

THE POLITICAL ECONOMY  
OF MEDICAL  
MARIJUANA

by

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ABSTRACT

The purpose of this research is to provide insight into the political economy of medical marijuana laws and the role diverse interest groups play in shaping drug regulation. This research tests the claims of marijuana activists that asset forfeiture and lobbying of law enforcement groups has impeded the relaxation of marijuana regulation. This is accomplished by examining the effect of law enforcement collective bargaining and the proportion of seized assets returned to law enforcement agencies on the passage of medical marijuana laws between 1990 and 2010.

## INTRODUCTION

Marijuana regulation in the United States has evolved significantly since marijuana was first criminalized in the 1930s. In the 1970s, punishments for marijuana possession were somewhat relaxed and the potential for marijuana as a medicine was first explored. Medical marijuana laws (MMLs) were originally proposed in the 1970s, and the first laws were passed at the state level in the mid 1990s. Individual states continue to adopt new MMLs and to modify their existing laws. The stated purpose of medical marijuana laws is to allow ill patients access to a substance that may increase their quality of life. In practice, MMLs may also provide easier access to recreational marijuana and protection from legal repercussion. From this perspective, MMLs represent a step towards legalization of recreational use by the general public.

The purpose of this research is to provide insight into the political economy of medical marijuana laws and the role diverse interest groups play in shaping drug regulation. There has been minimal work examining the political economy of medical marijuana. Investigating the political economy of medical marijuana may provide insight into the states most likely to adopt MMLs, as well as those states that are likely to legalize general consumption. Marijuana activists commonly claim that prohibition generates funding for law enforcement agencies, the judicial system and the prison system. They further claim that such funding is used to perpetuate prohibition.<sup>1</sup> A goal of this research is to examine these claims and see if they are supported by empirical evidence.

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<sup>1</sup>Activist groups including the National Organization for the Reform of Marijuana Laws (NORML) and the Marijuana Policy Project (MPP) have made this claim.



Asset forfeiture is the most direct mechanism by which police agencies can influence their own funding levels. It allows for the seizure of assets suspected to be used for or gained from illegal activity. Depending on the relationship between marijuana use and crime, asset forfeiture laws could be an tool for reducing crime while providing funding for law enforcement; they could also serve to increase police budgets while diverting resources from enforcement of other crime. Potentially important asset forfeiture is of little importance if law enforcement groups do not wield political power. Groups such as the International Association of Chiefs of Police have regularly expressed opposition to medical marijuana and praised asset forfeiture as a method for preventing black market distribution of medical marijuana. Marijuana arrests account for approximately 5 percent of all arrests that occur in the United States. Asset forfeiture from marijuana accounted for approximately one billion dollars out of six and a half billion dollars from all drug forfeiture between 2002 and 2012 (Elinson, 2014). The importance of asset forfeiture varies among different types of police agencies, with specialized drug task forces taking in more asset forfeiture proceeds than others.

This research investigates the determinants of state-level adoption of medical marijuana laws between 1990 and 2011. Special attention is paid to asset forfeiture and the potential political power of law enforcement groups. Beyond these right-hand-side variables of interest, the history of medical marijuana regulation in the state, demographics, political characteristics of the state, and the decisions of neighboring states are considered. Linear probability, logistic probability and proportional hazard models are used to estimate the effect of these variables on the probability of a state adopting a MML

in any given year. These analyses find that asset forfeiture and the preexisting unionization of law enforcement have no effect on the probability of a state adopting a MML.

This thesis is organized as follows: Chapter II provides background; Chapter III introduces the conceptual framework along with a brief history of medical marijuana; Chapter IV describes the empirical methods and data; results are presented in Chapter V; Chapter VI concludes.

## BACKGROUND

### Marijuana Regulation

Medical marijuana laws went through many iterations before the current laws were adopted. When marijuana was first criminalized in the 1930s, there were few effective marijuana activists. Bills to legalize marijuana will appear on the ballot in at least four states during 2014 and a federal bill is currently in committee. The path of marijuana regulation in the United States from the 1930s to the present is described below.

Prior to 1932, marijuana was unregulated in the United States. State-level prohibition of marijuana began with an optional provision to enact prohibition of marijuana in the federal Uniform Narcotic Drug Act of 1932. This act was developed by the National Conference of Commissioners on Uniform State Laws. By 1937, every state had prohibited marijuana use, either through adoption of the Uniform Narcotic Drug Act or through similar legislation. The Marihuana Tax Act was adopted by Congress in 1937 leading to prohibition at the federal level and uniform prohibition at the state level. The Marihuana Tax Act criminalized the possession and transfer of cannabis in the United States, with exceptions and excise taxes for medical and industrial use. There was no widespread distribution of medical marijuana during this time. The accompanying regulations and punishments for violation of the Marihuana Tax Act suggest that the goal of the act was to stop marijuana consumption rather than raise revenue. A one dollar tax on each transaction for those who dealt with marijuana medically or commercially was levied, and violation of the act earned a 2,000 dollar fine or five years imprisonment. The

Secretary of the Treasury granted regulatory and enforcement powers to the Commissioner of the Bureau of Narcotics and his agents. Harry Anslinger, the Bureau's first commissioner, ensured that reporting and disclosure requirements were rigorous.<sup>2</sup>

The Controlled Substances Act of 1970 established the drug schedules that are still in place today. The drug schedules are intended to rank the danger and potential medical use of various substances. The penalties for possession and distribution are also determined by the schedule designation a drug is assigned. Marijuana is a Schedule I substance because the DEA considers it to have, “no currently accepted medical use in the United States, a lack of accepted safety for use under medical supervision, and a high potential for abuse.”<sup>3</sup> As the schedule number increases, the potential medical value increases and the potential for abuse decreases, which implies that marijuana is classified as one of the most dangerous drugs with the least potential medical benefit.<sup>4</sup>

Marijuana was initially placed into Schedule I on a provisional basis with possible rescheduling awaiting the conclusions of the National Commission on Marijuana and Drug Abuse.<sup>5</sup> This commission was established by the Comprehensive Drug Abuse Prevention and Control Act of 1970 to investigate “the nature and scope of use, the effects of the drug, the relationship of marijuana use to other behavior and the efficacy of existing law.” The commission concluded, “Society should seek to discourage use [of marijuana],

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<sup>2</sup>U.S. House. 75th Congress, H.R. 6906, Marijuana Tax Act. Washington: Government Printing Office, 1937.

<sup>3</sup>Heroin, lysergic acid diethylamide (LSD), 3,4-methylenedioxy-N-methylamphetamine (MDMA), and N,N-dimethyltryptamine (DMT), are also Schedule I, while cocaine, methamphetamine and methadone are Schedule II substances, ketamine, and anabolic steroids are in Schedule III, and Xanax, Valium and Ambien are in Schedule IV.

<sup>4</sup>21 U.S.C §812(b)(1)(AC)

<sup>5</sup>This commission is commonly referred to as the “Shafer Commission.”

while concentrating its attention on the prevention and treatment of heavy or very heavy use. The Commission feels that the criminalization of possession of marijuana for personal use is socially self-defeating as a means of achieving this objective.” The Commission defined and recommended the decriminalization of marijuana, where decriminalization meant the removal of criminal penalties for personal use or casual sale.<sup>6</sup>

The Nixon administration did not implement these recommendations. Instead, in 1973 they combined the Bureau of Narcotics and Dangerous Drugs and the Office of Drug Abuse Law Enforcement to create the Drug Enforcement Administration (DEA). The DEA is the primary agency responsible for enforcing federal drug laws. The DEA is aided by the Department of Justice (DOJ) for prosecutions. The DEA works with state and local police agencies as well as special purpose drug task forces. Drug task forces are multi-jurisdictional agencies created to combat drug distribution and production in an area spanning multiple jurisdictions. The introduction of marijuana as medicine posed a new challenge to drug enforcement agencies.

The first medical marijuana patient in the United States was Robert Randall. He successfully defended himself using a medical necessity defense after being arrested in 1976.<sup>7</sup> The federal government removed his access to marijuana two years later, after which he again successfully sued the federal government and received government grown marijuana for the rest of his life. Randall’s court cases led to the creation of the federal Investigational New Drug (IND) program, and spurred the state-level Therapeutic Research Programs (TRPs) that first appeared in the late 1970s.

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<sup>6</sup>National Commission on Marijuana and Drug Abuse, 1972, pg. 167

<sup>7</sup>United States v. Randall, Super-Ct. D.C. Crim. No. 65923-75

TRPs were the first officially sanctioned state-level attempts to provide marijuana to sick patients. Individual doctors could attempt to gain permission to use marijuana in research, or states could obtain the permission for multiple doctors and patients. The barriers to access for doctors and patients were significant, and as with all Schedule I drugs the doctor must be licensed by the DEA to handle the drug, the Federal Drug Administration (FDA) must approve the research protocol, and a supply of the drug must be obtained from the National Institute on Drug Abuse (NIDA). Only seven of the 26 states with TRPs succeeded in delivering marijuana or synthetic THC to patients, and most programs served small numbers of patients. In this analysis TRPs are used as an indicator of existing political support for medical marijuana. The presence of a TRP in a state indicates a previously organized constituency that supports medical marijuana. An operational TRP provides evidence of a stronger lobbying effort, as well as potential allies in state governmental agencies.

A number of states have reduced the penalties for marijuana possession while preserving the severity of the offense. This is not technically decriminalization and is referred to as depenalization (Pacula et al., 2003). While important from a legal perspective and of great importance to those charged with marijuana possession, the practical effects of decriminalization and depenalization are similar. Both reduce the penalties to marijuana consumption and will be referred to as decriminalization in this research.

