

THE EFFECTS OF CANNABIS LEGALIZATION ON THE ECONOMY OF STATE
COLORADO – A CASE STUDY

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Bachelor's Thesis
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Date of submission: April 3rd, 2022

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Title of thesis: THE EFFECTS OF CANNABIS LEGALIZATION ON THE ECONOMY OF STATE COLORADO – A CASE STUDY

Date: 3 April 2022

Degree: Bachelor of Science in Economics and Business Administration

Supervisor: Christopher Decker

Objectives

The main objectives of this study were to determine the economic variables which cannabis legalization would alter, and to use case study to examine how cannabis legalization and those variables manifest themselves in Colorado, US.

Summary

Cannabis use has a plethora of effects for user's health, social life, and employment. As recent studies have broadened the understanding of the effects on users, the interest has shifted to the economic implications of different policies. Multiple sources of data were used to gather information about legalization's effect on overall employment, jobs in marijuana industry, state tax revenues and their allocation, number of business license holders, and changes in state budgets.

Conclusions

In Colorado, cannabis legalization has generated hundreds of millions in tax revenue annually after legalization. Cannabis revenues have been mainly directed to fund schools and education, health care, human services, and local affairs among other things. The number of unemployed decreased in Colorado after legalization of marijuana, and cannabis industry has generated almost 40,000 jobs after 2012. State budgets related to law enforcement and public health and safety were observed to spike after legalization due to need to restructure around new legal framework.

Key words: *cannabis, policy, legalization, economic effects*

Language: English

Grade:

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1. INTRODUCTION

1.1. Background

In recent years, the movement of cannabis legalization has captured North America and Europe. Cannabis has been illegal for many decades, starting from 1937 in the USA by the passing of Marihuana Tax Act, from which prohibition eventually spread worldwide (Bewley-Taylor, 2011). From 1961 onwards cannabis has been classified as an illegal substance in 186 countries as part of the United Nations Single Convention on Narcotic Drugs. Recently, some countries have decided to reverse the illegal status of cannabis and bring it to the legal but controlled markets. Despite the debate about whether or not cannabis is safe to use remains to this day, the states that have legalized cannabis have noticed multiple benefits that the legalization has brought up.

1.2. Research problem

The consensus among the legislators around the world has long been that cannabis is a dangerous substance to be used, with no relevant medical use. However, the scientific literature has long argued that the properties of cannabis do not necessarily warrant a complete prohibition, with compelling support for that argument (Friedman, 1972; Lenton, 2000; Caulkins et al., 2015). With the findings supporting limited medical

use, and with propositions that recreational cannabis is neither life-threatening nor harmful when used moderately, the scientific community has little by little started to adopt a more permissive stance, which has been reflected in the legalization of recreational marijuana in Canada, Colorado, the Netherlands, and Uruguay to name a few. However, discussion has historically been infected by racism and misinformation, and more recently revolved around the medical properties of cannabis, along with the proposed negative consequences that legalization would have on the health of the users. More recently, the discussion has started to take into account the possible economic aspects of cannabis legalization.

The purpose of this bachelor's thesis research is to explore and evaluate the economic benefits involved in legalization of medical and recreational cannabis. Because cannabis has only in the last decade been legalized in only few states globally, the literature about the economic effects is still very thin.

1.3. Research questions

The research questions in this thesis were selected to guide the research process, and are as following:

1. What are the economic costs and economic benefits associated with cannabis legalization?
2. Do the economic benefits outweigh the economic costs?
3. Can the findings of this thesis be used to justify legalization?

1.4. Research objectives

The objective of the research is to dive deep into the literature about cannabis and its effects on the economy with the emphasis on examining the state of Colorado. The emphasis of the study will be on exploring all the different economic benefits and costs that are associated with cannabis legalization, and to assess whether there are reasonable grounds for cannabis legalization worldwide. To gain an accurate overall view about cannabis, the health and social aspects are also explored thoroughly, as evaluation about cannabis must consider all the possible factors which are relevant in policy discussions. The economic variables which will be identified in the literature review will be explored from perspective of state Colorado after legalization was

carried out. The purpose is to obtain an objective view of the legalization phenomenon and associated variables, and to use the findings of this study to continue the discussion around cannabis legalization.

2. LITERATURE REVIEW

2.1. Introduction

The debate over cannabis legislation has been around for decades, and finally some states around the world have started to reform their cannabis laws. However, the impact that legalization could have on state economies has long been impossible to study, as reliable real-world data has not been available. As cannabis has long been under prohibition, the effects of legalization are only now beginning to emerge, as the few legalized states have only for a few years been able to release accurate statistics and data about the effects. Thus, it is important to take a more accurate and reliable look into the specific benefits cannabis legalization could have, but also to try and see if those benefits can outweigh the negative effects of cannabis use.

The main purpose of this literature review is to obtain an accurate view of the main effects that cannabis has on society. First, the literature review begins with a brief historical description of the prohibition process behind the current legal systems. After that, we take a view on cannabis markets and the principles under which they function. The dimension of health effects is covered comprehensively, in order to get an idea about the magnitude and seriousness of the health impacts, as it continues to be a cornerstone in cannabis legalization debates. Societal implications of cannabis use are discussed to get an understanding about the often-hidden effects of cannabis use. Afterwards, the economic costs and benefits are briefly explored, to form a conceptual framework under which the costs and benefits will be analyzed in detail later in the thesis.

2.2. Legal status of cannabis

This chapter reviews why cannabis prohibition is to date, the prevailing policy as well as how the current market works. Then we explore the current legal status of cannabis around the world and take a look at the different arguments of drug legalization debate.

We do this to better understand the historical factors in play which still affect the discussion around cannabis legalization.

For a long, cannabis has been used for spiritual, medicinal and recreational purposes but the current system of prohibition was established only in the last 100 years. Despite its illegal status, cannabis has remained as the most widely used psychoactive substance, with the estimated 180 million users spread over almost every country in the planet. The current system of drug prohibition around the world is based on the 1961 Single Convention on Narcotic Drugs, which effectively limits all “production, manufacture, export, import, distribution of, trade in, use and possession” of cannabis for other than “medical and scientific research” purposes. The assumptions behind the prohibition are that cannabis use can seriously harm users, and that there are no medical uses for cannabis, which according to Hall (2020) is not the case.

However, as many countries, such as Canada and Uruguay, and different states in the USA, have recently legalized either medical or recreational cannabis, the milieu of prohibition is facing huge changes. Signs from many European countries point towards a trend of legalization, with Malta, Spain, Portugal and Netherlands being the most lenient towards recreational cannabis use. Germany, Luxembourg, Italy, and Switzerland have also given indications of intent to loosen their cannabis regulations.

2.3. Beginning of prohibition

According to Inciardi (1999), in the nineteenth century there were no barriers for drug trade, and drugs were integrated into economic and political systems as well as everyday life. In the late 19th century, the harms of drug use were noticed by the society, and not long after began the efforts of medical community to depict drug use as "sinful, deviant, outright wicked, and dangerous without the close supervision of a physician."

As described by Bewley-Taylor et al. (2011) in their depiction about rise of cannabis prohibition, the prospect of internationally controlling cannabis and its trade was introduced in the 1912 International Opium Convention. Although the convention had no rulings about cannabis, it led to series of discussions about the need for control

over cannabis use and trade. The discussions led to actions, as restrictions on international trade of cannabis were established in the 1925 International Opium Convention. In the US, there had already been discussions and actions in order to restrict drug trade, for example the 1914 Harrison Act placed a tax on drug distributors, but the law was later interpreted as a ban on drug distribution by the Supreme Court and Federal Bureau of Narcotics. The 1925 International Opium Convention led to cannabis being banned in one form or another in United Kingdom, the Netherlands, and Germany. In the US, cannabis was effectively banned from 1937 onwards after the introduction of Marijuana Tax Act, which according to Bewley-Taylor (2011) did not act as a tax law but rather “legal mechanisms to enforce the prohibition of all use of marijuana.”

The legal status of cannabis was decided in the 1961 Single Convention on Narcotic Drugs, which rules cannabis as one of the most dangerous and addictive psychoactive substances. The required 40 ratifications were fulfilled in 1964, and thus the Single Convention entered into force. Seven years later THC – the main active ingredient – was included into the 1971 Convention on Psychotropic substances, where the prohibition was strengthened, and THC instead of the whole plant cannabis was put under control.

2.4. The functioning of the illegal cannabis markets

In trying to understand the effects of legalization on society, it is vital to explore the functioning of the illegal cannabis markets, which works under the same principles as do normal good markets.

In his article about policy trade-offs, Rogeberg (2018) makes the following assumptions regarding illegal cannabis markets: downward sloping demand curve applies to cannabis (declining prices will increase the total consumption), cannabis use has externalities and internalities, because of the risks associated with illegal markets the consumers will prefer legal goods (assuming everything else held equal), illegal production is inefficient, demand and supply move towards the equilibrium, and people do not always make the rational choices. These assumptions are the logical

foundation of trying to understand how illegal cannabis markets work and how they would respond to legalization.

Ogrodnik et al. (2015) discuss in their paper about the effect that legalization would have on the suppliers and buyers of cannabis. In the figure 1 below is the demand curve for cannabis under illegal markets (grey), and the new demand curve for legalized cannabis (black). In the event of legalization, the non-monetary costs such as interacting with the illegal market and the risk of getting arrested disappear. When the non-monetary costs disappear, the demand for cannabis increases which is illustrated by the Figure 1, where the demand curve shifts upwards. In this new equilibrium, the buyers and sellers are willing to trade more cannabis than before cannabis was legal.

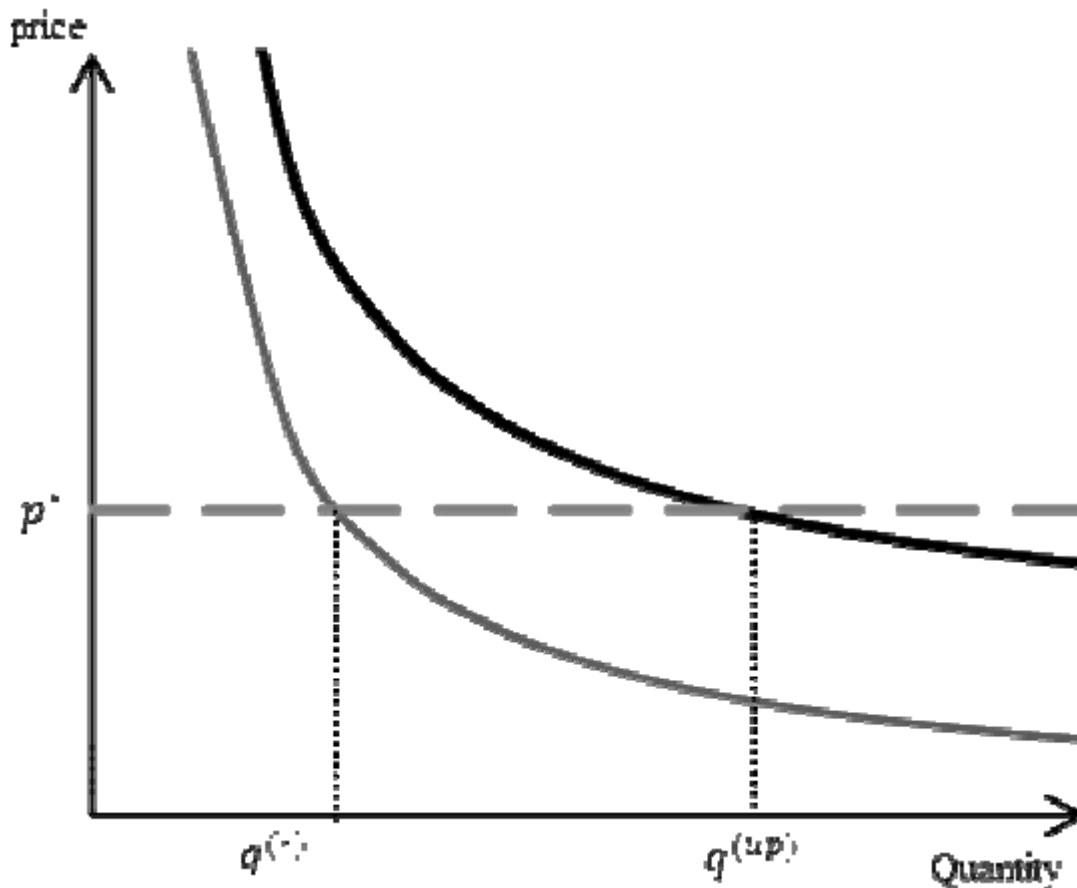


Figure 1: Demand curve (Ogrodnik et al, 2015)

Similarly, the supply side would effectively experience same kind of reduction of non-monetary costs after legalization, which according to Ogrodnik et al. include the risk of arrest and prosecution, but also violence in dealing with criminal organizations. Also, with legal markets the competition would increase. The Figure 2 below shows the

effect on the supply curve, which is flat due to the assumption that “production costs per unit do not increase as output increases and the supply is sufficient to satisfy demand” (p. 310).

