could already be in areas with social stigmas against alcohol use, suggesting those who go to these colleges are already biased against the use of alcohol and/or marijuana.

In a 2013 working paper, the Pacula et al did an evaluation of each state's medical marijuana laws, looking at the specificities of each law. The authors found states with dispensaries or home cultivation can increase the use of alcohol (Pacula et al. 2013, 31). The authors also evaluated the effect of medical marijuana laws on traffic fatalities, doing a replication of Anderson, Hansen

and Rees (2013). The replication's findings were consistent with the original study, suggesting medical marijuana laws reduce the number of alcohol related traffic fatalities (Pacula et al. 2013, 30). A strength of Pacula et al. (2013) is its replication of Anderson, Hansen and Rees (2013). Because it found nearly the same results, it strengthens the literature regarding medical marijuana laws and shows the findings of Anderson, Hansen and Rees (2013) are replicable. Another strength of Pacula et al. (2013) is the evaluation of state medical marijuana laws and considering what provisions some states have and other do not.

In a 2015 study, the authors evaluated the effect of medical marijuana laws on alcohol and marijuana consumption. The authors used data from the National Survey on Drug Use and Health (NSDUH) for the years 2004-2012; the authors evaluated the data using a two-way fixed effects model (Wen, Hockenberry, and Cummings 2015, 67-69). The study found that for adults 21 and older, medical marijuana laws increased the probability of marijuana consumption with binge drinking by 22% and use of marijuana with drinking by 18% (Wen, Hockenberry, and Cummings 2015, 72). A strength of Wen, Hockenberry, and Cummings (2015) is its evaluation of medical marijuana laws and their effect on alcohol and marijuana's economic relationship. Another strength is the evaluation of individual provisions within state medical marijuana laws, as pointed out in Pacula et al. (2013).

To summarize the studies that found a complementary relationship, two studies used the price of beer as a proxy for alcohol and found that when beer prices rise, both alcohol and marijuana consumption fall (Pacula 1998, Williams et al. 2004). A 1999 study compiled an alcohol price made up of the prices for beer, wine, and liquors and also found a negative relationship between the alcohol price and consumption of alcohol and marijuana (Saffer and Chaloupka 1999). Recent studies evaluating the effect of medical marijuana laws have found

marijuana dispensaries increase alcohol consumption and adults are more likely to consume marijuana while drinking in states with medical marijuana (Pacula et al. 2013, Wen, Hockenberry, and Cummings 2015).

V.   Analysis of Arguments

A weakness regarding studies on both sides of the argument is the age of the data. Thies and Register (1993), Chaloupka and Laixuthai (1997), DiNardo and Lemieux (2001), Pacula (1998), and Saffer and Chaloupka (1999) all use data from the 1980s to draw their conclusions. Even Williams et al. (2004) and Pacula et al. (2010) use data from the 1990s and early 2000s, before any major medical marijuana laws came into existence. Public perception and attitudes towards marijuana have changed substantially since then with only 24% of Americans polled in 1980 supporting legalization compared to 62% of Americans in 2018 (Hartig and Geiger 2018). This change in public perception could suggest the data from the 1980s may not be accurate as the stigma against marijuana could influence people not to report their use of the drug. Consequently, the data may not be reliable. The takeaways from these articles should be looked at as reflective of the time when the data was gathered. As more states legalize marijuana, the data will likely improve. New studies will be more accurate.

Some strengths of the substitute's argument include using natural experiments. DiNardo and Lemieux (1997) use the new federal drinking age to see the effect on alcohol and marijuana consumption among young people. Crost and Guerrero (2012) use the legal drinking age of 21 as a natural discontinuity to see if the drinking age influences young people's choices of substances. Dragone et al. (2017) uses the time period in between Washington legalizing marijuana and Oregon legalizing marijuana as a natural discontinuity to see the effect on crime rates and consumption of other drugs.

VI.   Decision

More research is required before a decision can be made regarding the economic connection between alcohol and marijuana. Recent changes to marijuana's legal status and changes in the public's attitude to the drug will produce much more reliable data. Multiple states have had votes on whether to legalize marijuana in the past year, and legalization has become a campaign issue among multiple 2020 Democratic presidential campaigns. There have not been enough studies published within the past five years that evaluate the economic connection between alcohol and marijuana in states with legal, recreational marijuana. In the coming years, more studies need to evaluate legal marijuana's effect on the consumption of alcohol and traffic fatalities attributed to alcohol. This will help determine alcohol and marijuana's economic connection and if the connection is strong enough to reduce traffic fatalities attributed to alcohol.