Between 1978 and 1996, 34 states and the District of Columbia passed laws favorable to medical marijuana, but none of these laws were effective at providing

marijuana to patients. Arizona passed a MML in 1996, however, it required a physician to prescribe marijuana to a patient. As marijuana is illegal at the federal level, pharmacists did not have access to it and could not legally distribute it. California passed the first effective MML in 1996 via Proposition 215, requiring that physicians “recommend” medical marijuana to a patient rather than prescribe its use. California allowed patients to cultivate marijuana themselves. Medical marijuana activists present MMLs as a method by which severely ill patients can increase their quality of life. Management of pain, nausea and appetite are common justifications for legalizing medical marijuana.

There is a single previous study examining the political economy of medical marijuana. Crawford (2013) provides a detailed examination of the medical marijuana market in Oregon, and describes the broad political forces shaping marijuana policy in the United States. He uses a Cox Proportional Hazard model to examine the likelihood of a state adopting a medical marijuana law, finding that *Democratic status* is the only consistently significant independent variable.<sup>8</sup>

Crawford (2013) finds single issue ballot measures and a history of voting Democratic to be significant components of a state passing a MML. Republican states are found to be more likely to approve a medical marijuana initiative if dispensary regulations are included than if there are no dispensary regulations. Besides party affiliation, the right-hand-side variables he includes are as follows: population, proportion white, per-capita income, proportion with at least a Bachelors degree, number of plants eradicated by the DEA, and if a bordering state has adopted a MML.

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<sup>8</sup>*Democratic status* is defined as a state voting democratic in three of the last four presidential elections.

The primary problem with Crawford's analysis arises from including the number of plants eradicated by the DEA. The number of plants eradicated is not necessarily related to support for medical marijuana in a state, political opposition, or the amount of drug enforcement in the state. Cross state comparisons are difficult with DEA eradication data due to the two main forms of marijuana production, indoor and outdoor. For a given quantity of marijuana produced over a one-year period, the number of plants likely to be seized by the DEA is greater for outdoor grows than indoor grows because finding outdoor plants is also typically easier than finding indoor plants. Helicopters and thermal imaging can be used to identify and destroy illegal outdoor grows without a warrant or arrest of a producer. Indoor grows can be identified through thermal imaging, but destruction of marijuana relies on identifying an informant or other source of probable cause to enter the grow site.<sup>9</sup> Busts of indoor grows are typically coupled with arrests, while outdoor busts may occur without any criminals present. It is likely, although not definitive, that busts of outdoor grow sites lead to a greater number of marijuana plants eradicated.

Eradication of ditchweed was recorded separately by the DEA until 2006, after which ditchweed was included in the outdoor plants eradicated category.<sup>10</sup> Ditchweed accounted for a significant proportion of outdoor marijuana cultivation between 1990 and 2006, leading to overestimation of outdoor marijuana plants eradicated after 2006. The number of plants eradicated in a state has as much to do with geography and climate as opinions surrounding marijuana regulation. Coupled with changes in data reporting practices, DEA eradication data are not an accurate measure of enforcement effort.

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<sup>9</sup>533 U.S. 27, 121 S. Ct. 2038, 150 L. Ed. 2d 94, 8 ILRD 37 (2001)

<sup>10</sup>Ditchweed is wild cannabis with minimal THC levels.



### Dispensaries

Marijuana distribution and production regulations are important differences between states' medical marijuana laws. Medical marijuana can be grown by individuals, typically known as caregivers, or sold by licensed storefronts, known as dispensaries. Beyond the probability of adoption, this analysis will consider the likelihood of a state having dispensaries in existence and the legal status of dispensaries. Early adopting states generally had quasi-legal dispensaries before dispensaries were formally legalized.<sup>11</sup> Later adopting states often passed MMLs with provisions regulating the distribution of medical marijuana.

Dispensary regulations were not included in California's initial law, but storefronts selling medical marijuana appeared within a year. Washington, Oregon, and Alaska followed California's lead and passed similar MMLs in 1998. Between 2007 and 2009 minimally regulated dispensaries began appearing in states other than California. The proliferation of these quasi-legal businesses prompted subsequent states to regulate distribution and sales. New Mexico was the first state to regulate dispensaries in the initial law (passed in 2007), while still allowing home cultivation. The first MML passed by a legislature occurred in Hawaii in 2000. Subsequently the majority of MMLs were adopted by legislatures rather than through ballot initiatives.<sup>12</sup> See table 1 for detailed information on each state's MML. This table provides a timeline of changes in marijuana regulation. It includes the year a Therapeutic Research Program was enacted and the year it was

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<sup>11</sup>Early adopting states are those with a medical marijuana law before 2000.

<sup>12</sup>A significant fraction of states whose legislatures passed MMLs lack an initiative process entirely.

repealed. A TRP is considered effective if it delivered marijuana to at least one patient. The year a MML was adopted and the method of passage is indicated. ‘Chronic’ indicates that chronic pain is an accepted medical condition, while ‘home’ indicates that home cultivation is allowed. The year dispensaries were legalized and the year they first appeared are also noted. Similar to the first MMLs, the next stage in marijuana de-regulation was enacted by ballot initiative. Colorado and Washington both legalized recreational use of marijuana in 2012, and Colorado began retail sales on January 1, 2014.

Early medical marijuana laws did not regulate the production, distribution or sale of medical marijuana. These laws typically included provisions for caregivers rather than storefront dispensaries. Caregivers are characterized by medical marijuana advocates as a spouse, sibling, or benevolent stranger growing small amounts of marijuana while providing marijuana and dose management for someone who is too sick to grow their own. States determine the number of patients a caregiver can serve. In most states patients may only have a single caregiver at a time.<sup>13</sup> The number of plants a caregiver is allowed to cultivate is determined by the number of patients they serve. Presumably, some of the marijuana not consumed by patients is diverted to the black market, either through dispensaries selling directly to dealers or patients purchasing for friends.

Quasi-legal dispensaries arise most often when there is no limit on the number of patients a caregiver can serve. Caregivers running these quasi-legal dispensaries often serve hundreds of patients and operate out of a storefront. Perhaps the most creative quasi-legal dispensaries existed in Washington State, where caregivers were limited to

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<sup>13</sup>The single exception to this rule is Rhode Island.

serving one patient at a time. This was interpreted literally, patients would sign up with a caregiver for a few moments as they purchased their marijuana and then remove the caregiver after the purchase was complete. This legal gray area was closed by the Washington State Legislature on July 22, 2011 when SB 5073 (HB 1100) removed this loophole.<sup>14</sup>

Legal dispensaries are licensed, regulated and limited in number by state governments. Some states allow dispensaries to grow their own marijuana, others license producers as well or allow dispensaries to purchase marijuana from patients who operate smaller grows. A few states (e.g., Arizona) allow patients to grow their own if they live sufficiently far from dispensaries.

### Asset Forfeiture

Civil asset forfeiture is a legal action taken against property.<sup>15</sup> The initial United States forfeiture statutes were passed by the first United States Congress and served to enforce piracy and customs laws. These laws were upheld by the Supreme Court due to the difficulty of obtaining jurisdiction over property owners. Asset forfeiture law saw minimal use and remained broadly unchanged until the 1980s. There was one major exception to this trend: asset forfeiture was used during alcohol prohibition against vehicles transporting liquor. In 1984 Congress amended the Comprehensive Drug Abuse Prevention and Control Act of 1970 allowing asset forfeiture proceeds to be used for law

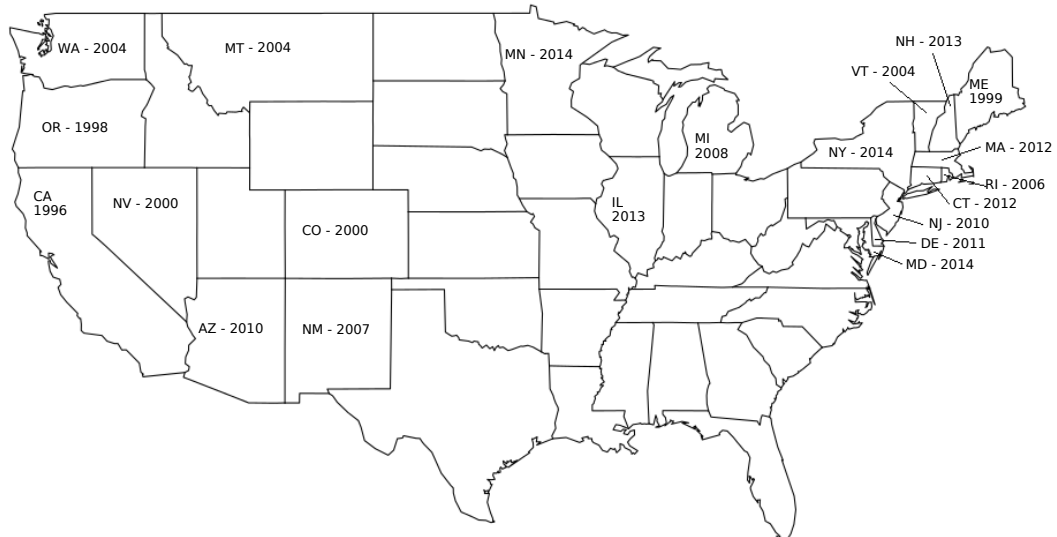
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<sup>14</sup>Governor Christine Gregoire selectively vetoed the portions of SB 5073 that explicitly allowed and regulated dispensaries.