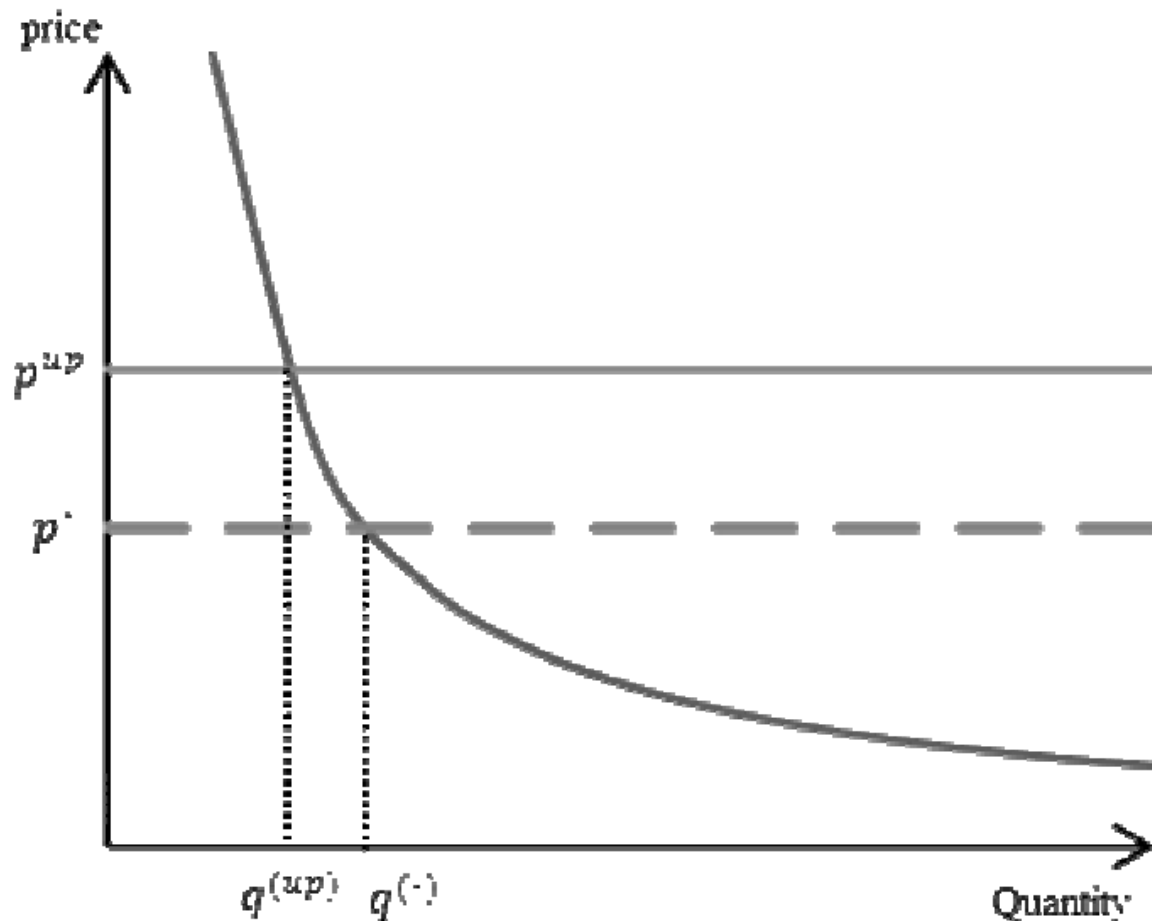


Figure 2: Supply curve (Ogrodnik et al., 2015)

According to Ogrodnik et al., there is a way for the legislators and government to counter this increase in consumption by applying a tax and reducing the amount of sellers (either by a state monopoly or requiring a business license). This is shown in Figure 3, in which the price is increased from p_1 to p_2 , which shifts the demand so that the quantity transacted is lower than before. They however note that rising prices too much will result in the consumers buying their cannabis from illegal markets, thus negating the effect of taxes.

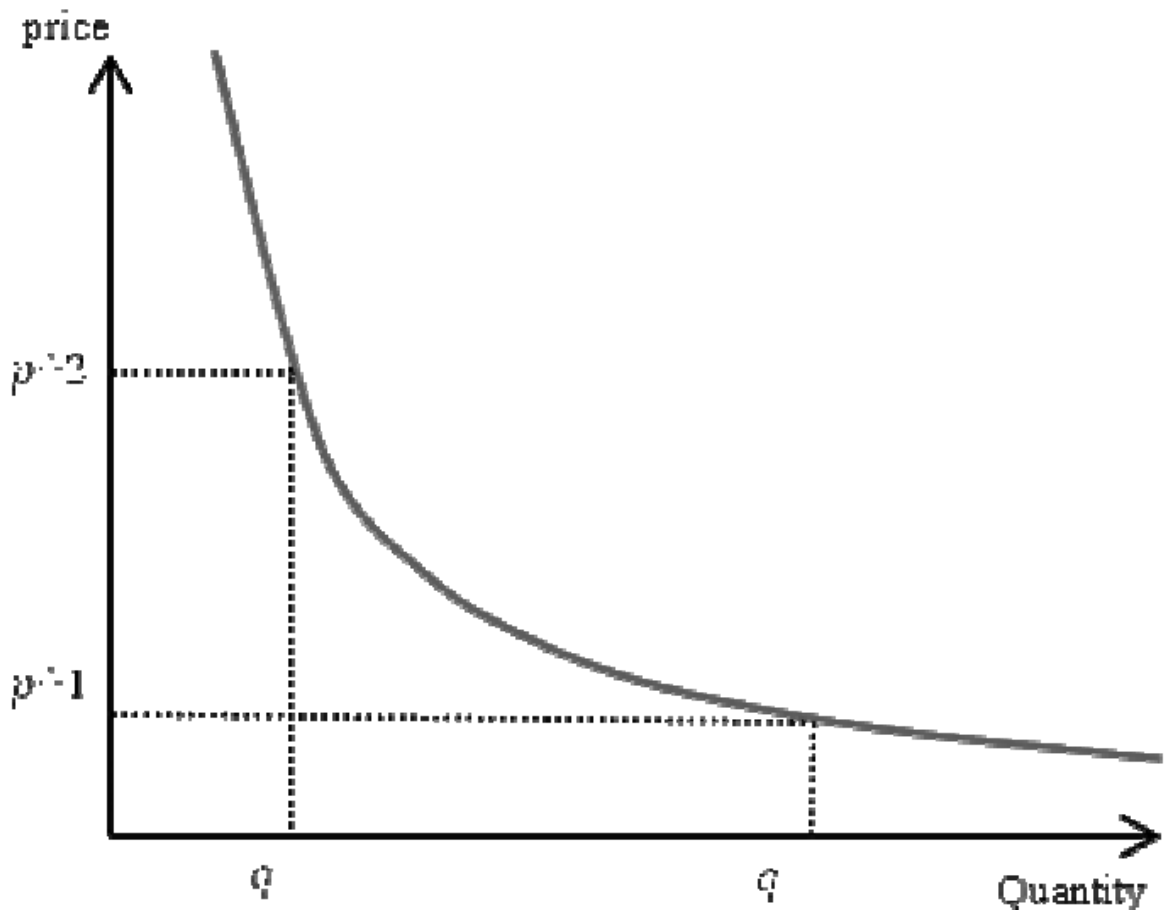


Figure 3: Demand curve after legalization (Ogrodnik et al., 2015)

2.4.1. Estimating the market size of illegal cannabis markets

Because cannabis is sold off-the-record in most of the world, there are no accurate numbers concerning the size of cannabis markets and we must rely on estimations. With these estimations, there are a lot of unknown factors and assumptions that have been made which effect the final estimation. Such factors include accurate number of users, amount of cannabis used, frequency of use, and length of using career.

Prohibition Partners has tried to estimate the sizes of cannabis markets in Europe, North America, and Oceania. In The European Cannabis Report (2021), they estimate the European illegal market for adult-use cannabis to be around 11.6 billion euros in sales. As legalization of adult-use cannabis will eventually reach Europe, Prohibition Partners estimates the European legal cannabis markets to grow from 230 million to around 3.1 billion euros in 2025; that would be a staggering 13-fold increase in market size.

Prohibition Partners (2020) estimated that North America's legal cannabis sales were about 18.1 billion dollars in year 2020. Out of this number, 12.48 billion dollars were from recreational adult-use cannabis, while the medical cannabis sales accounted for 5.64 billion dollars. According to their estimate, total North American legal cannabis sales were projected to be up to \$39 billion dollars by the end of 2025. In Canada, the illegal market for cannabis was estimated at 800 million dollars before legalization, half of which was taken over in just two years by the legal supply route. This demonstrates just how quickly the legal market can take over the illegal underground economy. The Oceanian market for cannabis is still relatively small; only around 50 million US dollars (Prohibition Partners, 2020). However, it has been estimated to be able to reach up to 1,550 million US dollars in 2024.

2.4.2. Determinants of price for cannabis

The price of cannabis is decided by the willingness of the buyer to pay for the product, and by the seller's willingness to sell the product (Ogrodnik et al., 2015). The price, supply and demand can be influenced by public policy, and different policies can have drastically different effects on the total costs and benefits that fall on the society. Interestingly, as found out by Clements and Zhao (2009), the pricing rules of regular products seem to apply to cannabis. Thus, 10 percent increase in the amount sold decreases the unit price by 2.5 percent. They also point out that cannabis can be considered as an "experience good", because the quality of the cannabis product is not often known until the transaction has been completed. In cannabis particularly, some of the quality information will not be available to the users even after ingestion.

Cannabis remaining illegal creates a paradoxical situation, where the costs of use are borne by the states, but the illegal distributors claim the profits of the industry. As pointed out by Ogrodnik et al. (2015), the prices set by the seller usually cover the growing costs, selling costs, and risks related to illegal activities (arrest, prosecution, or violence). Profits are often huge and attractive to those short of money. However, generating significant income through sale of illegal drugs is not risk free as the risks increase in tandem with traded amounts. According to Clements and Zhao (2009), in large quantity transactions the supplier is often willing to offer substantial discounts. This could be due to the risk factor included in holding massive quantities of drugs, as

often substantial amounts indicate retail activities, and law enforcement in many countries tends to give tougher sentences for those supplying drugs. Large quantity discounts pose a problem for the users, as they will prefer to purchase larger quantities for the significant discounts, which increases the risk that the user ends up using more than intended.

Ogrodnik et al. (2015) state that from the buyer's perspective there are two kinds of costs related to buying cannabis: monetary and non-monetary costs. The monetary costs include the price paid for cannabis, and non-monetary costs include things such as risk of being arrested or risk of getting involved in other illegal activities. The user exposes himself to getting disappointed, as the quality of the product is not obvious by simply looking at it: as Vickery and Finch (2020) point out, the variability in the quality of cannabis between two batches can be significant, and thus two similar looking cannabis products could be completely different. The illegal transactions are often rushed, and product testing in lower quantities is time-consuming, risky, and impractical, so the user risks getting an amount much lower than agreed, or a cannabis product of a different strain or potency than agreed (Clements and Zhao, 2009). As will be discussed in the health effects section, the potency of a specific cannabis product is a crucial factor in the effects the user experiences.