States with legal, recreational marijuana no longer need surveys as a proxy for marijuana consumption. They can use the legal sales of marijuana instead. Marijuana sales data should give more accurate findings than survey data. As mentioned above, survey data could be influenced by stigmas against marijuana, or survey takers may not want to admit to illegal activity. Any future study evaluating the connection between alcohol and marijuana should use data from states with legal, recreational marijuana.

Future studies should also use a complete measure of the price of alcohol such as a weighted average using prices of different types of alcohol and a breakdown by types of alcohol. Many previous studies have focused on beer (due to its prevalence), but this does not give an accurate representation of overall alcohol consumption. A more accurate model could give a better insight on the general connection between alcohol and marijuana, as well as specific connections between different types of alcohol and marijuana.

Making a decision based on the available studies, I conclude the economic relationship between alcohol and marijuana can vary by type of alcohol and group of consumers. Pacula (1998) and Williams et al. (2004) found beer and marijuana have a complementary relationship. For different types of alcohol, the connection to marijuana is unknown. Alcohol and marijuana are substitutes among young people according to Chaloupka and Laixuthai (1997), DiNardo and Lemieux (2001), Crost and Guerrero (2012), and Anderson et al. (2013). Williams et al. (2004), however, gave evidence of complementary status among college students, complicating the potential connection. The literature is mixed in regard to marijuana's connection with binge drinking. Thies and Register (1993), Chaloupka and Laixuthai (1997), and Dragone et al. (2017) suggest binge-drinking and marijuana are substitutes, but Wen et al. (2015) suggest a complementary relationship. Wen et al. (2015)'s conclusion is more general than Dragone et al. (2017) as Wen et al. (2015) uses nationwide data. Thies and Register (1993) and Chaloupka and Laixuthai (1997) both use data from the 1980s in states where all forms of marijuana are illegal. Dragone et al. (2017) uses more recent data as well as data from a state with recreational marijuana, but the sample is relatively small and would be difficult to generalize to the entire United States. While the findings of Thies and Register (1993), Chaloupka and Laixuthai (1997), and Dragone et al. (2017) could be representative of the time period and geographic region, Wen et al. (2015) is more representative of what the relationship between alcohol and marijuana is today for the entire United States.

VII.   Transition into a Broader Comparison of Alcohol and Marijuana

Unfortunately, there has not been sufficient evidence to truly answer whether alcohol and marijuana are substitutes or complements. Through my research, a natural parallel between the prohibition of alcohol in the 1920s and the current prohibition of marijuana appeared. This led to

a larger question: if Prohibition of alcohol is widely regarded as a failure then why is marijuana outlawed today? Both prohibitions were costly to enforce, failed to significantly deter consumption, and encouraged criminal behavior. A comparison of the two substances' history and continued use could be beneficial to understanding why marijuana is still outlawed, and potential reasons why the substances should be legalized.

    VIII.   Brief History of Alcohol Prohibition in the United States

        a.   Prohibition

Prohibition of alcohol existed in the United States from 1920-1933. Prohibition began with the ratification of the 18th Amendment and ended through ratification of the 21st Amendment. Evangelical Christians and the Temperance Movement orchestrated Prohibition. The temperance movement also supported women's suffrage, direct election of senators, child labor laws, and an income tax (Thorton 1991a, 48-49). Before the 18th Amendment, some states had already instituted anti-alcohol laws, and many towns across the United States were "dry," meaning alcohol was banned.