<sup>15</sup>Civil, rather than criminal, asset forfeiture laws are used in this paper. Civil asset forfeiture laws are used more often because they do not require a criminal conviction.

enforcement purposes. In 2000, the Civil Asset Reform Act amended federal forfeiture law but did not change the distribution of forfeiture proceeds. State law has broadly followed federal law, with individual states differing in the proportion of seized assets returned to law enforcement and the standards of proof required.

Figure 1: Medical Marijuana Adoption Dates



This figure presents the year in which each state adopted a MML, unlabeled states have not adopted a MML.

Table 1: Characteristics and Timing of Medical Marijuana Laws

	1970 – 1980	1981 – 1990	1991 – 2000	2001 – 2014
State				
AL	1979: TRP – Ineffective			
AK	1975: Personal Consumption Legalized	1982: TRP – Ineffective	1998: MML – Initiative (Home, Chronic)	
AZ	1980: TRP – Ineffective	1985: TRP – Repealed	1996: Decriminalized	2010: MML – Initiative
AR				
CA	1976 Decriminalized 1979: TRP – Effective	1989: TRP – Repealed	1996: MML – Initiative (Home, Chronic, Dispensaries Exist)	2004: (Dispensaries Legal)
CO	1979: TRP – Ineffective		2000: MML – Initiative (Home, Chronic)	2007: (Dispensaries Exist) 2010: (Dispensaries Legal) 2012: General Legalization
CT				2012: MML – Legislature (Dispensaries Legal)
DE				2011: MML – Legislature (Chronic, Dispensaries Legal)
DC			1998: MML – Initiative	2010: MML In Effect (Dispensaries Legal) 2013: (Dispensaries Exist)
FL	1978: TRP – Ineffective	1984: TRP – Repealed		
GA	1980: TRP – Effected			
HI			2000: MML – Legislature (Home)	
ID				
				Continued on next page

Table 1 – continued from previous page

State	1970 – 1980	1981 – 1990	1991 – 2000	2001 – 2014
IL	1978: TRP – Ineffective			2013: MML – Legislature (Chronic, Dispensaries Legal)
IN				
IA	1979: TRP – Ineffective	1987: TRP – Repealed		
KS				
KY				
LA	1978: TRP – Ineffective	1989: TRP – Repealed		
ME	1976: Decriminalized 1979: TRP – Ineffective	1987: TRP – Repealed	1999: MML – Initiative (Home)	2009: (Dispensaries Legal) 2011: (Dispensaries Exist)
MD				
MA			1991: TRP – Ineffective	2012: MML – Initiative (Home, Dispensaries Legal)
MI	1976: Decriminalized 1979: TRP – Effective	1987: TRP – Repealed		2008: MML – Initiative (Home, Chronic) 2010: (Dispensaries Exist)
MN	1976: Decriminalized 1980: TRP – Ineffective			
MS	1977: Decriminalized			
MO				
MT				2004: MML – Initiative (Home, Chronic) 2009: (Dispensaries Exist)
NE	1978: Decriminalized			
NV	1979: TRP – Ineffective		2000: MML – Initiative (Home, Chronic)	2005: TRP – Repealed 2010: (Dispensaries Exist)
				Continued on next page

Table 1 – continued from previous page

State	1970 – 1980	1981 – 1990	1991 – 2000	2001 – 2014
NH				2013: (Dispensaries Legal) 2013: MML – Legislature (Chronic, Dispensaries Legal)
NJ		1981: TRP – Ineffective		2010: MML – Legislature (Home, Chronic, Dispensaries Legal) 2012: (Dispensaries Exist)
NM	1978: TRP – Effective			2007: MML – Legislature (Home, Chronic, Dispensaries Legal) 2009: (Dispensaries Exist)
NY	1977: Decriminalized 1980: TRP – Effective			
NC	1977: Decriminalized			
ND				
OH	1975: Decriminalized 1980: TRP – Ineffective	1984: TRP – Repealed		
OK				
OR	1973: Decriminalized 1979: TRP – Ineffective		1998: MML – Initiative (Home, Chronic)	2010: (Dispensaries Exist) 2014: (Dispensaries Legal)
PA				
RI		1981: TRP – Ineffective		2006: MML – Legislature (Home, Chronic) 2009: (Dispensaries Allowed)
				Continued on next page

Table 1 – continued from previous page

State	1970 – 1980	1981 – 1990	1991 – 2000	2001 – 2014
				2013: (Dispensaries Exist)
SC	1980: TRP – Ineffective			
SD				
TN		1981: TRP – Effective		
TX	1980: TRP – Ineffective			
UT				
VT				2004: MML – Legislature (Home, Chronic) 2011: (Dispensaries Legal) 2013: (Dispensaries Exist)
VA				
WA	1979: TRP – Effective			2004: MML – Initiative (Home, Chronic) 2009: (Dispensaries Exist) 2012: General Legalization
WV	1979: TRP – Ineffective		1997: TRP – Repealed	
WI				
WY				

This table provides a timeline of changes in marijuana regulation in the United States. MML indicates the passage of a medical marijuana law and the method of passage, the effective date is noted if it lagged adoption by a significant period; TRP indicates the passage of a therapeutic research program, it is considered effective if the program ever delivered marijuana to a patient; ‘Home’ indicates home cultivation is allowed; ‘Chronic’ indicates chronic pain is an allowed medical condition; the year in which dispensaries first appeared, and the year they were legal are noted.



## CONCEPTUAL FRAMEWORK

Positions on adoption of a Medical Marijuana Law depend on a large number of relationships that are uncertain. At this time, the relationship between MMLs and consumption of marijuana is unknown. This analysis will assume some portion of illegal consumption will become legal. The other critical relationship is between marijuana consumption and crime. Marijuana consumption could directly cause crime, or influence crime rates through an indirect mechanism. The net effect of increased marijuana consumption on crime is uncertain. The final important relationship is the importance and magnitude of asset forfeiture in police budgets. All of these relationships are discussed in detail below.

### Interest Groups

Three major interest groups are concerned with changes to marijuana regulation: voters who are consumers of marijuana, voters who are not consumers and law enforcement groups. The aggregation of these interests groups leads to ambiguous predictions regarding the role asset forfeiture plays in the adoption of MMLs. The relationship between marijuana and crime and the importance of asset forfeiture proceeds in the law enforcement objective function introduce further uncertainty in the adoption of MMLs.

In general, voters are presumed to prefer lower taxes and lower levels of crime. It is assumed that marijuana consumers prefer lower risk of arrest and easier access to marijuana. The position of voters who are not consumers is ambiguous. Some voters may dislike marijuana consumption on principle, perhaps hoping to prevent increased consumption by others with their position against medical marijuana laws. Those voters who are not deciding based on principle will likely base their decision on the relationship between marijuana and crime.

It is uncertain if illegal marijuana consumption is a substitute or complement to other forms of crime. Anderson et al. (2013) find that medical marijuana laws lead to a reduction in the prevalence of traffic fatalities. Their research suggests that drunk driving is reduced in states with a MML, but this does not provide a definitive relationship between marijuana and crime. Increased marijuana consumption could still lead to increased crime, either through a direct effect of the drug on users' behavior, or through increased property crime to fund a user's addiction. If marijuana and crime are complements then non-consuming voters will oppose medical marijuana laws. In this case, the hope is that opposing a MML will reduce crime rates, or avoid an increase in taxes to fund more police enforcement. Those holding this position believe that marijuana consumption, directly or indirectly, leads to more crime and more law enforcement expenditures. If voters who are not consumers believe that marijuana and crime are substitutes, then they are expected to support MMLs. If this is true, then adopting a MML will reduce crime, while freeing a portion of law enforcement budgets for other purposes.

Benson et al. (2001) examine the changes in non-drug crime rates using county level data from Florida from 1984 to 1989. They find that as drug crime enforcement increases, non-drug crime increases, particularly property crimes. A similar study in Illinois (Benson et al., 1992) found that increased drug enforcement led to a decrease in traffic control and a corresponding increase in traffic fatalities. The 1984 to 1989 study examines data from a time when drug arrests were rapidly increasing while the later study was conducted when drug arrests were slightly decreasing. Both studies found increases in non-drug crimes as a result of the increased drug enforcement activities. Though not definitive, this research suggests that drug enforcement is not fully funded through asset forfeiture and represents a real opportunity cost for law enforcement agencies. If drug enforcement was fully funded through asset forfeiture, then non-drug crime is expected to

be unaffected by increasing drug enforcement.

Law enforcement groups may care about the overall level of crime, the level of illegal marijuana consumption and their funding levels. Law enforcement may be able to influence their funding through asset forfeiture activities. The greater the level of drug crime the more opportunities for asset forfeiture, potentially leading to an endogenous budget. The position of law enforcement groups regarding medical marijuana laws depends on their presumed objective.

If a law enforcement agency seeks to maximize public safety, and cannot influence their budget, then their predicted position depends on the relationship between marijuana consumption and crime as well as the response of governments to changing crime rates. The adoption of a MML is assumed to shift a portion of illegal marijuana consumption to legal consumption, reducing the demand for marijuana enforcement. This will lead to a reduction in the demand for law enforcement services, potentially resulting in lower levels of funding. If law enforcement groups do not expect funding levels to be reduced, then they will support MMLs, if they do expect funding levels to be reduced then they will have no position on MMLs. Total marijuana consumption is assumed to remain at a similar level so the direct effect of marijuana on crime should not change. If funding is not adjusted in response to lower crime rates due to the adoption of MMLs then law enforcement groups will utilize the extra funding to increase public safety. If funding is reduced in response to the effects of a MML then the lower levels of funding and the lower levels of crime should offset each other, leading to no effect on the overall level of public safety.