2.5. Health effects of cannabis

When discussing the health effects of cannabis, we must remember that it is a widely cultivated and used plant with countless different strains. Unlike in alcoholic beverages with one active agent, there are over 400 different chemicals in cannabis (Oakley, 2004), which makes the comparison of the two substances impossible, but also forces us to be skeptical about the findings on health effects.

In the context of legalization, the subject of health effects of cannabis becomes increasingly complex, as data in some areas is incomplete or missing. Nonetheless, the health effects of cannabis use have been under study for a few decades now, and the literature has found that there are a wide range of consequences of using cannabis. The studies conducted seem to suggest that the most serious health consequences of cannabis use are dependency and road crashes (Hall, 2020), and

unsurprisingly the disease burden of cannabis is smaller than in alcohol, tobacco, heroin, and cocaine.

The categorization of the health effects is mainly based on the division used in the research report by Caulkins et al. (2015). The reason for this is the clarity of the division and the wide coverage of the most serious health effects cannabis has on the user.

2.5.1. Fatal overdose and cannabis poisoning

As Hall (2014) notes, cannabis does not pose a threat of fatal overdose unlike opioids. Vickery and Finch support this statement, as they found there is no known amount of THC that would kill a human. For this reason, Reiman (2017) argues that cannabis could be used as a substitute for opioids; in states that permit medical cannabis, opioid related mortality has decreased due to patients having an effective and less harmful substitute for their opioid medication.

Even if it is nearly impossible to die directly from consuming cannabis, there is still a risk of accidentally consuming too much cannabis, resulting in an unexpected high (Matheson & Le Foll, 2020), which often causes paranoia, panic attacks, hallucinations, and Emergency Department (ED) visits. The common factor in these cases of accidental poisoning are usually cannabis-infused edibles, which are known for their delayed effects and longer duration of intoxication. Because it might be hard for children to differentiate between cannabis edibles and regular sweets due to their similar packaging and looks, it is particularly important to pay attention to regulating edible packaging (in states that have legalized or consider legalizing) to mitigate the risks of children accidentally ingesting cannabis. There are signs that cannabis legalization might increase the incidence of cannabis poisonings, as in Colorado, where total ED visits related to cannabis increased 29 percent in the first year after legalization (Caulkins, 2015). More alarming are the statistics from poison center calls for children in Colorado, where cannabis-related calls increased by 63 percent after the legalization (Caulkins, 2015).

2.5.2. Cognitive impairment

Cognitive impairment is probably one of the more serious consequences that cannabis use can have. Studies show that cannabis has a negative effect on short-term

memory, attention, reaction time, psychomotor performance, self-control, learning and educational attainment (Caulkins, 2015; Evans, 2013). However, the scientific literature has yet to conclude if those changes in cognitive function are long-term or only temporary.

As Caulkins emphasizes, the evidence for significant long-term impairment is still inadequate, but we cannot claim that the risks are non-existent, because the long-term effects might be due to social or developmental processes. A population especially vulnerable to developmental or social effects are children, who require specific measures to protect them from harmful effects of cannabis use.

2.5.3. Accident risks

Cannabis-related accident risks include falls, motor-vehicle accidents, workplace accidents and other marijuana related accidents. Because cannabis is known for affecting psychomotor performance, short-term memory, attention span, reaction time and self-control, there are major risks associated with driving while intoxicated, as recent marijuana use doubles the likeliness to be involved in a traffic accident (Evans, 2013; Caulkins et al., 2015). Thus, it is not surprising that most commonly found drug in fatally injured drivers is marijuana (Caulkins et al., 2015).

The risk of traffic accidents in adolescents after using cannabis is higher than in adults for two reasons. First of all, up to 13 percent of high-school seniors admitted to driving after using marijuana while only 10 percent of respondents admitted to driving after having five or more drinks (Caulkins et al., 2015), which indicates that young people might perceive cannabis as less-impairing. Second reason for adolescents' increased risk for accidents while driving under the influence of marijuana is the lack of self-control, which inhibits risk-seeking and impulsive behavior (Evans, 2013). As Evans points out, self-control improves from youth into adulthood, but it also degenerates because of substance abuse and dependence. The issue of underage traffic accidents is not trivial, as they are a leading cause of death for adolescents aged between 15 and 20 years.

2.5.4. Dependency

For the users themselves, the greatest health-related risks associated with drug use are either overdose or dependence, the latter of which affects many cannabis users. Cannabis dependency is characterized by users who are unable to control their cannabis use even when they recognize the negative effects of their use (Hall, 2020). The symptoms of withdrawal include increased irritability, anger, depression, difficulty in falling asleep, craving marijuana and decreased appetite (Budney et al., 2007), and they usually last from one to three weeks.

The risk of developing a cannabis dependence is fairly high in cannabis, with nearly 10 percent of users suffering from the condition (Evans, 2013), and daily use of cannabis has been found to further increase the chance of developing cannabis dependency (Hall, 2020). The dependency statistics for those who started using cannabis in adolescence are more alarming, about one in six (Caulkins et al., 2015). Young users between ages 12 and 25 accounted for two thirds of all substance abuse treatment admissions for marijuana in the USA (Hall, 2020), emphasizing the seriousness of the issue. On the other hand, about half of the admissions are due to referrals from the criminal justice system, which leaves open the argument that some of the individuals referred to substance abuse treatment may not be in need of the treatment in the first place.

Legalizing cannabis could lead to adverse effects if cannabis prices were to fall from the current levels. Many have raised the issue surrounding the possible negative effects of legalization on the vulnerable populations such as those already suffering from dependency, and adolescents (Hall et al., 2019; Newman et al., 2021). With a state monopoly, the state could dictate the prices and indirectly alter the amount of cannabis consumed by the public, which in turn would cause the number of dependencies to decrease.

2.5.5. Respiratory and cardiovascular health

As the main route of administration for cannabis products is smoking, the effects of the smoke must be part of the discussion about marijuana consumption and its dangers. Similarly, to tobacco, cannabis smoke has been found to containing many of the same carcinogens as tobacco, predisposing the users to similar health problems that tobacco smokers suffer from: respiratory diseases, cardiovascular diseases and

possibly cancer (Caulkins et al., 2015). On the other hand, Caulkins also argues that long-term cannabis smoking is still far less harmful than tobacco smoking, mainly because daily use is rarer, and the amounts of smoke inhaled are much lower.

As Hindocha argues, one of the greatest harms associated with cannabis is related to the simultaneous use of tobacco in 'joints'. Tobacco use is indeed over-represented in cannabis users, as nearly 90% of them report life-time exposure. The harmful toxins of smoking can be avoided by using cannabis orally or by vaporizing it, and those methods have become increasingly popular in recent times.

2.5.6. Mental illnesses

Many studies have highlighted the negative effect of cannabis use on mental health (Evans, 2013; Caulkins et al., 2015; Hall et al., 2019; Hall, 2020; Shakya, 2021). Use of marijuana has been associated with anxiety, depression, early onset of schizophrenia and experiencing psychotic symptoms without diagnosed psychosis (Evans, 2013; Caulkins et al., 2015; Lowe et al., 2018; Hall et al., 2019; Hall, 2020; Shakya et al., 2021), but many of the causalities are still unknown.

As discussed by Lowe et al. (2018) in their paper, a common misconception among cannabis users is that they can use cannabis to treat their mental illnesses such as depression, anxiety or insomnia. Therefore Lowe et al. argue that cannabis use is not treating the users' conditions, but rather "substituting distressing symptoms of their illness with acutely pleasurable ones." This is supported by the findings of Evans (2013) and Hall (2020), who suggests that trying to use cannabis to cope with mental illnesses could lead to the user becoming addicted, which would worsen their mental health even more. The literature indeed suggests that cannabis use tends to worsen the course of mental illnesses that the individuals already have (Hall, 2020).

Especially important is to address the issue relating to connections between cannabis use and onset of schizophrenia. As of now, the causal relationships are still unknown, but Caulkins et al. (2015) argue for a complex set of factors that may lead to cannabis accelerating the onset of psychosis:" if cannabis use does have a causal impact on psychosis, it appears to be highly contingent on the timing and intensity of cannabis use and possibly on a genetic propensity or other existing personal and environmental

risk factors”. Therefore, in trying to decrease the burden of cannabis use on the users’ mental health it is vital to prevent adolescent use, decrease amount of cannabis consumed and to make sure that addicted people get all the help they need.

It must be noted that even if the user experiences some psychotic symptoms, it is not necessarily negative. As Caulkins et al. describe: “The ability to experience some of these psychotomimetic symptoms in a voluntary and time-limited fashion is, for some people, part of the attraction of the recreational use of the drug.” However, whether the voluntary subjection to psychotic symptoms is in any way beneficial remains unknown. Still, it can be argued that if a person wants to experience sensations that are out of ordinary, they should have the right to do it. Even if cannabis can have acute positive effects for mental health in moderate amounts, the majority of literature points towards adverse health effects as a consequence of heavy and regular cannabis use.

2.5.7. Health benefits

In contrast to the negative effects cannabis has on the user, we will now examine the benefits that cannabis can have on the users’ health. Cannabis-based medical products (CBMP) are available in varying degrees around the world depending on local cannabis legislation and are used to treat multiple conditions.

As an example of the multiple benefits cannabis-based medical products’ (CBMP) can offer, Vickery and Finch. (2020) present a case study featuring a 77-year-old armed forces commander veteran Ray, who had suffered from chronic neck, arm and back pain after injuring himself on a mission in Vietnam in 1968. Ray had also been affected by PTSD and severely disturbed sleep, and his future perspectives were negative as he had to live with worsening pain. He had gone through all conventional medical and surgical therapies, but the CBMP prescription had significant effect on Ray’s condition. In just six months into the medication, Ray no longer felt any neuropathic pain and was able to stop his opiate medication. His sleeping was improved drastically, as his dreams had become less negative, and the quality of sleep improved. Overall, the CBMP prescription had improved Ray’s condition and well-being with no reported side-effects.

As was evident from the paragraph before, CBMP's can be used to treat wide range of conditions such as MS spasticity, neuropathic pain, chronic pain, chemotherapy-induced nausea and vomiting, insomnia, decreased appetite, weight loss associated with HIV/AIDS and social anxiety. While some of these conditions have better proof of CBMP's effectiveness, some lack proper evidence and cannot be fully trusted. As Vickery and Finch put it, "the evidence for the effectiveness of CBMP in specific indications is hampered by a lack of high-quality appropriately powered randomized controlled trials (RCT) and by the publication of many systematic reviews which conflate trials with differing types of medicinal cannabis such as CBMP with recreational products."

2.5.8. Recreational benefits

There are also multiple recreational health benefits from cannabis use, which Newman et al. (2021) consider to be "non-trivial, as they improve users' everyday lives, make their experiences and life journey more pleasant, and improve their overall feelings of well-being." The list of recreational benefits is long and subjective to every user. According to Newman et al. (2021), cannabis can "help users have fun, relax, think creatively, celebrate, and relieve boredom, and importantly, is often used as a substitute for alcohol." Newman et al. also report that cannabis can increase the experienced enjoyment in activities such as walking in nature, watching movies, reading, looking at art, hiking, dancing, or exercise. They add that for many, the primary reason for using cannabis lies in social factors, as it can strengthen the feelings of belonging, heighten pleasure in sexual activities and make boring activities more pleasurable. It is easy to see the benefits that cannabis (in moderate amounts, of course) can offer during a time in which people are increasingly suffering from burnout and mental illnesses.

2.6. Social effects of cannabis use

After examining how cannabis affects the user, it is now important to also take into consideration the social effects of cannabis use. As cannabis is one of the most used drugs, it is logical to assume its impact on society is not trivial. However, as these social costs are so complicated by nature, it is close to impossible to accurately estimate their dollar values.