Prohibition put legal restrictions on the sale and distribution of alcohol, not the consumption of alcohol. Even though the consumption of alcohol was not illegal, alcohol consumption in the United States decreased after Prohibition went into effect. There are no official statistics regarding alcohol consumed, but it is estimated that after Prohibition went into effect the United States' alcohol consumption dropped to 20-40% of its pre-Prohibition level (Miron and Zwiebel 1991, 5). The level of alcohol consumption then began to rise, and it is estimated that alcohol consumption at the end of Prohibition was at 50-70% of its pre-Prohibition level (Miron and Zwiebel 1991, 5). Prohibition was expensive to enforce; Congress appropriated $6.3 million in 1921 and $13.4 million in 1930 (equivalent to $90.57 million and 206.49 million

in 2019 dollars respectively) (Miron and Zwiebel 1991, 2). Prohibition also aided the rise of organized crime in the United States. Prohibition encouraged the smuggling of alcohol over state lines, which allowed groups to gain ties with others across the nation and create an organized criminal network. Since Prohibition created a black market for alcohol, criminal organizations made large profits from smuggling alcohol. The smuggling of alcohol caused a shift in what type of alcohol was commonly consumed, as smuggling potent liquors was easier than smuggling beer (Thorton 1991b, 3). Criminal organizations fought for greater profits. This violence is exemplified by the 1929 Valentine's Day Massacre (Demleitner 1994, 626). Criminal organizations earned large amounts of money from smuggling alcohol and this led to greater power and influence in the political sphere, as these organizations could now "buy" politicians. Violent crime rates were also rising in major cities, with the homicide rate rising 78% from pre-Prohibition levels (Thorton 1991b, 6). Other crimes like theft of property and robbery also increased after Prohibition went into effect (Thorton 1991b, 7). Perhaps the greatest damage done was the erosion of confidence in American laws and legal processes, as many Americans felt Prohibition was unjust (Demleitner 1994, 626). The relatively high cost of enforcement, low deterrence in consumption, and rise in crime and disregard for the law led to Prohibition being overturned in 1933 with the ratification of the 21st Amendment.

b. Current Alcohol Use in the United States

Alcohol is one of the most prevalent drugs in the United States today. A survey found 86.4% of Americans aged 18 and older have used alcohol at some point in their lives, with 70.1% having used it within the past year, and 56% having used it within the past month (NIAAA 2018). Alcohol abuse is prevalent, with 12.7% of American adults classified as alcoholics (Grant et al. 2017, 1).

Alcohol provides valuable tax revenues to states and localities. Local and state governments received $7 billion from alcohol-related excise taxes in 2015 (Tax Policy Center 2017). Alcohol also causes damage to states and localities. In 2010, alcohol was estimated to have caused $249 billion worth of damages. This figure was found through evaluation of the costs associated with drinking like drunk driving, binge drinking, underage drinking, and drinking while pregnant (Sacks et al. 2015). Driving under the influence of alcohol is an especially damaging problem in the United States. It is estimated four million American adults drive drunk at least once annually. Highway crashes attributed to drunk driving cost Americans an estimated $37 billion annually. In 2010, alcohol was involved in 47.2% of pedestrian fatalities, 39.9% of vehicle occupant fatalities, and 33.8% of pedal cyclist fatalities (Chambers, Liu, and Moore 2017). It is clear the actions of those under the influence of alcohol is damaging to society, but the failure of prohibition means that we choose not to outlaw alcohol.

IX.   Brief History of Marijuana Use in the United States

      a.   History of Hemp Use in the United States

Hemp, a strain of the plant cannabis, has been grown in the U.S. since Colonial times. Hemp has a low THC content (the chemical that gets a person "high") and is grown for its fibers. Hemp fibers can be used in a variety of industrial processes, including the creation of clothing, rope, and paper. Famously, George Washington and Thomas Jefferson grew hemp on their private estates, and the United States Constitution was printed on hemp (Warf 2015, 426). Following the American Revolution, the United States boosted production of hemp when Congress levied tariffs on imported hemp, and domestic production of hemp remained strong until the creation of the cotton gin and increased imports of hemp from Russia (Warf 2014, 426).

Hemp was banned by the Marijuana Tax Act in 1937, so during World War II American supplies of hemp and other industrial products were depleted. Congress then relegalized hemp and created initiatives to grow hemp during wartime. This was short lived, and hemp was declared illegal again in 1948 (Warf 2014, 430). Hemp has again become legal with the passing of the 2018 farm bill in December of 2018 (Lieber 2018).

b. Prohibition Movement against Marijuana

Mexican immigrants in the Southwestern United States brought marijuana to the United States in the early 20th century. The practice of using marijuana to get high was also adopted by black jazz musicians in New Orleans, who had been introduced to it by Caribbean immigrants. The use of marijuana began to spread across the country by way of the jazz music circuit. Soon after, states began to make marijuana illegal, with Utah being the first state of 29 to make it illegal from 1915 to 1931 (Warf 2014, 429). The federal government made marijuana illegal in 1937 with the Marijuana Tax Act. Many consider these laws to be an effect of racist attitudes towards Mexican immigrants and black Americans. The paper and cotton industries, competitors of the hemp industry, also advocated for marijuana to be made illegal (Christiansen 2010, 232-233, Warf 2014, 429-430).