The existence of asset forfeiture laws allows law enforcement agencies a measure of control over their own budgets. If law enforcement budgets are endogenous with respect to the agency's enforcement decisions then the predicted position of law enforcement groups depends on the levels of asset forfeiture. If asset forfeiture proceeds

from marijuana enforcement are greater than the cost of marijuana enforcement, law enforcement agencies are expected to oppose MMLs. The shift from illegal to legal consumption will reduce the funding in excess of costs obtained from marijuana enforcement, leading to lower levels of public safety. In this situation enforcing marijuana law leads to a net benefit in police budgets allowing them to take on other law enforcement activities. Hoping to preserve this funding in order to increase public safety, law enforcement organizations will oppose MMLs.

On the other hand, if asset forfeiture proceeds obtained from marijuana enforcement do not cover marijuana enforcement costs then law enforcement groups are predicted to support MMLs. In this scenario marijuana enforcement is a net drain on law enforcement budgets. Shifting illegal consumption to legal consumption will reduce the potential asset forfeiture proceeds from marijuana enforcement, leading to reduced funding and lower levels of public safety. In this situation law enforcement groups are also expected to support full legalization of marijuana. LEAP (Law Enforcement Against Prohibition) is an example of a law enforcement group that supports medical marijuana and legalization.

It is entirely plausible that asset forfeiture plays a more or less important role in different states during different times. The importance of asset forfeiture is likely related to the overall level of crime in a state, as well as the potential for seizures. For example, Wyoming has an extremely high per-capita asset forfeiture level due to its location along the Interstate 80 and Interstate 90 smuggling routes.

Baicker and Jacobson (2007) provide evidence that law enforcement agencies do consider asset forfeiture proceeds in their decision making. They also find that these proceeds are partially offset by reductions in other budget sources. County governments reduce their allocations to police budgets in response to profitable seizures, despite this being prohibited by statute in most states. Police in turn respond to the net incentives

(their portion of seized assets less local government offsets) by seizing more assets in localities with more generous incentives. Agencies in these areas also focus on the most profitable enforcement activities.

Baicker and Jacobson (2007) find that for each dollar local police seize through the federal DOJ Equitable Sharing program, county allocations are reduced by a dollar.<sup>16</sup> County allocations are not fully offset for seizures made through state asset forfeiture programs. Normally, the funds diverted from local police flow to other criminal justice programs, although during periods of fiscal stress the diverted funds are used to increase public welfare spending. State and local governments typically receive a share of the proceeds when assets are forfeited under the state program, and local governments may be attempting to punish police agencies that use the federal equitable sharing program rather than the state program.

Baicker and Jacobson (2007, pg. 22) conclude that, "...localities in states with higher statutory sharing make more drug arrests per capita, this effect holds only where budgetary reductions are not used to offset seizures." They find this effect not only for total drug arrests, but also for drug arrests as a proportion of index crime arrests.<sup>17</sup>

Baicker and Jacobson (2007) provide evidence that police agencies respond to the incentives asset forfeiture distribution laws create. In localities with generous asset forfeiture laws, police shift their efforts to drug crime enforcement and towards the most profitable drug busts. This change in policing priorities suggests that law enforcement groups objective is to maximize their budget rather than solely focusing on increasing public safety. If law enforcement agencies sought to maximize public safety then there should not be any differences between agencies with generous and stingy asset forfeiture laws. A formal theory of budget maximizing government agents is presented by Niskanen

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<sup>16</sup>The DOJ Equitable Sharing program typically returns 80 percent of seized assets to the seizing agency or agencies.

<sup>17</sup>Index crimes include: homicide, forcible rape, robbery, burglary, aggravated assault, larceny, motor vehicle theft and arson.

(1975). It is plausible that bureaucrats maximize their budget, as their salary and status depend on the budget they command. In Niskanen's initial theory bureaucrats did not always maximize their utility, nor did their behaviors lead to the conditions necessary for an equilibrium between the output desired by the government and the output desired by the bureau itself (Niskanen, 1975, pg. 618). His theory is expanded upon by Migue and Belanger (1974).

Migue and Belanger (1974) propose that bureaucrats maximize their discretionary budget, rather than total budget. Discretionary budget is defined as the difference between the total budget and the minimum cost of providing the expected services. It is important to recognize that the bureaucrats themselves are best positioned to know the true cost of providing a given level of service, and that monitoring by an external party is costly. A large discretionary budget allows administrators and employees to enjoy both higher status and higher compensation. If law enforcement groups' objective is to maximize their budget they will oppose MMLs, in order to prevent illegal marijuana consumption becoming legal consumption.

## EMPIRICAL METHODOLOGY AND DATA

This research is primarily intended to investigate the relationship between asset forfeiture, police unionization and the passage of medical marijuana laws. When the influence of all interest groups is aggregated, no definite predictions can be made. A large constituency of consumers may not lead to increased support for MMLs. The effect of an increase in the number of marijuana consumers depends on how other voters view medical marijuana patients and their opinions on the relationship between marijuana and crime. Further ambiguity is introduced by the different objectives law enforcement groups could be pursuing. Despite these reservations, the empirical methodology is presented below.

The baseline regression is:

$$Y_{it} = \mathbf{X}_{it}\boldsymbol{\beta} + e_{it},$$

where the  $i$  subscript indicates individual states and the  $t$  subscript indicates years. For regressions investigating the presence of medical marijuana laws,  $Y_{it}$  takes on the value of one if the  $i$ th state approved a MML in year  $t$  or any previous year, otherwise  $Y_{it}$  is equal to zero. The vector  $\mathbf{X}_{it}$  includes all independent variables. These variables are listed in table 2. The idiosyncratic error term is denoted  $e_{it}$ . All variables are observed once in each state-year combination. All 50 states are observed between 1990 to 2011. Only the District of Columbia is excluded. A MML was passed there in 1998, but implementation was delayed until 2010. Dependent variables are described in table 3 and summary statistics are presented in table 4.

In addition to the adoption of a MML the method of distribution is also investigated. The existence of dispensaries and the legality of dispensaries are considered in separate regressions. These characteristics of distribution do not necessarily overlap as expected. Some states have legalized dispensaries but do not yet have any open storefronts. Storefronts selling marijuana to patients exist in many states before they are

explicitly legal. This is especially common in states that passed a MML before 2000. These storefronts are considered dispensaries in this analysis because they provide similar access to marijuana as fully legal dispensaries. Consumers who purchase from these quasi-legal dispensaries do not face an increased risk of arrest compared to fully legal dispensaries. States that recently adopted a MML often legalize dispensaries in the initial law, but have not yet determined the specific regulations or have not issued licenses. In these regressions  $Y_{it}$  is equal to one if dispensaries exist or are legal, and equal to zero otherwise.

Two approaches are taken to evaluate the relationships discussed in the Conceptual Framework chapter. The first utilizes typical panel data methods, including state and year fixed effects, to account for inherent differences between states and yearly shocks common to all states. The second is a hazard model, which yields the probability of a MML being enacted in any state in a given year, conditional on the state not adopting a MML up to that point. Both of these approaches will treat MMLs as if they are identical. In reality there is significant heterogeneity across laws. A major source of heterogeneity comes from differences in the regulation of dispensaries. The existence and legality of dispensaries are investigated using fixed effect linear regressions conditioning on the existence of a MML in each state-year. An important consideration in all regressions is the permanence of MMLs. The Montana legislature successfully passed a repeal bill, but it was vetoed by the governor.<sup>18</sup> The longest delay occurred in Washington D.C. where the legislature successfully prevented the implementation of its MML for more than a decade. Inherent to Cox proportional hazard models is the assumption that once a law has been passed it cannot be repealed. After a state has passed a MML, that state is removed from the dataset. The fixed effects model will utilize two regressions, one in which a state is removed from the dataset after a MML is passed and one in which all state-year

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<sup>18</sup>A subsequent bill significantly limited the medical marijuana industry in Montana. The most restrictive portions of this bill are currently under injunction.



observations are preserved.

### Independent Variables

The passage of new laws is influenced by a variety of forces, ranging from broad demographic shifts to the force of individual personalities. Independent variables are selected to capture important demographics trends, the influence of law enforcement and the political landscape in each state. Summary statistics for all independent variables are presented in table 5.

Asset forfeiture variables are chosen to capture the potential profit motive created by forfeiture proceeds at the level of an individual agency. State laws concerning civil asset forfeiture vary along multiple dimensions. This research focuses only on the distribution of proceeds rather than the procedures followed, standards of proof, or innocent owner defenses. If the civil asset forfeiture procedures differ between drug and non-drug statutes, then the drug statutes were used. Asset forfeiture distributions are disaggregated into the proportion of proceeds flowing to four separate categories. These categories are: first the seizing agency (or agencies), second the prosecutor, defense attorney, and county or local state's attorney, third the state attorney general, and finally statewide crime funds. The total of these categories is also calculated, while the remaining funds flow to non-law enforcement uses.<sup>19</sup> These categories are chosen based on the amount of influence the distribution could have on a law enforcement agency deciding between crimes to investigate. It is assumed that funds returned directly to the seizing agency influence that agency's decisions more than funds flowing to a state-wide asset forfeiture fund. The proportion of proceeds returned to the seizing agency is the only forfeiture variable specified in a majority of state statutes. Only results using *% to Seizing Agency* are presented based on this data limitation.<sup>20</sup>

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<sup>19</sup>Non-law enforcement uses typically include education funds, general funds, or drug treatment programs.