2.6.1. Effects on education

As briefly mentioned in the section about cannabis and its health effects, cannabis use in adolescence seems to hinder educational attainment (Shakya et al., 2021). The cause of lower educational attainment is attributable to cognitive impairment caused by cannabis, which includes reduced attention span, decline in memory, difficulties in learning, and decline in verbal IQ (Evans, 2013; Shakya et al., 2021). These effects are most evident when cannabis is used daily by adolescents (Hall, 2020).

Hall also states that “young people who perform poorly in primary school are more likely to become regular cannabis users.” He also mentions that it is possible that reverse causality is true, so as early cannabis use is attributable cause to poor grades and eventually leaving the school early without a diploma.

Unfortunately, poor educational attainment combined with other negative outcomes of cannabis use may lead adolescent cannabis use to cause more problems in the future for the user such as risk of other drug use, increased antisocial behavior, unemployment, financial strain, and problems in interpersonal relationships (Shakya et al., 2021). Shakya et al. remind us that even in this regard, the causal relationships are not clear, and the reason for these associations might be social milieu factors. As Caulkins et al. (2015) state, “even a few years of poor academic performance during high school can have cascading effects on college and career prospects.”

2.6.2. Effects on career

Because cannabis use has not been seen as socially acceptable, cannabis users have had to suffer from harsh consequences for their careers, as the stigma of current use or prior marijuana convictions have made it more difficult to find employment.

As pointed out by Evans (2013), the effects of marijuana use on people’s careers is not nearly as relevant because “productivity losses may be negligible to the extent that the vast majority of marijuana consumers, like alcohol consumers, do not go to work intoxicated and instead reserve revelry for weeknights or weekends or other occasions that would not interfere with their work responsibilities” (p. 5). This same reasoning does not work on those who are daily cannabis users and dependent on the substance. Especially dangerous jobs or jobs that require precision could suffer from

negative – possibly fatal – consequences if cannabis-dependent people were working there while impaired, and this fact alone might encourage managers to include drug screening programs to exclude cannabis dependent people from working in places which demand safety and carefulness.

Removing the stigma and criminal penalties would support a marginal productivity gain, as those who are affected could participate in the job market (Evans, 2013). Caulkins et al. (2015) however argue that if people had less reasons to hide their cannabis habits, which legalization would do, it could hamper the career development of those individuals. In that case, the most affected would be the individuals in minorities who use cannabis, as they already suffer from many obstacles during their careers. Caulkins et al. (2015) also implies that among managers, cannabis use is frowned upon because of the stigma, leading users to a disadvantaged position when it comes their promotions, raises, bonuses and vacations. Legalization could encourage managers to design their hiring process to screen out those who are cannabis dependent to avoid possible cannabis-related accidents. After all, people who tested positive for cannabis during hiring process were found to be involved in 55 percent more industrial accidents and they also suffered 85 percent more injuries in work compared to those who tested negative (Caulkins et al., 2015).

2.6.3. Crime

As cannabis is classified as an illegal drug, in many places the consequences of use, possession, sale or production becomes illegal. Getting caught often leads to arrest and incarceration, as in many places the sentences are arguably too harsh. There are signs that more tolerant cannabis laws could lead to increase in cannabis-related crime, as is seen in Spain; the number of cannabis-related offences per user recorded by the police is ten-fold compared to the numbers in Italy, which has stricter cannabis laws (Prohibition Partners, 2020). However, there are also reports that cannabis legalization could lead to reduction in cannabis-related crimes and thus it would save public resources (Clements & Zhao, 2009; Colorado Department of Public Safety, 2021).

Colorado, as the first state to legalize cannabis in 2012, has the most accurate data available to date. Colorado Department of Public Safety (2021) reports that between

2012 and 2019 total number of marijuana arrests decreased by 68 percent. Majority of those arrests were made on the grounds of possession, and those arrests decreased by three quarters. Sales arrests were decreased by half, but surprisingly production arrests went up by three percent.

Caulkins et al. (2015) found cannabis use to increase the likeliness that teenagers take part in delinquent or dangerous activities. Even though the marijuana related crime rates of young people decreased after legalization in Colorado, the proportion compared to adults ended up increasing (Colorado Department of Public Safety, 2021). Whereas juveniles between 10 to 17 years of age accounted 25 percent of all marijuana arrests in 2012, the same age group was accountable for nearly 50 percent of all marijuana related arrests seven years later. This indicates that the number of adult arrests has decreased significantly, with Colorado Department of Public Safety reporting nearly 84 percent reduction in marijuana crimes by those ages 21 or older.

Lu et al., (2021) analyzed the effect of cannabis legalization on crime rates in Colorado and Washington State, and they found that cannabis legalization had no long-term effects on crime rates in any category of crimes. This is explained by Caulkins (2017), who argues that legalization causes the problems of cannabis use to be only shifted: crime and illegal markets are replaced by potential increase in marijuana consumption, which has multiple negative effects on the user.

These statistics point towards the fact that liberalizing cannabis laws has a crime-reducing effect, which must be taken as a clear indication that current cannabis laws are affecting the users adversely, with no actual effect in reducing cannabis use.

The costs of cannabis prohibition laws and their enforcement on society are not small. Miron and Waldock (2010) estimated drug prohibition expenditures to be 15.6 billion dollars for all drugs, while estimating cannabis to be about fifth of all expenditures at 3.35 billion dollars. According to Caulkins (2017), the 40 000 cannabis offenders in the US spend up to 14.6 million days in prison. He also estimated the costs on society for those prison days at 110 dollars per a day spent in prison, which ended up being an abysmal 1.6 billion dollars a year.

2.6.4. Antisocial behavior

Even if cannabis use has a social element in it, some users seem to be isolating themselves from their families due to their cannabis use (Caulkins et al., 2015). Antisocial behavior associated with cannabis use has been mentioned and proven by others as well (Popovici et al., 2014; Shakya et al, 2021). The COVID-19 pandemic led to people having to self-isolate, but it is an unfortunate outcome for those who suffer from cannabis dependency and are already behaving antisocially, as self-isolation caused the amounts of cannabis consumed to rise about 20 percent (Bartel et al., 2020).

Worrisome is the fact that cannabis use seems to be more prevalent in those who are unemployed compared to those who work full- or part-time (Evans, 2013). Given the antisocial properties of cannabis, this issue should be addressed to not worsen the problem of unemployment.

Although it is exceedingly difficult to estimate the economic effects of antisocial behavior, it should be clear that it is mostly detrimental to the cannabis user, their peers and family.

2.7. Economic effects of cannabis legalization

The most important consideration in this thesis relates to the economic effects that cannabis legalization would have on state economies. This involves changes in state budgets, the tax revenues created by legalization, employment aspects such as new jobs created, and lastly new expenditures which would result from legalizing cannabis.

2.7.1. Budgetary savings

Because of cannabis prohibition, states must incur costs in prevention, arrests, prosecutions, incarcerations, police resource spendings, and justice system costs (Evans, 2013; Hajizadeh, 2016; Newman et al., 2021). Evans also points out the prospect of decreases in cannabis addiction treatment costs, as “majority of admissions have historically been referrals from the criminal justice system.” Although the size of these budget expenses changes from country to country, we can still get an idea about the magnitude of these expenses by looking at a few example countries.

The question still remains whether or not the budgetary benefits combined with tax revenue gains can offset the negative socioeconomic impacts of current policies; a question with multiple factors, some of which are hard to put monetary value on.

As an example of the budgetary savings which cannabis legalization would cause, Miron and Waldock (2010) estimate the savings of approximately 8.7 billion dollars in USA per year. This is composed of reductions in prosecutorial, judicial, correctional and police resource spendings. Newman et al. (2021) attribute 3.7 billion dollars to the costs incurred by the police on the enforcement of cannabis prohibition in the USA. In Canada, the estimates for cannabis policies and associated legal frameworks range from 500 million to one billion per year. Such numbers give an estimation about the magnitude of spending on drug enforcement policies.

As argued in The European Cannabis Report (Prohibition Partners, 2021), many nations will be seeking new ways to fuel their economic recovery after the COVID-19 pandemic, and cannabis legalization can reduce government costs, but more importantly increase state revenues. Plans to include liberalization of cannabis laws into economic recovery have been made in Portugal, Barbados, and Jersey (Prohibition Partners, 2021).

2.7.2. Revenue gains

If cannabis were to be legalized, states could start applying sales and income tax on cannabis revenues, which would increase the tax revenue of those states. An effective tax – a tax which would actually end up generating tax revenue – is only possible if the legalized cannabis industry can take over the illegal markets. According to Rogeberg (2018), the legal tax for cannabis under legalization should be at least the size of external costs, and the total price of cannabis should be around the current illegal prices. Evans (2013) asserts that the total economic impact of legalization depends on such things as likelihood of tax evasion and the impact on alcohol consumption.

Even so, some argue that regulating cannabis use by taxation is a more appropriate way to combat the issue of externalities, and the collected tax funds from cannabis sales could be used on preventing harmful effects of cannabis use (Ogrodnik et al, 2015; Rogeberg, 2018). Especially now that state economies are recovering from

COVID-19 pandemic, countries find themselves in a tricky situation and in need of funds to finance the economic recovery. Many have argued that it would be more appropriate to legalize cannabis and start taxing it, as those funds could even be directed to improving the overall well-being of the society, as was done in Colorado and Washington (Hajizadeh, 2016; Newman et al., 2021)

Various estimates have been made about the possible tax revenues that cannabis industry could generate (Prohibition Partners, 2021), but more recently a lot of data has become public due to cannabis legalization in many states in the US. The specific tax revenues will be discussed later in the thesis, as part of the case study.

2.7.3. Employment

Prohibition Partners (2021) estimate that the cannabis industry in US supports hundreds of thousands of jobs, such as cultivation, distribution, and retail. From the perspective of cannabis industry, which in the US must navigate through the constantly changing combination of unique cannabis laws, legalization would be of enormous help. Legalizing cannabis sales and consumption would allow the producers and retailers to face a competitive landscape and earn profit (Newman et al., 2021). New jobs could emerge, as the cannabis supply chain is estimated to have supported 243 000 full-time jobs in US already in January 2020, as reported by Newman et al.

Cannabis has been fueling the Netherlands' economy, as cannabis coffeeshops in Amsterdam have attracted 1.5 million tourists to the city annually, which has opened employment opportunities in retail and tourism (Prohibition Partners, 2021). As the number of states which allow adult cannabis use is still low at the moment, the states where cannabis has been legalized can utilize the unique position they are in by attracting tourists, at the same time gaining a boost to the state economies (Newman et al, 2021).

For many cannabis violation convicts, more liberalized laws could mean better employment opportunities and better personal economic situation, because fines, asset seizures, legal fees, court proceedings, missed workdays and stigmatization are arguably disproportionate measures to deter people from using cannabis (Evans, 2013). Supporting this view that the current methods are flawed is Lenton (2000), who

argues that there is no evidence that the harsh cannabis prohibition laws work in deterring people from using cannabis. As cannabis prohibition laws have significantly affected young adults, African Americans and Latinos, legalization would greatly reduce the compounding negative effects of prohibition in vulnerable communities, and support socioeconomic movement (Hall, 2020).

Taking the mind-altering properties of cannabis into account, it must be noted that cannabis can have negative effects on employees' productivity. As pointed out earlier, the effect varies depending on the job and the person. Even though cannabis use is more prevalent in those who are unemployed compared to those who work full- or part-time, for most people the use of cannabis is reserved for weekends or nights so that it does not affect normal life (Evans, 2013). Evans strengthens the argument that cannabis can be comparable to alcohol in considerations about productivity by stating that both substances decrease productivity similarly.

In cases where cannabis decreases productivity, the cause is often due to employee turnover, absenteeism, or illness (Evans, 2013). All of these could be mitigated with better preventive actions, company policies or informing the users about the adverse effects of cannabis.