President Richard Nixon established the National Commission of Marijuana and Drug Abuse in the 1970s for research on potential laws regarding marijuana and other drugs. The Commission found marijuana laws to be racist in origin and saw no proof of crime increasing with use of marijuana (Christianson 2010, 233). This report was submitted with the suggestion to decriminalize marijuana; Nixon rejected the findings and suggestion (Warf 2014, 431). Eleven states[1] decriminalized possession of small amounts of marijuana during the years 1973 to 1978.

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[1] Oregon, Alaska, Maine, California, Colorado, Ohio, Minnesota, Mississippi, New York, North Carolina, and Nebraska

When the Drug Enforcement Agency (DEA) was petitioned to remove marijuana from the Schedule I drug list in the 1980s, the DEA studied the effects of marijuana. A Schedule I drug is defined as "drugs with no currently accepted medical use and a high potential for abuse" (DEA 2018). The study suggested marijuana be moved to Schedule II drug status. The DEA, however, decided there was not enough evidence; marijuana remains a Schedule I drug (Christianson 2010, 233-234). Marijuana's Schedule I drug status prevents the substance from being used in clinical trials or being tested medically.

X.   Current State of Marijuana Prohibition

Marijuana is banned by the United States Federal Government. Despite this, 33 states have legalized marijuana for medicinal purposes; 11 of those states[2] and the District of Columbia have also made recreational marijuana legal[3]. The Federal government can prosecute those who distribute and sell marijuana in any state. Deputy Attorney General James M. Cole, however, defined what types of cases attorney generals could bring to court in 2013 (U.S. Dep't of Justice 2013, 1-2). The Cole Memorandum essentially provided protections for those selling and distributing marijuana in states where the substance has been legalized. The Cole Memorandum was revoked in January of 2018 by Jeff Sessions, the attorney general at the time. The effects of this change in policy have not been well researched.

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[2] Alaska, California, Colorado, Illinois, Maine, Massachusetts, Michigan (legal but no business licenses have been given out yet to dispensaries), Nevada, Oregon, Vermont, and Washington
[3] See map below