<sup>20</sup>Results using the proportion returned for any law enforcement use are similar. The other categories lack

Baicker and Jacobson (2007) also use measures of the profit motive created by asset forfeiture laws.<sup>21</sup> The other main source for asset forfeiture information is Edgeworth (2008), who provides details on state statutes in 2007. These data are verified with state statutes, and changes to distribution procedures are identified. When state statutes do not specify distribution procedures, supplementary data are gathered through phone conversations with state Attorney Generals' offices.

Using the actual amount of asset forfeiture funds distributed to seizing agencies is preferable, but reliable data are not collected by law enforcement. The Law Enforcement Management and Administrative Statistics (LEMAS) survey asks individual law enforcement agencies the dollar amount of assets seized due to drug crime. Unfortunately, this question is first asked in 1997, one year after the first MML was adopted. The LEMAS survey only includes information on the dollar amount seized rather than the amount returned to the agency. State statutes are more reliable and provide a better comparison between states and across time than the LEMAS survey data.

States in which law enforcement agencies are already organized are expected to be more effective at lobbying because some of the organizational costs have already been incurred. The LEMAS survey asks police agencies with greater than 100 full-time equivalent sworn employees if they have a collective bargaining agreement with their sworn officers. The proportion of agencies reporting a collective bargaining agreement is calculated and used as a proxy for the strength of police unions in that state. The LEMAS survey is conducted every three to four years, and the collective bargaining question is asked in each survey between 1987 and 2007. Values for *% Collective Bargaining* for years in which the question is not asked are assumed to be equal to the latest observation, because the variation across time within a state is small relative to the variation between states.

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sufficient observations to be interesting.

<sup>21</sup>Jacobson was kind enough to share the data used in Baicker and Jacobson (2007).

Several right-hand side control variables are included to capture demographic trends, the political landscape, the level of crime, and the success of previous medical marijuana activists. Previous research investigating the political economy of medical marijuana laws only found a history of voting democratic to be significant (Crawford, 2013). Preliminary regressions of the present analysis indicate that including *Democratic Status* does not lead to different results than including *Democrat Unified* and *Republican Unified*.<sup>22</sup> *Republican Unified* and *Democrat Unified* are indicator variables, taking on the value of one if the respective party controls both the legislature and Governor's house.<sup>23</sup> These data are obtained from Carl Klarner a political scientist at Indiana State University.

The behavior of neighboring states is important due to the potential spillover of medical marijuana into neighboring states. It is unclear if increased availability of medical marijuana in a neighboring state will increase or decrease the propensity of a state to adopt a MML. Neighboring states with MMLs provide examples of effective, or ineffective, laws. Knight and Schiff (2010) show that citizens base their lottery buying decisions on the opportunities available in neighboring states. This effect may hold for illicit markets as well. While cruder than the measure Knight and Schiff (2010) use, the presence of a neighboring state with a MML is a potentially important difference between states. *Neighbor MML* takes on the value of one if any neighboring state adopted a MML in the previous year and zero otherwise.

Support for medical marijuana laws and the behavior of law enforcement are expected to be influenced by the level of crime in a state. The direction of this effect is indeterminate. Per-capita property crime and per-capita Index One crimes are potential measures of the crime level in a state.<sup>24</sup> Preliminary regressions indicate no difference in

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<sup>22</sup>*Democratic Status* is equal to one if a state voted for the Democratic presidential candidate in three out of the four latest presidential elections, and zero otherwise.

<sup>23</sup>Nebraska has a unicameral legislature where members run without party affiliation. It is considered to never have republican or democratic unified government.

<sup>24</sup>Index One crimes include: Aggravated assault, forcible rape, murder, robbery, burglary, larceny, motor vehicle theft, and arson.

results between the two measures. Accordingly only results with *Property Crime* are presented. Property crime data are from the Uniform Crime Reports, a representative survey of law enforcement agencies conducted by the FBI that includes robberies, burglaries, larceny and motor vehicle theft.

Standard errors are clustered at the state level in all models except for the Cox proportional hazard model (Bertrand et al., 2002). Clustered standard errors account for the correlated shocks that occur within states, which are likely correlated with explanatory variables. Each state is observed once per year, so the primary concern is correlation across time in a state's outcome. Using clustered standard errors also adjusts for heteroscedasticity in the residuals. Plotting residuals from an OLS regression against the *% Collective Bargain* variable indicates larger variation in the residuals as *% Collective Bargain* approaches 100 percent. The minimum variation occurs between 40 and 60 percent, with a slight increase as *% Collective Bargain* decreases. The residuals are less heteroscedastic with respect to *% to Seizing Agency*. The residuals have similar behavior when state and year fixed effects are included, as well as for logistic probability models. This situation naturally calls for a fixed effects model with clustered standard errors.

#### Fixed Effects

Fixed effects models rely on the variation within groups to estimate parameter coefficients. When state fixed effects are included the identifying variation arises from changes in independent variables across time. When year fixed effects are included the identifying variation arises from each state's deviations from a common time trend. The fixed effects regression is:

$$Y_{it} = \mathbf{X}_{it}\boldsymbol{\beta} + \alpha_i + u_t + e_{it}.$$

State fixed effects are denoted  $\alpha_i$  while year fixed effects are denoted  $u_t$ . The

vector  $\mathbf{X}_{it}$  is defined as above. Including both types of fixed effects allows a more nuanced model to be estimated. Each state has a unique political environment and history of marijuana regulation, state fixed effects will account for these and any other unobserved differences between states. While fixed effect models provide an excellent method to control for all time invariant effects, some of the variables of interest are completely or effectively time invariant. In particular *% to Seizing Agency* remains constant in a large number of states, reducing the chance of identifying a significant effect. Demographic variables are similar, remaining relatively close to the state mean through time. Minor variations from the state average in the proportion of men or the age distribution in a state are unlikely to be causal factors in the passage of a MML.

Year fixed effects allow for yearly shocks common to all states. Continuing research into the efficacy of medical marijuana and increasing acceptance of recreational use is a trend common to the entire United States. When year fixed effects are included the identifying variation comes from an individual state's deviation from the national time trend. Including both state and year fixed effects causes the identifying variation to arise from an observation's deviation from both the national average and the individual state's average.

The fixed effects model disaggregates the error term into a fixed component and an idiosyncratic component. The fixed effects model requires a random sample from the cross section, change in each covariate over time in at least one state, and no perfectly linear relationships among right-hand-side variables. For the fixed effects estimator to be unbiased and asymptotically consistent, strict exogeneity of the covariates is required. This requires a large number of observations relative to the number of time periods. The expected value of the idiosyncratic error ( $e_{it}$ ) conditional on all covariates in all time periods ( $\mathbf{X}_{it}$ ) and the fixed error component ( $\alpha_i$ ) must be zero. If the idiosyncratic errors are serially uncorrelated, then the fixed effects estimator is the best linear unbiased estimator.

State fixed effects are useful to control for unobserved heterogeneity, if this heterogeneity remains constant through time. Based on the relatively low number of state-year observations, it is likely that unobserved heterogeneity exists in this model. This heterogeneity could potentially arise from differing historical treatment of marijuana in states, differences in implementation of asset forfeiture law, or demographics that are not included in the model. Only *% to Seizing Agency* is included to measure the revenue generating potential of asset forfeitures, while asset forfeiture laws differ in a number of ways. A primary difference is the level of proof required to seize assets. This is lower than the “beyond a reasonable doubt” level of proof required for criminal convictions in most states.<sup>25</sup> In some states owners must prove they had no knowledge their property was used for a crime, while in others the burden lies on the state. These differences in the standards of proof and the burden on innocent owners are not included in this model, potentially leading to unobserved heterogeneity.

### Hazard Model

Survival analysis models time to an event’s occurrence, or the timing of transitions between different states. Here the event of interest is the passage of a medical marijuana law.<sup>26</sup> After a state adopts a MML it drops out of the dataset, implying that medical marijuana cannot be repealed once it has been adopted. The survival function,  $S(t)$ , is the probability that the passage of the law occurs after some time  $t$ . If all states will eventually pass a MML, then  $S(\infty) = 0$ . However, there is no reason to assume all states will pass a MML. Marijuana may become federally legal before they do, or some states may never adopt a MML. This implies  $S(\infty) > 0$ . Because some states have passed laws after the analysis period, and others will in the future, the time to passage of a MML is right

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<sup>25</sup>The exceptions are California, Nebraska, North Carolina, and Wisconsin.

<sup>26</sup>Other potentially interesting transitions are: the effective date, date of access for patients, or the establishment of dispensaries.

censored.<sup>27</sup> For any point in time, censoring does not occur because a state is at an especially high (or low) risk of passing a MML conditioning on covariates, rather censoring occurs at a fixed time.<sup>28</sup> Informative censoring occurs when an entity drops out of the dataset due to an outcome or covariate of interest. No state has left, or attempted to leave, the union during the analysis period so informative censoring is not a concern.

The hazard function,  $\lambda(t)$ , is the probability at time  $t$  of an event occurring conditional on the event not occurring before time  $t$ . The hazard function is estimated using a maximum likelihood estimator. Proportional hazard models allow the conditional hazard rate  $\lambda(t)$  to be broken down into two separate functions, the baseline hazard function  $\lambda_0(t, \alpha)$  and the proportional hazard function  $\phi(\mathbf{x}, \beta)$ . In these models, changes in regressors have a multiplicative effect on the baseline hazard function. The baseline hazard function represents the probability of a state adopting a MML if all right-hand-side variables are equal to zero.