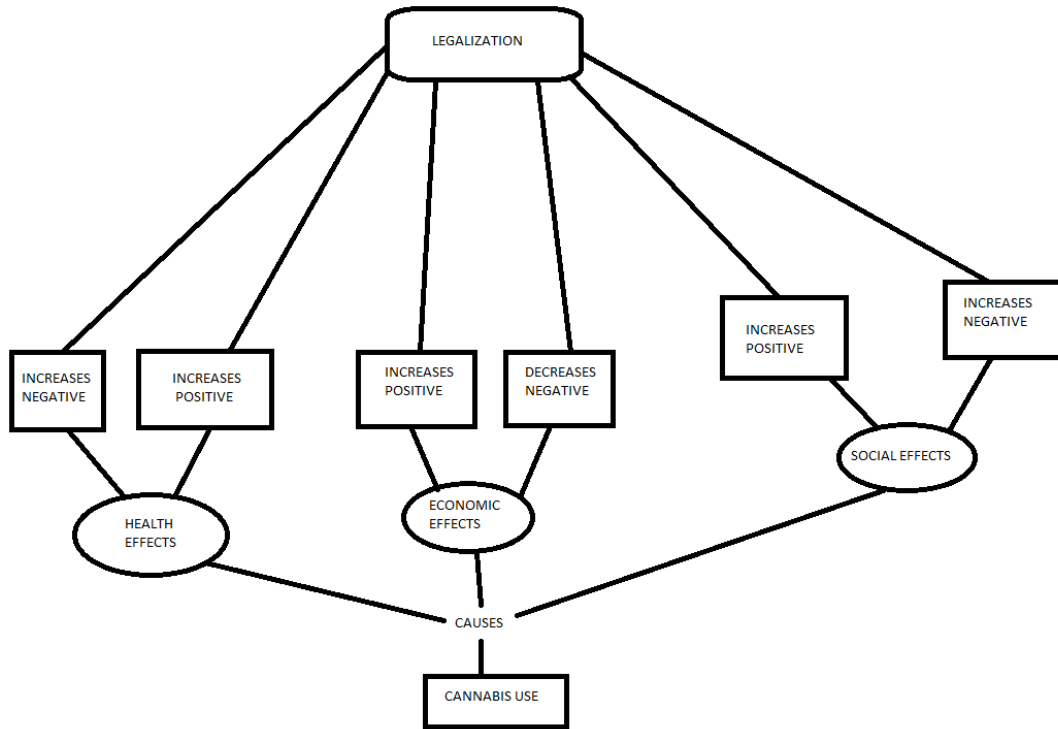
2.7.4 New expenditures

The act of legalizing cannabis creates a direct cost as the policies need to be implemented (Evans, 2013). These costs include setting up the regulatory framework, retail monitoring, conducting investigations on businesses, and prosecuting tax evaders. If we suppose that the consumption would be going to increase after legalization, it will increase healthcare, social service, and criminal justice costs. As historical data from legal marijuana markets is limited, it is difficult to estimate the increase in consumption. Even if such data were available from other countries, the data would be unreliable as consumer behavior typically changes from country to country because of local mores and cultural norms.

As Evans puts it, "law enforcement spending would merely shift from one category of offense to another." However, it is fair to say that it is more productive to try to combat

the inevitable consequences of marijuana use instead of keeping on fighting the war on drugs.

2.8. Conceptual framework



2.9. Conclusion and Setup for Further Analysis

As it has become clear, cannabis prohibition is costly on the society. The moderate adverse health effects and slight positive effects are not optimal under prohibition. Legalization would allow more extensive use of cannabis as a medicine, but the misuse of the substance would increase healthcare and public safety costs. Economically legalization makes sense for two reasons. Cannabis use is inevitable, and history shows that prohibition is both expensive and inefficient. Legalization of cannabis supply chains would mean that states can start collecting tax revenue, but also the costs of cannabis prohibition would fall. The societal effects of cannabis are more complex, but it seems that the positive recreational benefits and also negative

effects such as antisocial behavior, crime and decreases in educational attainment would increase. An appropriate policy would take these negative aspects into account and try to minimize them.

Based on these findings in literature review, five hypotheses could be identified to study how legalization manifests in the economy. The hypotheses are tested to either prove or deny the assumption that cannabis has economic benefits. The hypotheses are as follows:

H1: Legalization of cannabis creates new tax revenues

H2: Legalization of cannabis creates new jobs and businesses

H3: Legalization of cannabis decreases law enforcement and judicial budgets

H4: Legalization increases the healthcare and public safety budgets

H5: Legalization causes new expenditures for setting up the new legal framework

The hypotheses are then examined in the section 4, where the findings about Colorado's cannabis legalization are presented. The first hypothesis is tested in the first section to map out the size of cannabis tax revenues in respect to state revenues. Then the hypothesis 2 will be examined to determine the effect on employment. The last three hypotheses will be tested as part of trying to understand the effect on budgets.

3. METHODOLOGY

3.1. Case study

To examine the phenomenon of cannabis legalization more closely, a case study approach was chosen. A case study makes in-depth analysis possible on one specific instance of a phenomenon (Swanborn, 2010). It can answer broad and complex questions by providing a thorough understanding of the processes in each case. The ability to generalize those conclusions and findings in other contexts is not automatic, but can give valuable insight into the phenomena, and allows future researchers to confirm or deny the findings. The data for analysis in case analyses is collected from multiple sources, and often there are multiple variables under study which are then studied over time to see how they develop and describe the phenomenon. As Swanborn states, in case studies the simultaneous change of variables is studied over

time to develop understanding about the connection between those variables, and to gain understanding why those variables change the way they do. League of European Research Universities (2009) paper highlights the role of case studies in informing public policies, by providing clearly presented quality research which can solve complex problems. Bernd Huber reinforces the role of research in policy, by saying that it “is the duty of both science and policymakers to engage the public and to show that policy is underpinned by objective research” (p. 1).

3.2 Case Colorado and data collection

The case to be analyzed in this research was the state of Colorado. Colorado was a suitable state for the analysis as it is the first state in the US to legalize cannabis for recreational use. The legalization of recreational marijuana took place in 2012, which is stated by the Amendment 64 in Colorado constitution. As the data on the effects of legalization is still very limited globally, both by time and existence of such data, Colorado can offer valuable statistics as the first state in the US to legalize recreational marijuana. Not only is a longer period of time a benefit for the observations’ reliability, but it also allows to see how the shift in legislation continues to have an effect years after the legalization.

The variables which were studied were marijuana tax revenues, license, and fee revenues, portion of state taxes, portion of state net collections, retail marijuana business licenses, medical marijuana business licenses, state operating budget, corrections budget, health care policy and financing budget, judicial budget, law budget, public health and environment budget, public safety budget, average year-over-year rate in budgets before and after legalization. The data for these variables was collected from multiple sources, including official and unofficial organizations.

In regard to the first section in findings, the Colorado’s marijuana tax revenues as well as the state tax revenues and net collections were found from Colorado Department of Revenue’s (CDOR) annual reports, as well as from the CDOR’s Marijuana Tax and Fee Revenue Report containing revenue data from the beginning of the legalization to date. The charts depicting the distribution of marijuana tax and fee revenues were found from The Colorado Sun, an online newspaper which had gotten the data from the state itself.

In short of official labor statistics, estimates provided by Leafly were used. Leafly is a cannabis-centered website aiming to inform the public about cannabis, and the reports provided by Leafly are composed jointly by Leafly and Whitney Economics. They estimated the employment numbers based on the assumption that each \$1 million in revenue creates 15 to 17 jobs, which is the average for all US industries (Leafly, 2022). Then they combined the revenue-based estimates to variables such as state specific regulatory environment, cannabis license data, macro events (such as COVID-19), financial statements, and interviews with business owners. Retail and medical marijuana business licenses were used to observe the number of active businesses operating in Colorado, and those statistics were obtained from CDOR's annual reports. In the latter part of the employment section, the study by Chakraborty et al. conducted in 2021 was used to estimate the effect on labor markets in total.

The last section about the effects on state budgets has data collected from Colorado General Assembly's "explore the Colorado state budget" -website, as well as Colorado state operating budget appropriations provided by Joint Budget Committee Staff.

3.3 Limitations of methodology

When using a case study, especially with only one case of interest, there is the issue of generalization. As a case is studied, the outcomes of the study rely on the particular phenomena associated with the case, which might not be present in other similar cases, thus making generalization difficult. The lack of generalizability also hampers the reliability of the said study, as a case study only observes but doesn't prove actual causalities. Despite this issue, a case study can give valuable information about the case that is studied, provided that the analysis is comprehensive and explanatory.

In this case study, the use of estimates is inevitable as some data is simply not collected. A good example of this is the employment numbers for Colorado's cannabis industry, which were based purely on estimates, because the federal government in the US doesn't track jobs in cannabis industry due to its federally illegal status (Leafly, 2017).

Some variables are more representative than others in this study. While directly inspecting tax dollars collected from marijuana will give simple and understandable results, the changes in state budgets will not have the same effect. This is due to the fact that state budgets are determined by multiple unknown variables. With case study, this issue magnifies as understanding complex phenomenon such as state budgets requires far more time and resources, as well as more sophisticated research methods and a wider base of knowledge for the analysis.

Observer's experiences, presuppositions, biases, and values are also in a big role when analyzing a particular case. The observer might be inclined to see a phenomenon in a particular way because of his or her past experiences. Presuppositions might affect the intended outcomes of the study, therefore affecting the research process. Biases are always in play as humans are limited in the objectivity of their consciousness.

4. FINDINGS

In this section, the hypotheses which were identified in the previous section are explored. The data is analyzed using the methods mentioned in the methodology section.

The term "marijuana" is used, as it more accurately reflects the actual intended use of the product. While cannabis usually refers to the whole plant, marijuana describes the drug prepared from cannabis (Mosher & Akins, 2013). The term marijuana is also used by the state Colorado in the official documents, so therefore it was natural decision to use the term.

4.1 Marijuana taxes

With the aim of testing the first hypothesis (legalization of cannabis creates new tax revenues), it was reasonable to look at the tax revenues generated from marijuana sales after legalization. According to the Colorado Department of Revenue, the sale of retail marijuana began January 1st, 2014. The data was collected from Colorado Department of Revenue's Marijuana Tax and Fee Revenue Report, which included data from February 2014 to date, as well as from the state's annual reports.

Table 1 includes marijuana tax, license, and fee revenues from 2014 to 2021 in Colorado. All of these tax, license and fee revenues are collected by the state of Colorado, which distributes those taxes to specific funds. This information is presented later in this section by Figure 4. In Colorado, the state sales tax is 2.9% and applied to both medical and retail marijuana until July 1st, 2017, when retail marijuana, retail marijuana products, and retail marijuana concentrates were exempted from the state sales tax (CDOR, 2022). This still left medical marijuana and marijuana accessories to be taxed under the state sales tax. Retail marijuana sales tax was 10% until July 1st, 2017, when it was raised to 15% after retail marijuana was exempted from the 2.9% state sales tax. The effects of these tax changes can be seen in the Table 1, as state sales tax revenues decreased by a third after 2017, and consequently the retail marijuana sales tax saw a huge spike. Retail marijuana excise tax was 15% for the whole period. Licenses and fees include payments for medical and retail marijuana business licenses, as well as other fees.