States where marijuana is legal

■ Legalized recreational and medical marijuana   ■ Legalized medical marijuana
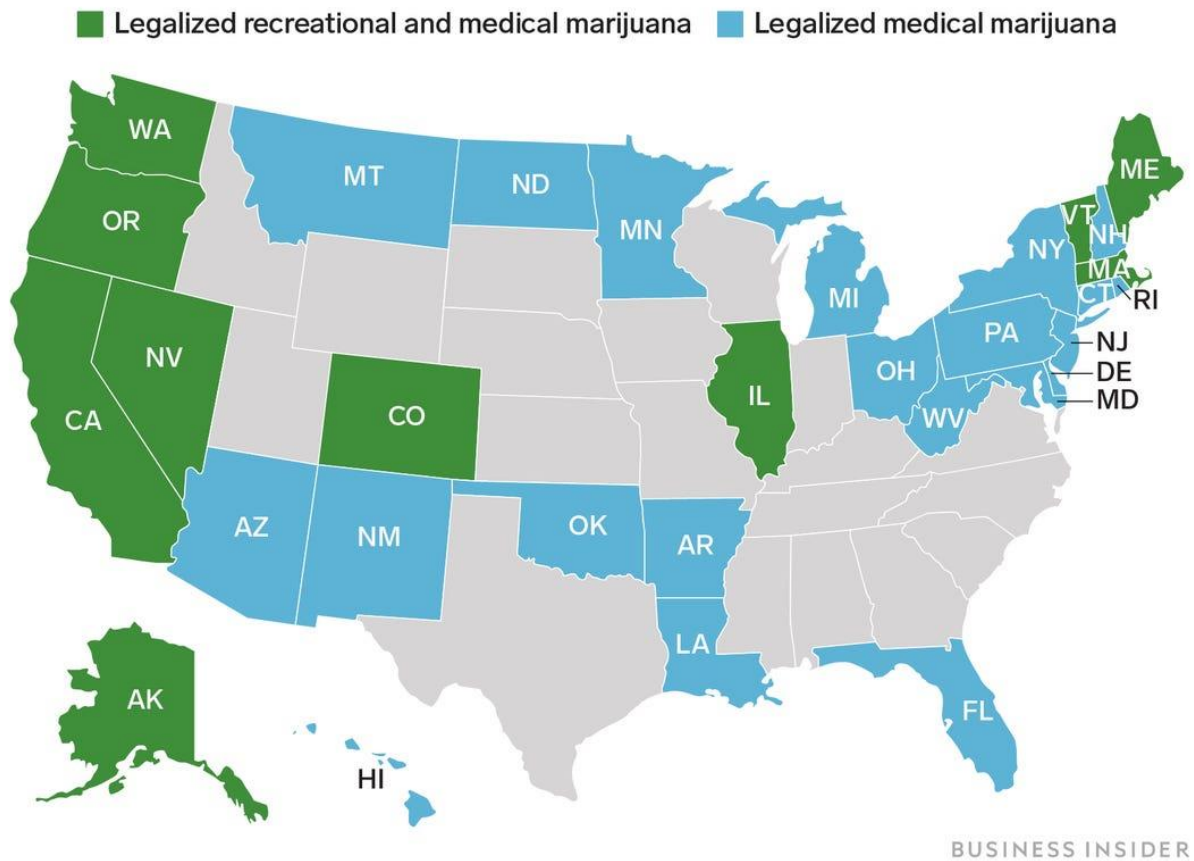
Legalization of marijuana appears to have not raised property or violent crime rates within legal states. A 2017 study found a significant reduction in rape, assault, robbery, and theft on the Washington side of the border as compared to the Oregon side (Dragone et al. 2017, 13). The authors attributed this drop in crime to a substitution from alcohol to marijuana. The authors cite alcohol's tendency to make a person more aggressive and marijuana's relative docile effect on users as a reason why the substitution had this effect on crime, specifically violent crime. A 2014 study evaluated the effect of medical marijuana laws on crime in states that border Mexico. The study found that after border states implemented medical marijuana laws, crime rates went down. Specifically, the authors found a drop in violent crimes (robberies and homicides), and also

found a drop among drug-related homicides and juvenile gang-related homicides (Gavrilova, Kamada, and Zoutman 2014, 27). This finding suggests liberalization of marijuana laws could help reduce some of the violence associated with drug cartels in the United States, as a legal marijuana market would essentially take out the cartels' black market.

A 2018 paper found mixed results regarding traffic fatalities and states with legalized marijuana. The first regression found a positive, significant relationship between traffic fatalities and the legalization of marijuana in Washington and Colorado (Cole 2018, 18). When the author adjusted for fatalities that occurred at times most commonly associated with drunk driving (12am – 4:30am), there was a negative, significant relationship between the fatalities and legalization of marijuana (Cole 2018, 23). The author's explanation for this discrepancy is that in states with legal marijuana, drivers are more willing to drive while high and that is what is accounting for the additional fatalities overall (Cole 2018, 23). A potential issue to consider in future studies is the relative difficulty of testing whether someone is intoxicated from marijuana at the time of a blood test. Marijuana metabolizes at a slower rate than alcohol and remains in an individual's blood stream for days or weeks following their initial use of marijuana. This could overreport the number of fatalities attributed to driving under the influence of marijuana. This means law enforcement would have to rely on other ways of proving a person was intoxicated while driving, like using field sobriety tests or cognitive tests.