Time varying regressors must be “external” or weakly exogenous to the outcome of interest. Whatever process is causing the time variation must not affect the process the hazard model is investigating. If the time varying covariate follows a deterministic process, it can always be considered external. Automatically adjusting laws are examples of an external covariate. This requirement presents serious problems in this analysis. For example, it is reasonable to expect that changes in crime rates influence both asset forfeiture law and support for medical marijuana laws. Asset forfeiture laws were established before medical marijuana laws, but the usage of asset forfeiture may be related to support or opposition to MMLs.

These issues with the hazard model lead to more general concerns about endogeneity in the model. The usage of asset forfeiture may be more important than the actual proportion of asset forfeiture proceeds returned to an agency. Law enforcement

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<sup>27</sup>States that passed MMLs after 2010 include: Connecticut, Illinois, Massachusetts, and New Hampshire.

<sup>28</sup>Observations are censored in 2010, the end of the analysis period.

agencies that often utilize asset forfeiture are likely very different than agencies that rarely seize assets. Agencies that often seize assets are likely more practiced and more efficient with forfeiture procedures. These differences are unlikely to be exogenous to the state's general opinion on medical marijuana, however, the direction of the effect is uncertain. States with a high level of drug crime are likely to be more experienced with asset forfeiture, but it is unknown if increased levels of drug crime lead to more or less support for medical marijuana.

Hazard and fixed effect models have differing strengths and weaknesses. Fixed effects allows the probability of a state adopting a MML to vary between years and between states. This is in stark contrast to the baseline probability of adoption in the hazard model which does not vary between years or states.<sup>29</sup> The fixed effects model allows for laws to be repealed, though this has no effect on the results, while the hazard model cannot account for this possibility. With a large number of observations the hazard model is a more sophisticated method to model the passage of laws, but the limited number of observations means the fixed effects model is superior for this analysis.

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<sup>29</sup>The low number of observations removes the possibility of including any fixed effects in the hazard model.



Table 2: Independent variable definitions and sources

Variable	Definition	Source
TRP	A therapeutic research program has existed in the state	Marijuana Policy Project
TRP Operational	The therapeutic research program delivered marijuana to a patient	Marijuana Policy Project
Initiative Process	The state has a ballot initiative process	State statutes
Neighbor MML	At least one neighboring state has a MML	Geography
Democrat Unified	Democratic Governor and Democratic control of state Legislature	Carl Klarner of Indian State University
Republican Unified	Republican Governor and Republican control of state Legislature	Carl Klarner of Indian State University
% to Seizing Agency	Proportion of asset forfeiture proceeds returned to the seizing agency	Baicker and Jacobson (2007), and state statutes

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Table 2 – continued from previous page

Variable	Definition	Source
% to Law Enforcement	Proportion of asset forfeiture proceeds re- turned to any law enforcement use	State statutes
% Collective Bargain	Proportion of large police agencies with a collective bargaining agreement	LEMAS, The U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Statistics
Drug Forfeiture	Total assets forfeited due to drug crime, millions of 2010 dollars	LEMAS, The U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Statistics
Population	State population in Millions	U.S. Census Bureau, Population Division
Income	Real per-capita income in thousands of 2010 dollars	U.S. Bureau of Economic Analysis, SA1-3 series
Age	Two variables: proportion of state popu- lation under 20 and over 65.	National Cancer Institute, SEER State-Level Population Files
Male	Proportion of state population that is male	National Cancer Institute, SEER State-Level Population Files
White	Proportion of state population that is white	National Cancer Institute, SEER State-Level Population Files

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Table 2 – continued from previous page

Variable	Definition	Source
Property Crime	Per-capita Property crime in the state, includes robbery, burglaries, larceny and motor vehicle theft	Uniform Crime Reporting, Federal Bureau of Investigation

Data on the Democrat Unified and Republican Unified variables available at <http://www.indstate.edu/polisci/klarnerpolitics.htm>. Large police agencies are those with greater than 100 full time equivalent sworn employees, the collective bargaining question was asked in 1987, 1990, 1993, 1997, 2000, 2003, and 2007. The question concerning assets forfeited due to drug crime was asked in 1997, 2000, 2003, 2007. LEMAS data is available from <http://www.bjs.gov>, census data is found at <http://www.census.gov/popest/data>, per-capita income is found at <http://www.bea.gov/regional>, and SEER demographic data is available from <http://seer.cancer.gov/popdata>

Table 3: Dependent variable definitions and sources

Variable	Definition	Source
MML	Medical Marijuana Law Passed	Marijuana Policy Project, State statutes
Dispensaries Allowed	Dispensaries are allowed in state law	State statutes
Dispensaries Exist	Existence of a storefront selling marijuana to multiple patients	Sevigny et al. (2014), Pacula et al. (2013), Personal correspondence with Daniel Rees

Note: This table describes the independent variables of interest and their sources. All independent variables are indicator variables and are observed in each state-year pair.

Table 4: Dependent variable descriptive statistics

Variable	N	mean	sd	min	max
MML	1,100	0.400	0.490	0	1
Dispensaries Allowed	308	0.081	0.274	0	1
Dispensaries Exist	220	0.155	0.362	0	1

Note: Home Cultivation, Dispensaries Allowed and Dispensaries Exist are considered missing if the state never passes a MML.

Table 5: Independent Variable Descriptive Statistics

Variable	N	mean	sd	min	max
TRP	1,100	0.52	0.50	0	1
TRP Operational	1,100	0.14	0.35	0	1
Initiative Process	1,100	0.46	0.50	0	1
Neighbor MML	1,100	0.22	0.41	0	1
Democrat Unified	1,100	0.22	0.42	0	1
Republican Unified	1,100	0.21	0.41	0	1
% to Seizing Agency	1,100	48.5	40.7	0	100
% to Law Enforcement	1,100	77.8	33.8	0	100
% Collective Bargain	1,100	60.8	40.1	0	100
Real Income	1,100	35.8	6.24	21.9	58.6
Property Crime	1,100	214	263	4.81	1,847
Age under 20	1100	28.3	2.2	23.0	39.8
Age 20 to 34	1,100	21.2	1.98	16.8	27.7
% Male	1100	49.2	0.80	47.9	52.7

Note: TRP Operational is considered 0 for states that never had a TRP.

Drug Forfeiture is observed in 1997, 2000, 2003, 2007.

## RESULTS AND DISCUSSION

This section presents the empirical results of this analysis. In most specifications the proportion returned to the seizing agency and the proportion of large agencies with collective bargaining agreements do not significantly affect the probability of a state adopting a MML. The proportion of seized assets reduces the probability a state will legalize dispensaries, although significant the magnitude of the effect is small.

Fixed Effects

Tables 6 and 7 present the results from the fixed effects models. Table 6 presents results with observations kept after passage while table 7 presents results with observations removed after passage. Both tables sequentially increase the number of covariates. State fixed effects are included in all but one specifications, and year fixed effects are included in all specifications. State fixed effects are only excluded to include time-invariant covariates.

The primary right-hand-side variables of interest, *% to Seizing Agency* and *% Collective Bargain*, are not significant in any specification that includes state fixed effects. Coupled with jointly significant state fixed effect constants, this implies that there are systematic differences between states that are not captured by the chosen covariates. The proportion of large agencies with collective bargaining agreements is found to have a negative, but not significant effect on the probability of passing a MML in any regression that includes state fixed effects. In specifications that do not include state fixed effects, the proportion of large agencies with collective bargaining agreements is found to have a positive and significant effect. Despite changes in magnitude, this pattern is consistent between regressions that keep observations after passage (table 6) and regressions that drop observations after passage (table 7). No regressions find *% to Seizing Agency* to be significant. The insignificant results on *% to Seizing Agency* and *% Collective Bargain* in

all models that including state fixed effects suggest that if any interaction between the political power of law enforcement and the adoption of MMLs does exist, it is not captured by these models.

The most surprising result is the large negative and significant coefficient on the percentage of males in a state for all regressions including state fixed effects. The sign on *% Male* switches when the state fixed effects are removed. This suggests that the relationship between *% Male* and MML passage is different between states as opposed to within states. The other variables measuring high consuming groups are either not significant or negative and significant.<sup>30</sup> *% Male* and *% Age 20 to 34* are positive in some specifications, but are never statistically significant when positive. These results imply that increases in high consuming groups, within a state and across time, lead to a decreased probability of that state adopting a MML. This result could be driven by non-consumers increasingly voting against MMLs as the number of consumers increases.

Per-capita property crime and real income are found to have small, and rarely significant, negative effects on the probability of a state adopting a MML. A unified Republican state government has a small and negative effect on the probability of a state adopting a MML as expected. A unified Democratic government has no effect. Much of the variation in state political attitudes is consistent across time and is accounted for in the state fixed effects, so the variation identifying this variable comes solely from states that switch to or from a unified Republican government in the analysis period.

The large values of the constants are offset by the negative coefficients on the demographic variables. This is expected as the values of demographic variables are never equal to zero. The constant reported is the average of the state fixed effects for all regressions that include state fixed effects. It is unsurprising that state fixed effects are significant considering the insignificance of other right-hand-side variables. This implies

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<sup>30</sup>These variables are, *% White*, *% Age under 20*, and *% Age 20 to 34*.



that much of the variation in a state's probability to adopt a MML is not captured by the model.