Year	State Sales Tax	Retail Marijuana Sales Tax	Retail Marijuana Excise Tax	Licenses and Fees	Total Taxes, Licenses and Fees Revenue
2014	17 834 802	26 892 566	11 375 268	11 491 686	67 594 323
2015	26 968 987	55 616 542	33 417 832	14 407 812	130 411 173
2016	36 448 955	83 750 123	59 420 537	13 985 194	193 604 810
2017	30 536 901	131 512 817	71 965 027	13 353 728	247 368 473
2018	10 828 237	181 854 222	61 612 669	12 234 509	266 529 637
2019	11 234 906	212 487 924	66 667 126	12 068 469	302 458 426
2020	13 858 886	260 528 061	101 499 043	11 594 120	387 480 110
2021	14 531 331	277 618 532	118 538 471	12 797 719	423 486 053

Table 1: Marijuana Tax, License, and Fee Revenues in Colorado, 2014-2021

Table 2 lists the total marijuana tax revenues from 2014 to 2021 in the state of Colorado, which are then compared to Colorado's total state sales, use, and excise tax revenues collected from other products or services. The specific taxes which are included in the Total Marijuana Taxes are state sales tax (for both medical and retail marijuana), retail marijuana sales tax, and retail marijuana excise tax. As the Table 2 shows, marijuana taxes accounted over one percent of the state taxes in the first fiscal year that it was taxed. The table also reveals that not only do marijuana tax revenues

keep rising, but they also keep claiming a bigger portion of the total state tax revenues. Last year, in 2021, cannabis taxes accounted for a little bit over eight percent of total taxes in Colorado.

Year	Total Marijuana Taxes (Excluding Licenses and Fees)	State Sales, Use, and Excise Tax	Marijuana Taxes' Share of State Tax Revenues
2014	\$ 56 102 637	\$ 4 589 496 389	1,22 %
2015	\$ 116 003 361	\$ 3 884 650 516	2,99 %
2016	\$ 179 619 616	\$ 3 971 573 409	4,52 %
2017	\$ 234 014 745	\$ 4 205 477 196	5,56 %
2018	\$ 254 295 128	\$ 4 504 425 027	5,65 %
2019	\$ 209 389 956	\$ 4 678 303 551	4,48 %
2020	\$ 375 885 990	\$ 4 710 668 759	7,98 %
2021	\$ 410 688 334	\$ 5 102 839 463	8,05 %

Table 2: The Development of Marijuana Taxes' Share of State Tax Revenues

As the Table 2 didn't include the license and fee payments, it was logical to include them in the analysis as well. Table 3 shows Total Marijuana Revenues, which are then compared to the State Net Collections. In this table, net collections include all the state sales, excise and use taxes from all sources. This comparison is done for the reason that while the first table concentrated only on the marijuana tax revenues, it seemed wise to compare the total collections from marijuana to the total state collections. While the comparison of marijuana revenues to state collections reveals that the ratio is smaller than when only tax revenues are compared, marijuana revenues were able to claim around two percent of state collections from the year 2017 onwards. The data clearly indicates that marijuana revenues not only increase state revenues, but they do it consistently and account for a large portion of the whole state's revenues.

Year	Total Marijuana Revenues	State Net Collections	Marijuana Revenues' Share of State Net Collections
2014	\$ 67 594 323	\$ 10 842 681 503	0,62 %
2015	\$ 130 411 173	\$ 11 838 748 436	1,10 %
2016	\$ 193 604 810	\$ 11 819 158 006	1,64 %
2017	\$ 247 368 473	\$ 12 204 917 926	2,03 %
2018	\$ 266 529 637	\$ 13 619 313 527	1,96 %
2019	\$ 302 458 426	\$ 14 598 953 664	2,07 %
2020	\$ 387 480 110	\$ 13 809 640 931	2,81 %
2021	\$ 423 486 053	\$ 17 560 048 770	2,41 %

Table 3: The Development of Marijuana Revenues' Share of State Net Collections After Legalization of Retail Marijuana

After examining the tax revenue information, it was logical to next see how Colorado spends the marijuana tax revenues. Figure 4 describes the distribution of marijuana tax and revenue fees for the fiscal year 2018-2019. The figure reveals that the marijuana revenues are distributed to general fund, marijuana tax cash fund, public school fund, public school capital construction assistance fund, and public school permanent fund. Most of the excise tax collected by Colorado from marijuana sales (4th column of Table 1) is distributed to Public School Capital Construction Assistance Fund, and then the excess is distributed to Public School Permanent Fund and Public School Fund. The retail marijuana sales tax (3rd column of Table 1) is split into two: 10% goes to local governments to use, and 90% goes to the state. 15.56% of the state share is kept in the general fund, 12.59 is redirected into the Public School Fund, and 71.85% is distributed to Marijuana Tax Cash Fund. Lastly, the 2.9% state sales taxes on medical marijuana and non-marijuana products sold in marijuana stores goes directly into the Marijuana Tax Cash Fund.

Figure 5 shows how the Marijuana Tax Cash Fund has spent it's budget. Combining the information that these figures present, it can be understood that in Colorado the marijuana revenues are being used primarily on schools and education, human services, public health and environment, and local affairs.

Distribution of Marijuana Tax and Fee Revenue for FY 2018-19

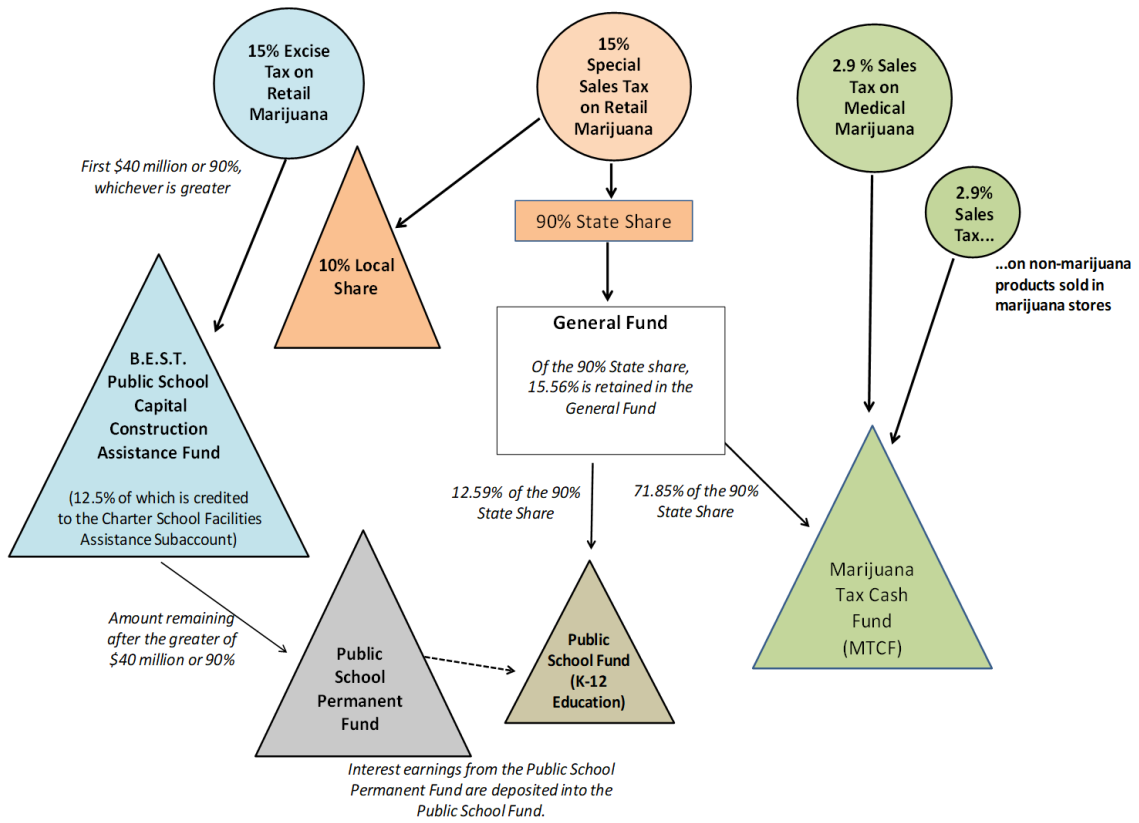


Figure 4: Distribution of Marijuana Tax and Fee Revenue for 2018-2019 (The Colorado Sun, 2019)

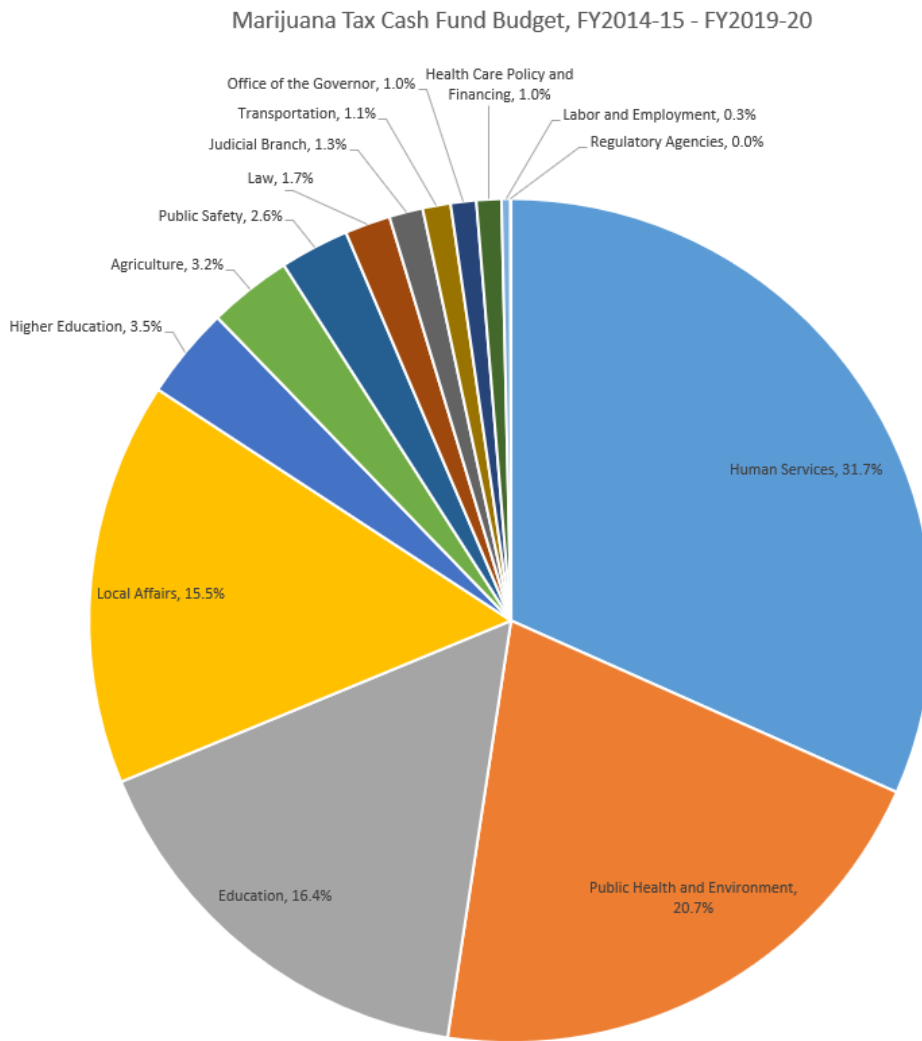


Figure 5: The Use of Marijuana Tax Cash Fund Budget 2014-2020 (The Colorado Sun, 2019)

4.2 Effect on employment

The second hypothesis predicts that cannabis legalization would cause new jobs to be created as brand-new businesses are created to offset the illegal market. To study that, the use of estimates was inevitable. While the numbers of total jobs in cannabis industry are only estimates and calculated by translating annual sales into full time equivalent jobs, they still give a rough estimation about the magnitude of impact that cannabis industry has on employment. The estimated total jobs in marijuana industry in Colorado are shown in Table 4. The jobs counted into total marijuana industry jobs includes both direct jobs which relate to the cultivation and sales of marijuana (“plant-touching jobs”), but also the supporting jobs needed to conduct business such as accounting, human resources, legal affairs, security, maintenance, and construction

(Leafly, 2022). As the table tells us, the immediate effect of legalization was measurable in tens of thousands of jobs, and the size of the marijuana industry seems to only go up.