The prohibition of marijuana plays a part in what is called the "War on Drugs", the United States' attempt at preventing the use and distribution of illegal drugs. The "War on Drugs" was declared in 1971 by President Richard Nixon who looked to reduce the amount of drug use and trafficking within the United States. It is estimated that the United States spends $51 billion annually fighting "The War on Drugs" (Coyne and Hall 2011, 3). Enforcement of marijuana

possession laws associated with "The War on Drugs" are estimated to cost $3.6 billion annually (ACLU 2013, 22). Drug use in the United States is high, with 10.6 percent of the population having used an illegal drug in the past month (CDC 2017). The "War on Drugs" has led to a massive increase in United States incarceration numbers, from 330,000 in 1980 to 1.6 million in 2013 (Becker and Murphy 2013, 2). Drug-related criminals account for around 50% of federal inmates and 20% of state inmates in 2013 (Becker and Murphy 2013, 2). Over 700,000 of the 1,561,231 drug related arrests were attributed to marijuana in 2014 (Coyne and Hall 2011, 2). Another issue regarding arrests for drug possession is the racial discrimination associated with the arrests. Blacks in the United States are 3.73 times more likely to be arrested for possession of marijuana than whites (ACLU 2013, 17). This, combined with studies finding that blacks and whites use marijuana at similar rates, suggests there is racial bias in marijuana possession arrests. Even decriminalizing possession of small amounts of marijuana could reduce the number of drug offenders in prisons, and thus reduce the amount of money spent on prisons and the cost to the legal system when sentencing those charged with possession of marijuana.

In addition to incarcerating large numbers of Americans for drug crimes and incurring large monetary costs, the "War on Drugs" has also caused substantial damage to the Central and South American countries where much of the drugs come from. The country of Mexico has been struggling in its own drug war, with 50,000 people dying from 2007 to 2013 (Becker and Murphy 2013, 3). These deaths are from the increased violence carried out by drug cartels based in Central and South America. Drug money funds paramilitary organizations in Columbia that has led to violence and unrest. Organized crime groups have also hijacked the Columbian political process and 60 Columbian senators were eventually imprisoned due to their connections to organized crime (Useche, San Vicente, and Mercier 2019, 1). The amount of violence and

unrest due to the drug trade has led to some countries either retaliating with violence or trying different strategies like Uruguay. In 1974, Uruguay decriminalized possession of small amounts of all drugs, and in 2013 became the first country to legalize marijuana for recreational use (Robinson 2016, 1). The effects of legalization were mixed, with homicide rates going up in 2012 and 2013. 5558 pounds of illegal marijuana were seized in 2015. Seizures of cocaine and "pasta base", a crack cocaine-like substance, have decreased since 2013, suggesting Uruguay citizens have begun to use less of those drugs (Robinson 2016, 1). Despite the mixed results regarding Uruguay's legalization of drugs, it is interesting to see a country try to deal with drug use without the costs of prohibition.

The low amount of deterrence, high costs, crime, and the damage to other countries associated with the "War on Drugs" have led to calls for the United States to change its drug policy. Legalization of marijuana has appeared to reduce violent crime in Washington state, and medical marijuana laws were effective in reducing crime in states along the border of Mexico. Marijuana, like alcohol, has negative health effects. The criminalization of the substance, however, appears to have led to increased expenses; it is still consumed, and has damaged civil liberties in the United States, especially for minorities. The "War on Drugs" appears to have failed and continuing to wage it is folly.

XI.   Conclusion

As more states (as well as the nation as a whole) consider legalizing marijuana, the link between marijuana and alcohol becomes more important. If alcohol and marijuana are substitutes, it could mean fewer traffic fatalities as a result of drunk driving and a decrease in the negative effects of alcohol such as binge drinking and underage drinking; if alcohol and marijuana are complements, it could increase the negative effects of alcohol.

21

This question needs more research to be answered accurately. Much of the literature regarding the economic connection between alcohol and marijuana is dated and was written when marijuana was illegal in all states. Now there are 11 states with legal, recreational marijuana, and the research has not caught up. To accurately answer what the economic connection between alcohol and marijuana is, studies need to make use of consumption data from states with legal, recreational marijuana.

Looking at the history of alcohol and marijuana in the United States, it is clear there needs to be a change in the marijuana laws. Prohibition of alcohol is popularly regarded as a failure and often used to refute those who want to outlaw alcohol. Prohibition of marijuana has been similarly a failure, yet the substance remains outlawed at the Federal level. In both cases of prohibition, the prohibition has failed to completely deter consumption of the substance, is costly to enforce, and encouraged criminal activity. In the case of the prohibition of marijuana, we have seen civil liberties violated, injustice as blacks are arrested more often than whites for possession of marijuana, and the "War on Drugs" has damaged many countries in Central and South America. The United States should consider legalizing marijuana at the Federal level and end the folly of prohibition.

XII.   References

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