The percentage of outcomes correctly predicted is the primary measure of predictive power used to evaluate the linear probability model. It is important to recognize that the right-hand-side variables of interest have little effect on the predicted outcomes. Most of the predictive power comes from from state and year fixed effects. Any state-year observation with a predicted outcome greater than or equal to 0.5 is considered to adopt a MML, while any predictions less than 0.5 is considered not to adopt a MML.<sup>31</sup> When observations are kept after passage of a MML and state fixed effects are included (regressions (1) to (3) in table 6 ) 61 percent of all outcomes are predicted correctly and approximately 20 percent of MML adoptions are predicted correctly. Including more right-hand-side variables than the primary variables of interest and demographic variables does not lead to greater predictive power. When state fixed effects are not included the proportion of correct predictions rises to 90 percent with correct predictions of MML adoption rising to around 40 percent. The large and significant coefficient on *Initiative Process* suggests that this variable is driving the increase in correct predictions. Correctly predicted outcomes when observations are dropped after passage are consistent at 98 percent, but the model fails to predict any of the positive outcomes. This is expected due to the greatly reduced number of state-year observations with positive outcomes. Coupled with the attempts of states to repeal MMLs, retaining observations after a state has passed a MML is the preferred model.

### Hazard Model

Using hazard models to investigate the adoption of medical marijuana laws imposes a few major constraints. In contrast to fixed effects models, hazard ratio models

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<sup>31</sup>This threshold of 0.5 is used to evaluate all models in this analysis.

require the observation to be removed from the dataset after a MML is passed. Also, there are insufficient observations within states to include state fixed effects in this analysis.

This leads to all states sharing the same baseline hazard ratio. The baseline hazard ratio is the probability of a state adopting a MML absent all covariates. Hazard models are useful because the baseline probability of adopting a MML does not need to be estimated. Each coefficient is interpreted as a multiplicative effect on the baseline hazard ratio, providing a fundamentally different interpretation than the coefficients in linear probability models. Table 8 includes both primary right-hand-side variables of interest. Control variables are introduced culminating in the complete model.

The proportional hazard results are similar to the results from the linear probability models. The existence of an initiative process increases the probability of a state adopting a MML by about three times relative to the baseline probability. The initiative process was the method by which early medical marijuana activists passed laws. These results confirm that the option for direct democracy was very important in the passage of MMLs.

*% to Seizing Agency* is found to have no effect on the probability of a state adopting a MML, this result was not expected but is consistent with the linear and logistic probability models. An increase in *% Collective Bargain* is found to have a small positive and statistically significant effect on the probability of a state adopting a MML. A 10 percent increase in agencies with collective bargaining agreements increases the probability of a state adopting a MML by 2 percent. Contrary to the linear probability models, the presence of a unified republican government does not decrease the probability of a state adopting a MML in a significant way. Property crime has a small, but statistically significant effect. The decisions of neighboring states with regard to medical marijuana and income are also found to have no effect on the probability of a state adopting a MML.

### Dispensaries

The existence and legality of dispensaries are distinguishing features between states' medical marijuana laws. The legal status of dispensaries varies across states and within individual states. In general, early adopting states did not specify the status of dispensaries, while later adopting states included specific regulations for the distribution of medical marijuana. The status of dispensaries falls into two main categories – in existence with an uncertain legal status, and explicitly legal. In this analysis any storefront selling marijuana to legal medical marijuana patients is considered a dispensary. Tables 9 and 10 present linear probability models examining the probability of a state having dispensaries in existence and having legal dispensaries. The same covariates used in the previous linear regression models are used, and the sample is restricted to states that currently have a MML in effect. The linear probability model is used because it allows for more covariates than the hazard model. More importantly, the hazard model cannot include state fixed effects.

The political power of law enforcement (as proxied by *% Collective Bargain*) appears to have no significant effect on the probability of a state having legal dispensaries and little to no effect on the existence of dispensaries in a state. This is reasonable as early MMLs did not come with regulated distribution, early dispensaries often developed organically and with little legal oversight after the initial laws were passed. In some states ballot initiatives are required to address a single issue, precluding the establishment of well regulated dispensaries. Law enforcement lobbying groups had more opportunities to shape subsequent dispensary regulation, and more time and potential to influence MMLs passed through legislatures.

*% Collective Bargain* and *% to Seizing Agency* have only minor effects on the existence of dispensaries. The only significant effects are found when state fixed effects

are not included, suggesting that *% to Seizing Agency* may be an important component of the state specific effects. Demographic variables are only significant when state fixed effects are not included. This suggests that changes in demographics over time do not have an effect on the likelihood of a state having dispensaries.

States with an initiative process are more likely to have dispensaries in existence. This effect arises from the lack of distribution regulation in early MMLs and the organic development of early dispensaries. States that had an operational TRP are more likely to have dispensaries, perhaps reflecting an established willingness to regulate marijuana distribution. Unified government under democrats or republicans does not have any effect. If a neighboring state adopts a MML dispensaries are more likely to be in existence. This effect disappears when state fixed effects are not included, suggesting it may be identifying larger regional effects than a direct influence of neighbors. Increased levels of property crime decrease the likelihood of a state having dispensaries, though this result is not significant in most specifications.

As in previous linear probability models, the measure of accuracy is the percentage of outcomes successfully predicted. The overall percent predicted correctly ranges from 55 percent to 95 percent. Correct predictions of the existence of dispensaries are only about 20 percent until regressions include *Operational TRP Initiative Process* and *Neighbor MML*. This result is driven by the presence of dispensaries in early adopting states and the delayed adoption of dispensaries in states which have recently passed MMLs with more stringent distribution regulations.<sup>32</sup>

The legality of dispensaries is affected by the political power of law enforcement. The probability of a state having legal dispensaries is reduced as the percentage of seized proceeds returned to the seizing agency increases. This effect is small, but statistically significant. The proportion of men and of whites in a state has no effect on the legality of

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<sup>32</sup>A state needed to have an open and operational dispensary for dispensaries to be considered in existence.

dispensaries. A larger percentage of those under 20 and between 20 and 34 decreases the probability of a state having legal dispensaries. Interestingly, these results are robust to inclusion of year fixed effects, implying that deviations from a state mean as well as deviations from a national trend affect the legality of dispensaries.<sup>33</sup> The option to pass a MML via the initiative process, the presence of a TRP and the political party in power have no effect on the legality of dispensaries. The presence of a neighbor with a MML increases the likelihood of a state legalizing dispensaries, but only in specifications that do not include year fixed effects. This suggests that the increasing number of states with MMLs is an important component of the national trend with respect to legal dispensaries. Similar to the existence of dispensaries, correct predictions of legal dispensaries are greatly improved by removing state fixed effects and including indicator variables for TRPs and initiative processes. The overall percentage of correct predictions ranges from 59 percent to 92 percent, similar to the successful predictions for the existence of dispensaries.

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<sup>33</sup>All linear probability models presented include year fixed effects.

Table 6: Linear Probability Models – Observations kept after passage

VARIABLES	(1)	(2)	(3)	(4)
% Collective Bargain	-0.0007 (0.0020)	-0.0008 (0.0020)	-0.0006 (0.0020)	0.0023*** (0.0006)
% to Seizing Agency	-0.0002 (0.0004)	-0.0003 (0.0004)	-0.0004 (0.0004)	0.0006 (0.0004)
% Male	-0.647*** (0.125)	-0.604*** (0.129)	-0.620*** (0.122)	0.137*** (0.0275)
% White	0.0059 (0.0315)	0.0042 (0.0317)	0.0052 (0.0304)	-0.0028 (0.0017)
% Age under 20	-0.0775 (0.0510)	-0.0854* (0.0503)	-0.0829 (0.0508)	-0.0360*** (0.0118)
% Age 20 to 34	0.0088 (0.0485)	0.0045 (0.0485)	0.0107 (0.0473)	0.0126 (0.0165)
TRP Operational				0.103 (0.0634)
Initiative Process				0.135*** (0.0502)
Democrat Unified			0.0216 (0.0331)	0.0501 (0.0445)
Republican Unified			-0.0753* (0.0419)	-0.0977** (0.0423)
Neighbor MML			-0.0134 (0.0602)	0.0056 (0.0818)
Property Crime		-0.0026 (0.0023)	-0.0029 (0.0021)	-0.0001 (0.0019)
Real Income		-0.0039 (0.0112)	-0.0057 (0.0114)	-0.0085* (0.0046)
Constant	33.27*** (4.418)	31.89*** (4.645)	32.41*** (4.332)	-5.673*** (1.400)
Observations	1,100	1,100	1,100	1,100
R-squared	0.353	0.356	0.365	0.375
State FE	Yes	Yes	Yes	No
% Correct	61	61	61	92
% Correct–Passage	19	20	20	45

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: The outcome of interest is the existence of a MML in a state. This is a binary indicator variable, varying at the state-year level. All variables are observed for each state-year combination between 1990 and 2010 - only the District of Columbia is excluded. Observations are retained after a state adopts a MML. All estimated coefficients in this table are from OLS regressions. Logistic regressions yield qualitatively similar results but are not included. Standard errors, in parentheses, are corrected for clustering at the the state-year level.