Year	Total Jobs in Marijuana Industry
2015	18,005
2016	23,407
2017	26,891
2018	31,486
2019	34,705
2020	35,539
2021	38,337

Table 4: Estimated Total Jobs in Marijuana Industry in Colorado, 2015-2021

The Table 5 shows how the estimated marijuana jobs compare to the total state employment numbers. As can be seen from the table, already in 2015 marijuana jobs accounted about 0.71 percent of Colorado’s total jobs. The share has increased steadily, and in 2021 marijuana industry already accounted for 1.4 percent of Colorado’s all employees. This data suggests that marijuana industry is becoming more and more important employer in Colorado as time passes.

Year	Marijuana Industry Jobs	Colorado State Total Nonfarm Employment	% of Total Colorado Jobs
2015	18005	2 541 167	0,71 %
2016	23407	2 601 508	0,90 %
2017	26891	2 659 967	1,01 %
2018	31486	2 726 925	1,15 %
2019	34705	2 789 958	1,24 %
2020	35539	2 651 333	1,34 %
2021	38337	2 745 258	1,40 %

Table 5: Marijuana Jobs Compared to Colorado State Total Jobs

Because the state of Colorado tracks the number of marijuana licenses, it allows the analysis of those numbers as well. The statistics on marijuana licenses were found from Colorado’s annual reports. Table 6 shows the active retail marijuana licenses which have been issued to businesses. This data suggests that initially, many businesses entry to the new market. In Colorado, the number of issued active marijuana licenses has grown yearly ever since the start of legalization, except for year 2019 when the number of licenses was lower than in previous year. The table also differentiates between retail marijuana store businesses, product manufacturer businesses, cultivation businesses, and testing facility businesses. The data suggests that retail stores and cultivation businesses are the most common types of licenses issued. Compared to the other business types, product manufacturers are less popular. Finally, there are only a handful of testing facility businesses operating in Colorado.

Year	Retail Marijuana				Total Retail Marijuana Licenses
	Retail Marijuana Store Business Licenses	Retail Marijuana Product Manufacturer Business Licenses	Retail Marijuana Optional Premises Cultivation Business License	Retail Marijuana Testing Facility Business Licenses	
2012	NA	NA	NA	NA	NA
2013	NA	NA	NA	NA	NA
2014	205	58	272	7	542
2015	372	132	471	19	994
2016	435	193	572	15	1215
2017	492	271	692	13	1468
2018	538	289	744	11	1582
2019	553	280	675	13	1521
2020	592	284	699	11	1586
2021	622	291	746	11	1670

Table 6: Retail Marijuana Licenses in Colorado, 2012-2021

The development of the number of retail marijuana licenses is plotted in the Figure 6, which demonstrates that the rate of increase is slowing down as time passes, and that the number of active retail marijuana licenses is settling somewhere above 1500 licenses.

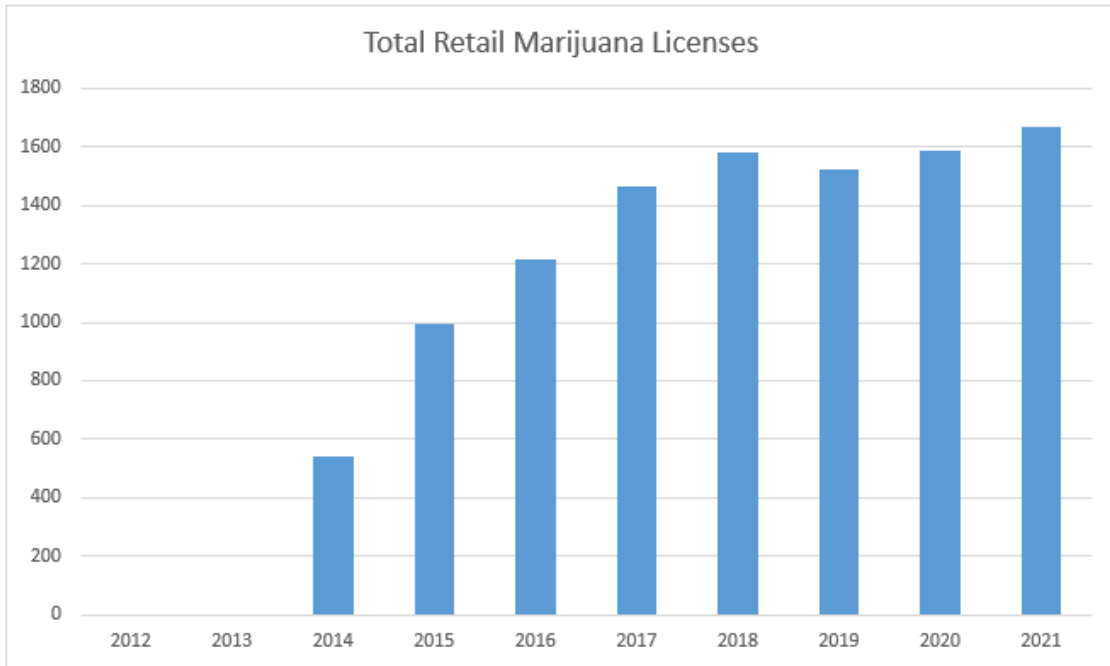


Figure 6: Total Active Retail Marijuana Licenses in Colorado, 2012-2021

Respectively, the number of active medical marijuana licenses is shown in the Table 7. Similarly to the retail marijuana licenses, number of medical marijuana licenses saw a big peak at the beginning of legalization due to many new entries into the market. Interestingly, the number of medical marijuana licenses started to drop after 2016, suggesting that there were initially too many businesses, which caused some to stop operations after a while. The table shows the respective amounts of licenses issued to store businesses, marijuana-infused product businesses, cultivation businesses and testing facility businesses. Like retail marijuana license numbers, the store and cultivation businesses are the most popular business types. Marijuana-infused product businesses are somewhat popular, and there are only a handful of businesses

operating medical marijuana testing facilities.

Year	Medical Marijuana				Total Medical Marijuana Licenses
	Medical Marijuana Store Business Licenses	Medical Marijuana-Infused Product Business Licenses	Medical Marijuana Optional Premises Cultivation Business License	Medical Marijuana Testing Facility Business Licenses	
2012	273	38	NA	NA	311
2013	372	80	488	NA	940
2014	493	144	727	NA	1364
2015	512	183	763	NA	1458
2016	529	237	785	NA	1551
2017	509	256	765	14	1544
2018	495	253	725	11	1484
2019	433	216	478	11	1138
2020	438	218	468	10	1134
2021	425	220	466	10	1121

Table 7: Medical Marijuana Licenses in Colorado

The number of total active medical marijuana licenses are plotted in the Figure 7. The figure illustrates the development of medical marijuana businesses, which suggest that the number of medical marijuana businesses in Colorado is settling somewhere around 1000 licenses after an initial rush into the market.

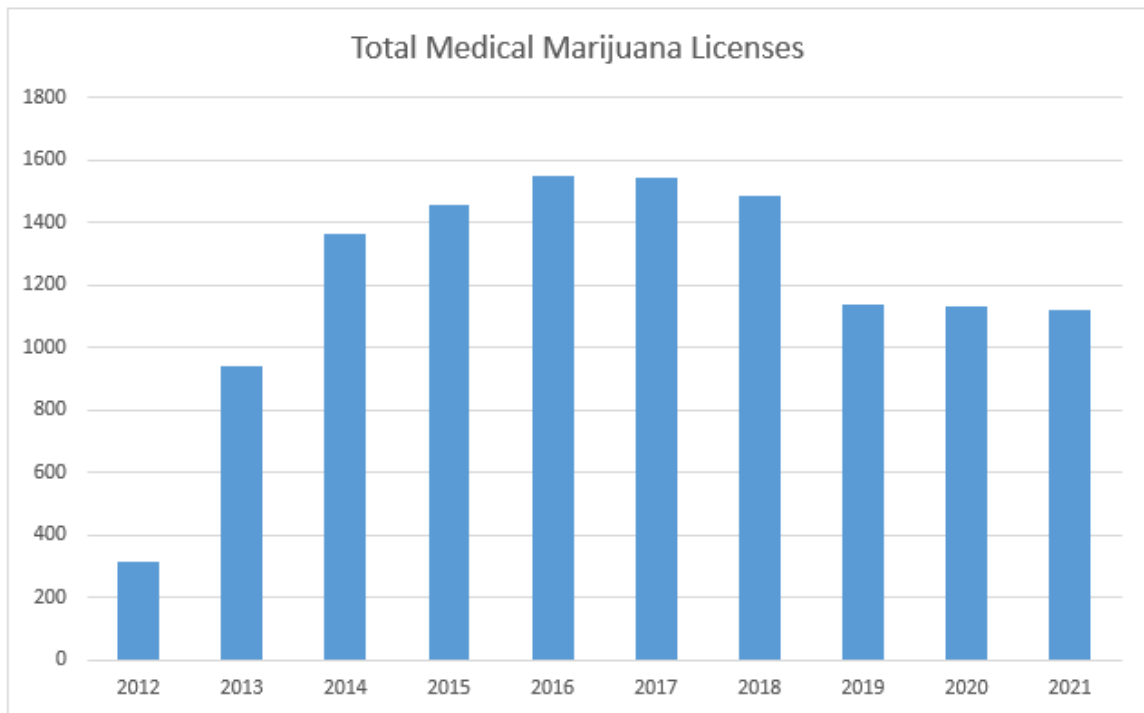


Figure 7: Total Active Medical Marijuana Licenses in Colorado, 2012-2021

A recent study found that cannabis industry also had a positive influence on the labor market in Colorado after the legalization of medical and recreational marijuana (Chakraborty et al., 2021). The study looked at Colorado’s labor markets and the trends which followed legalization, and it found that there was a 0.684 percentage point decrease in the unemployment rate. The number of unemployed people decreased by 6.6% after legalization. Inversely, the study found that legalization was associated with a 4.4% increase in overall employment in Colorado. Manufacturing sector benefitted the most with 12.9% increase in employees, while the service sector saw a 3.8% increase in employees.

4.3 Effect on state budgets

The last three hypotheses were related to the effects that marijuana legalization could have on state budgets. Hypothesis 3 predicts that there will be reductions in law enforcement and judicial budgets due to less need of enforcing and penalizing marijuana-related crimes. Hypothesis 4 predicts increases in healthcare and public

safety budgets. Finally, hypothesis 5 predicts that there will be initial costs associated with setting up a new legal framework around enforcing the new marijuana laws.

The three hypotheses were tested by inspecting the state budgets before and after marijuana was legalized in Colorado. The data analyzed included total state operating budget, corrections budget, health care policy and financing budget, judicial budget, law budget, public health and environment budget, and public safety budget. After finding the budget data, year-over-year change was calculated for each of the budgets in order to see how much each of those budgets changed over time. The data on budgets as well as the respective year-over-year changes can be found from Tables 8 and 9. Finally, the average year-over-year rates were calculated for each budget to see how the rate of increase in budgets changed after legalization, and this information can be found from Table 10.

Table 8 reveals us that a huge spike in health care policy and financing can be observed right after the legalization of marijuana took place in 2012. In 2012, the budget was 19.37 percent higher than in 2011. The budget continued to increase, with a 18.68% increase from 2012 to 2013, and a 14.96% increase from 2013 to 2014. The judicial budget also saw a somewhat relevant increase in the budgets around legalization: first a 7.95% increase from 2011 to 2012, then an 8.91% increase into 2013, 10.79% increase from 2013 to 2014, and lastly a 9.19% increase between 2014 and 2015.