Table 7: Linear Probability Models – Observations dropped after passage

VARIABLES	(1)	(2)	(3)	(4)
% Collective Bargain	-0.0005 (0.0007)	-0.0005 (0.0007)	-0.0005 (0.0008)	0.0004*** (0.0001)
% to Seizing Agency	-0.0003 (0.0004)	-0.0004 (0.0004)	-0.0004 (0.0004)	0.0001 (0.0001)
% Male	-0.1763*** (0.0640)	-0.1442** (0.0586)	-0.1391** (0.0588)	0.0204*** (0.0045)
% White	-0.0006 (0.0096)	-0.0037 (0.0010)	-0.0031 (0.0094)	-0.0007** (0.0003)
% Age under 20	-0.0168 (0.0137)	-0.0225 (0.0137)	-0.0219 (0.0140)	-0.0041* (0.0021)
% Age 20 to 34	-0.0017 (0.0112)	-0.0043 (0.0113)	-0.0055 (0.0116)	-0.0025 (0.0023)
TRP Operational				0.0191* (0.0106)
Initiative Process				0.0127* (0.0075)
Democrat Unified			0.0007 (0.0124)	0.0029 (0.0078)
Republican Unified			-0.0117 (0.0156)	-0.0092 (0.0101)
Neighbor MML			0.0162 (0.0230)	0.0098 (0.0185)
Property Crime		-0.0014 (0.0009)	-0.0016* (0.0009)	0.0002 (0.0003)
Real Income		-0.0050 (0.0043)	-0.0062 (0.0047)	-0.0015 (0.0010)
Constant	9.227*** (2.731)	8.346*** (2.514)	8.105*** (2.571)	-0.755*** (0.256)
Observations	973	973	973	973
R-squared	0.075	0.079	0.081	0.063
State FE	Yes	Yes	Yes	No
% Correct	98	98	98	98
% Correct–Passage	0	0	0	0

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: The outcome of interest is the existence of a MML in a state. This is a binary indicator variable, varying at the state-year level. All variables are observed for each state-year combination between 1990 and 2010 - only the District of Columbia is excluded. Observations are removed after a state adopts a MML. All estimated coefficients in this table are from OLS regressions. Logistic regressions yield qualitatively similar results but are not included. Standard errors, in parentheses, are corrected for clustering at the the state-year level.

Table 8: Cox Proportional Hazard Model

VARIABLES	(1)	(2)	(3)	(4)	(5)
% Collective Bargaining	1.002** (0.0009)	1.002** (0.0009)	1.002*** (0.0008)	1.002*** (0.0008)	1.003** (0.0012)
% to Seizing Agency	1.001 (0.0006)	1.001 (0.0006)	1.001 (0.0006)	1.001 (0.0006)	1.001 (0.0007)
TRP Operational		2.024 (1.180)	2.031 (1.223)	2.031 (1.226)	1.318 (0.939)
Initiative Process		3.263** (1.548)	3.324** (1.649)	3.333** (1.586)	2.789** (1.300)
Democrat Unified			1.004 (0.0480)	1.004 (0.0460)	1.005 (0.0443)
Republican Unified			0.997 (0.0483)	0.997 (0.0488)	1.001 (0.0480)
Neighbor MML				0.999 (0.0348)	1.000 (0.0313)
Property Crime					1.005* (0.0031)
Real Income					0.998 (0.0041)
Observations	923	923	923	923	923

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: The outcome of interest is the existence of a MML in a state. This is a binary indicator variable, varying at the state-year level. Multiplicative hazard ratios are reported. All variables are observed for each state-year combination between 1990 and 2010 - only the District of Columbia is excluded. Observations are removed after a state adopts a MML. Standard errors, in parentheses, are corrected for clustering at the the state-year level.



Table 9: Linear Probability Models – Existence of Dispensaries

VARIABLES	(1)	(2)	(3)	(4)
% Collective Bargain	0.0142 (0.0129)	0.0136 (0.0135)	0.0061 (0.0107)	-0.0005 (0.0023)
% to Seizing Agency	0.0003 (0.0011)	-0.0002 (0.0011)	0.0001 (0.0011)	-0.0014* (0.0007)
% Male	0.1453 (0.6041)	0.2664 (0.5932)	0.3931 (0.5724)	-0.0085 (0.0721)
% White	-0.0437 (0.0939)	-0.0186 (0.0952)	-0.0296 (0.0936)	-0.0070** (0.0030)
% Age under 20	0.1201 (0.2312)	0.0374 (0.2443)	0.1164 (0.2632)	-0.0549 (0.0372)
% Age 20 to 34	-0.1222 (0.1741)	-0.0899 (0.1954)	0.0249 (0.1842)	0.1331** (0.0616)
TRP Operational				0.3757*** (0.0805)
Initiative Process				0.3676*** (0.0904)
Democrat Unified			-0.0023 (0.0670)	0.0228 (0.0754)
Republican Unified			0.1554 (0.1148)	-0.0742 (0.1579)
Neighbor MML			0.6267*** (0.1791)	0.2086 (0.1560)
Property Crime		-0.0087 (0.0124)	-0.0065 (0.0134)	-0.0381*** (0.0083)
Real Income		-0.0576** (0.0200)	-0.0471** (0.0171)	-0.0141 (0.0091)
Constant	-5.604 (37.52)	-9.662 (38.60)	-19.37 (38.65)	2.195 (3.192)
Observations	143	143	143	143
R-squared	0.464	0.500	0.579	0.651
State FE	Yes	Yes	Yes	No
% Correct	58	55	62	95
% Correct–Passage	18	29	62	85

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: The outcome of interest is the existence of dispensaries in a state with a MML. This is a binary indicator variable, varying at the state-year level. Sixteen states with a MML are included. All variables are observed for each state-year combination between 1990 and 2010. Observations are retained after a state adopts a MML. All estimated coefficients in this table are from OLS regressions. Logistic regressions yield qualitatively similar results but are not included. Standard errors, in parentheses, are corrected for clustering at the the state-year level.

Table 10: Linear Probability Models – Dispensaries Legal

VARIABLES	(1)	(2)	(3)	(4)
% Collective Bargain	0.0035 (0.0054)	0.0021 (0.0043)	1.87e-05 (0.0036)	-0.0009 (0.0018)
% to Seizing Agency	-0.0020*** (0.0003)	-0.0015*** (0.0004)	-0.0011 (0.0006)	0.0004 (0.0013)
% Male	0.3384 (0.4862)	0.1341 (0.4624)	0.5155 (0.5087)	-0.1956* (0.0999)
% White	-0.0605 (0.0483)	-0.0313 (0.0575)	-0.0553 (0.0616)	-0.0007 (0.0038)
% Age under 20	-0.3186*** (0.1072)	-0.1712* (0.0945)	-0.1784 (0.1060)	0.0981** (0.0440)
% Age 20 to 34	-0.5143*** (0.1088)	-0.4515*** (0.1054)	-0.4732*** (0.1312)	-0.0391 (0.0579)
TRP Operational				0.0407 (0.1761)
Initiative Process				-0.2138 (0.2382)
Democrat Unified			-0.1651 (0.1351)	-0.0041 (0.1544)
Republican Unified			-0.0027 (0.0542)	-0.0208 (0.1436)
Neighbor MML			0.1852 (0.1391)	0.1521 (0.1208)
Property Crime		0.0207** (0.0090)	0.0159** (0.0060)	-0.0033 (0.0087)
Real Income		0.0282 (0.0236)	0.0236 (0.0230)	0.0154 (0.0173)
Constant	8.091 (28.09)	8.325 (24.79)	-7.374 (25.81)	7.490* (4.123)
Observations	143	143	143	143
R-squared	0.465	0.511	0.547	0.459
State FE	Yes	Yes	Yes	No
% Correct	62	65	73	92
% Correct–Passage	28	28	24	56

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Note: The outcome of interest is the legality of dispensaries in a state with a MML. This is a binary indicator variable, varying at the state-year level. Sixteen states with a MML are included. All variables are observed for each state-year combination between 1990 and 2010. Observations are retained after a state adopts a MML. All estimated coefficients in this table are from OLS regressions. Logistic regressions yield qualitatively similar results but are not included. Standard errors, in parentheses, are corrected for clustering at the the state-year level.

## CONCLUSION

The purpose of this research was to examine the political forces shaping marijuana regulation. The primary goal was to investigate the claim that marijuana prohibition is perpetuated by self-interested law enforcement interest groups. Ultimately this claim could not be directly addressed. Instead the proportion of asset forfeiture proceeds retained by the police and the prevalence of collective bargaining agreements were used as proxies.

The results do not provide substantial insight, measures of the political power of law enforcement were found to be insignificant, both statistically and economically. Increases in the percentage of large police agencies with collective bargaining agreements was found to slightly increase the probability of a state adopting a MML in linear probability models, and Cox proportional hazard models. The existence of anecdotal evidence that law enforcement organizations reliably lobbied against MMLs suggests that law enforcement groups are not directly supporting medical marijuana. The correlation between historically democratic states and public sector unions may have caused this result, or lobbying by medical marijuana activists may have been more effective in states with more collective bargaining agreements. Without data on the efforts of medical marijuana activists it is impossible to determine the true cause of this result.

The percentage of proceeds returned to the seizing agency is found to have no effect on the probability of a state adopting a MML. Previous research suggests that the distribution of asset forfeiture proceeds affects the efforts of police agencies and crime rates, but those effects apparently do not transfer into successful lobbying against MMLs by police agencies. Conversely, the percentage of proceeds returned to the seizing agency does appear to have a negative effect on the probability of dispensaries existing and being legal in a state. Forfeiture proceeds arise from illegal distribution of marijuana, which does not necessarily decline when medical marijuana is first introduced. Widespread legal

dispensaries provide an alternative to the black market that could reduce the opportunities for forfeiture, prompting political action by law enforcement groups.

Overall the effects of the political power of law enforcement are found to be small and generally insignificant. Even when statistically significant, most of the effects are of such small magnitude to be practically insignificant. Further research would benefit from direct measures of forfeiture proceeds rather than using state laws as proxies. The effect of recreational legalization on asset forfeiture proceeds will indicate the importance of marijuana prohibition on law enforcement budgets. Ultimately, the political power of law enforcement has little effect compared to the broader social forces driving relaxation in marijuana laws.

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