Year-over-year changes in Colorado State Budgets Before and After Cannabis Legalization in 2012				
Year	Year-over-year Change in Total State Operating Budget	Year-over-year Change in Correction Budget	Year-over-year Change in Health Care Policy and Financing Budget	Year-over-year Change in Judicial Budget
1999	-	-	-	-
2000	10,81 %	10,55 %	11,33 %	6,03 %
2001	4,83 %	7,25 %	10,00 %	5,76 %
2002	2,41 %	0,90 %	0,78 %	-2,91 %
2003	2,67 %	2,50 %	15,99 %	4,72 %
2004	3,09 %	3,69 %	4,18 %	4,09 %
2005	8,91 %	6,63 %	5,95 %	6,73 %
2006	6,60 %	9,30 %	2,62 %	11,35 %
2007	5,61 %	9,78 %	6,79 %	14,28 %
2008	8,51 %	6,09 %	9,00 %	11,19 %
2009	2,72 %	-1,45 %	11,38 %	1,80 %
2010	4,06 %	0,65 %	12,87 %	2,04 %
2011	-1,05 %	-1,15 %	5,94 %	5,13 %
2012	4,64 %	0,24 %	8,07 %	7,95 %
2013	9,89 %	3,93 %	19,37 %	8,91 %
2014	8,60 %	5,01 %	18,68 %	10,79 %
2015	8,04 %	5,25 %	14,96 %	9,19 %
2016	2,01 %	-0,82 %	-0,29 %	3,08 %
2017	5,79 %	3,45 %	9,13 %	3,59 %
2018	7,35 %	6,27 %	4,50 %	6,87 %
2019	9,08 %	7,55 %	4,60 %	8,68 %
2020	-2,62 %	-4,86 %	11,28 %	-2,53 %
2021	11,43 %	1,23 %	9,98 %	5,27 %

Table 8: Colorado’s State Operating, Corrections, Health Care Policy and Financing, and Judicial Budgets, 1999-2021

In the Table 9, we can see that after the legalization there was a single 17.98% increase in law budget moving from 2012 to 2013. Public health and environment budget also saw a single year-over-year increase of 12.38% between 2012 and 2013. Most notably, huge increases in public safety budget can be observed around legalization of recreational marijuana: from 2011 to 2012 the budget increased by 21.26%. Following that, the public safety budget continued to increase from 2012 to 2013, with an even bigger increase of 29,11%.

Year-over-year changes in Colorado State Budgets Before and After Cannabis Legalization in 2012			
Year	Year-over-year Change in Law Budget	Year-over-year Change in Public Health and Environment	Year-over-year Change in Public Safety Budget
1999	-	-	-
2000	-3,34 %	12,74 %	10,16 %
2001	6,15 %	9,48 %	12,45 %
2002	0,28 %	-3,75 %	1,12 %
2003	-1,15 %	-4,18 %	2,98 %
2004	107,40 %	8,18 %	12,11 %
2005	-47,45 %	38,86 %	0,87 %
2006	9,59 %	16,29 %	0,86 %
2007	15,01 %	2,14 %	0,98 %
2008	3,78 %	1,99 %	9,43 %
2009	3,27 %	-8,73 %	1,65 %
2010	9,32 %	3,23 %	3,39 %
2011	0,80 %	0,93 %	3,17 %
2012	7,56 %	4,94 %	21,26 %
2013	17,98 %	12,38 %	29,11 %
2014	8,36 %	4,78 %	-3,65 %
2015	4,06 %	-2,60 %	-0,62 %
2016	0,87 %	5,42 %	3,55 %
2017	3,31 %	2,30 %	2,28 %
2018	3,85 %	1,94 %	21,82 %
2019	9,84 %	4,92 %	3,50 %
2020	-0,99 %	-1,39 %	-4,39 %
2021	13,33 %	9,70 %	6,95 %

Table 9: Colorado’s Law, Public Health and Environment, and Public Safety Budgets, 1999-2021

Table 10 shows the average rate of change in those budgets presented in Tables 8 and 9. From this data we can see that after legalization the corrections, judicial, and public health budgets increased on average below the rate of average increase observed in total state budget. Health care policy and financing, law, and public safety budgets increased faster on average than the total state budget. Also, when

comparing the periods before (1999 to 2012) and after (2012 to 2021) recreational marijuana legalization, corrections, law, and public health and environment budgets experienced a decrease in the average year-over-year numbers. Inversely, the average rate of increase accelerated in health care policy and financing, judicial, and public safety budgets.

	Average Rate of change						
	Total State Operating Budget	Corrections Budget	Health Care Policy and Financing Budget	Judicial Budget	Law Budget	Public Health and Environment	Public Safety Budget
Before legalization	4,93 %	4,56 %	8,07 %	5,85 %	8,64 %	6,43 %	4,93 %
After legalization	6,42 %	2,73 %	10,03 %	6,18 %	6,82 %	4,24 %	7,98 %

Table 10: The Average Year-Over-Year Rate in State Budgets Before (1999 – 2012) and After Cannabis Legalization (2012 – 2021)

The hypothesis 3 predicted that there would be reduction in law enforcement and judicial budgets, which didn't happen. Law budget experienced spike in budget increase after the legalization, as did the judicial budget. That could be because contrary to the previous assumptions, there would be more need to enforce marijuana laws by supervising and tracking businesses. It is also viable to assume that even if specific marijuana crimes disappeared, other crimes would sustain their previous levels regardless of marijuana laws, and thus there would be no major budget savings from legalization. These budget numbers do not show the allocations of each budget, so it is impossible to assess whether or not legalization allowed more efficient spending for law enforcement on more serious crimes. Only law-related budget which saw reduction in spending was corrections budget, which tells that spending on correctional facilities and programs reduces when legalizing cannabis.

As per hypothesis 4, it could be noticed that health care policy and financing, public health and public safety each had increases in budget size. The reason for these effects is that legalizing a substance which is harmful for people's health, there is need to increase spending on preventive care and health care services.

These results also show us that there is an initial spike in state budgets resulting from cannabis legalization, just as predicted by hypothesis 5. The reason for this initial increase in budgets is result of setting up a new legal framework for public agencies to operate in, which usually means that those agencies need money to change their operations.

5. DISCUSSION AND POLICY IMPLICATIONS

The findings in section 4 indicate that it is reasonable to assume that there are significant economic benefits from recreational marijuana legalization. In Colorado, the legalization of recreational marijuana in 2012 has resulted in hundreds of millions of dollars in additional revenues annually. Last year Colorado collected over 423 million dollars in marijuana tax, license, and fee revenues, which account for 2.43% of the state's annual collections. The revenues collected from marijuana sales and businesses were used to construct schools, and fund expenditures such as education, public health, human services, and local affairs. Resulting from opening the legal marijuana markets, there has been considerable impact on the labor markets in Colorado, as the state saw thousands of new businesses in the emergent marijuana industry. Along with new businesses came a huge number of jobs: estimates say that there were over 38,000 jobs in Colorado's marijuana industry in 2021. As the state saw a big number of new jobs emerge, there was also a small decrease in the number of unemployed people. The findings demonstrate a correlation between legalization and increase in state budgets; there was a significant initial surge of funds directed towards judicial, law, public health, public safety, and health care policy and funding budgets. Only correctional budget was more or less not affected by marijuana legalization.

Most of these findings are in line with the hypotheses and previous literature. As hypothesis 1 predicted, there were significant tax revenues which could be redirected towards improving the local schools, human services, and other areas of society which are negatively affected by cannabis use. The results also confirmed the hypothesis 2, which stated that marijuana legalization would lead to new jobs and new businesses, further fueling the economic activity in Colorado. This evidence confirms that consumers are willing to purchase their cannabis products from legal sources, which decreases the size of illegal markets and brings otherwise invisible activities into

daylight. These two proven hypotheses support the claims by Clements and Zhao (2009), Rogeberg (2018) and Hall (2020), who all believed that legalization not only increases the funds available for government to use, but it also takes away revenue from illegal drug trafficking organizations, makes it possible for governments to cover the costs of cannabis use with cannabis tax funds, and enables governments to redirect cannabis tax funds to improving society at large.

Contrary to hypothesis 3, it was not clear from the findings that legalization would decrease law enforcement budgets, rather the data tells that the budgets could even increase. The findings relating to hypothesis 4 could however confirm that there was increase in health care and public safety budgets. These findings suggest that the concerns of increasing spending on health care, public safety, and law enforcement should be taken seriously. As hypothesis 5 could be confirmed to be true, policy makers must keep in mind that legalization will initially increase many of the state's budgets because setting up an appropriate legal framework requires time and resources for it to not be counterproductive.

In terms of the implications of this research, analysis of the empirical record in Colorado suggest that overall cannabis legalization is a much preferable policy in many ways. As this study could to some extent confirm the economic benefits of cannabis legalization, there are other viewpoints which are just as important in the policy discussions. The argument about the right of use arises often in the discussions about cannabis policies, and it must not be dismissed only because of its subjectivity. A respected social philosopher and economist Milton Friedman (1972) five decades ago asserted his position in line with the rising consensus today:

“On ethical grounds, do we have the right to use the machinery of government to prevent an individual from becoming an alcoholic or a drug addict? For children, almost everyone would answer at least a qualified yes. But for responsible adults, I, for one, would answer no. Reason with the potential addict, yes. Tell him the consequences, yes. Pray for and with him, yes. But I believe we have no right to use force, directly or indirectly, to prevent a fellow man from committing suicide, let alone from drinking alcohol or taking drugs.

I readily grant that the ethical issue is difficult and that men of goodwill may well disagree. Fortunately, we need not resolve the ethical issue to agree on policy. Prohibition is an attempted cure that makes matters worse—for both the addict and the rest of us. Hence, even if you regard present policy toward drugs as ethically justified, considerations of expediency make that policy most unwise” (p. 104).

Similarly, Evans (2013) argues for legalization because it serves the will of the majority of citizens and promotes personal freedom and choices. Even if the choice to use cannabis is not a rational one, it might be a personal preference. The preference to use cannabis over alcohol can be seen as a casual choice, similar to an individual choosing to eat a hamburger instead of salad: some people just happened to like different things and it shouldn't be punished. Instead of punishing, there are other more appropriate economic actions that regulators can take to guide people's behavior towards less harmful activities. More importantly, regulators should be especially cautious of using legislative measures to impose the preference of the regulators on individuals (Rogeberg, 2018).

While it cannot be denied that cannabis has negative effects – as do any other intoxicating substance humans use – the findings of this study and the literature review suggest that the proper policy to control cannabis in the society is through legalization and state-controlled or state-supervised system.

6. CONCLUSIONS

6.1. Main findings

Cannabis legalization brings new revenues for states as illegal markets turn into legal markets and creates numerous jobs in cannabis industry either in cultivation and sales, or in ancillary jobs needed to conduct business. Funds collected from increased business activities in such states can be used to improve the well-being of the society, but also to battle against the unwanted consequences of marijuana use. Legalization does increase the state spending for the short transition period between legal frameworks, and it also seems to increase state spending on healthcare, public safety, and law enforcement.

The economic benefits do seem to balance out the negative economic aspects of legalization, but when the scope of observation is widened to include the social and health aspects, it is obvious that legalization is much more humane and effective way to tackle the issues surrounding cannabis. Therefore, it seems inevitable that the facts speak for the legalization of recreational and medical cannabis. Legalization not only serves the will and freedom of the citizens, but also it decreases the harm caused by the repressive prohibition policy.

6.2. Implications for international business

Better understanding on the economic effects of cannabis can lead to public discussion and further progress the legalization globally. Underground cannabis business is still a huge industry, but the market in many places is out of reach for honest businesspeople. Cannabis legalization, as seen in the case study, can open up new opportunities for businesses globally, as new businesses emerge locally and already established businesses expand into new foreign markets. Emerging cannabis markets require experts from all backgrounds and professions to create, manage, and work in businesses. As research is not yet concluded when it comes to cannabis, new research opportunities arise as more and more states legalize.

6.3. Suggestions for future research

Further studies are needed to establish the results found by this research, and to generalize the results globally. This could be achieved by using a more statistical method to determine the statistical relationships related to legalization around the world. Especially the effect on state budgets needs more in-depth research and validation from more reliable research methodologies. The effect of taxation in moderating the amounts purchased is also an area of interest, which requires more in-depth research to determine the appropriate tax levels to minimize the social costs. Even though Colorado is using their marijuana taxes to improve the society by funding important sectors, it would be interesting to see a study which would find the most effective way to counter the negative effects of cannabis use. The lack of job tracking should encourage future researchers to study the marijuana industry and its

employees more carefully, and to find ways to calculate accurate employment statistics.

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