Department of Economics and Finance

Chair of Applied Statistics and Econometrics

Legalization of Soft Drugs and Government Tax Revenues: An Econometric Approach

Supervisor

Prof. Andrea Pozzi

Student

Alessio Martucci

Student number: 243691

Academic year 2021/2022

ABSTRACT

This paper formalizes a cross sectional econometric regression to estimate whether the legalization of the sale and use of soft drugs for recreational and medical purposes has a positive impact not only for government tax revenues, but also for society in terms of employment and personal consumption expenditure. The model developed is a panel data in which the dependent variable is represented by government tax revenues, and the independent variables are the macroeconomic determinants of tax revenues. Observations are made on the 50 US States and the District of Columbia from 2015 to 2020.

Table of contents

Disclaimer

According to the World Health Organization, a drug is “any psychoactive substance of plant or synthetic origin which acts on the central nervous system, affecting perception, consciousness, cognition, mood and emotions of a person.” Psychoactive substances may cause states of physical and/or psychic dependence, which may result into cases of tolerance (need to increase the dosage with possibility of abuse) or of double-stranded dependence (dependence from multiple drugs). Nowadays, most narcotics are categorized either as “hard” or “soft” drugs based on public opinion and perceived danger: the hard drug category includes the most potent and toxic substances which cause the most damage to human organs, like heroin, cocaine, ecstasy, LSD, etc. A soft drug, on the other hand, is considered less harmful because it produces either little or no physical or mental damage. Conventionally, this category includes substances like alcohol, caffeine, nicotine, marijuana, and psilocybin mushrooms. (World Health Organization, 2022). This paper concentrates on whether allowing the cultivation, sale and consumption of cannabis derived products represents a good investment for the national governments. It is important to remark that while soft drugs are perceived to be less addictive, they may still cause serious problems and thus must be regulated. The question, however, remains how.

Introduction and Problem Statement

On February 16th, 2022, the Italian Constitutional Court declared the so called "Cannabis Referendum" inadmissible and thus discontinued the ongoing process towards the decriminalization of recreational use of marijuana in Italy. The popular referendum was signed by more than 630.000 Italian citizens and contained a set of bullet points whose objectives where the abrogation of some provisions contained in the decree signed by the Italian President of the Republic on October 9th, 1990, which still today regulates the cultivation, possession, and trade of psychoactive substances in Italy under articles 73, 74, 75 DPR 309/90. In particular, the referendum aimed not only at decriminalizing cannabis cultivation for own consumption, but also at eliminating all those penalties strictly related to cannabis possession, such as detention up to 6 years and withdrawal of the driving license. (Gazzetta ufficiale, 1990)

In Italy, the debate regarding legalization of marijuana for recreational purposes has been going on for decades: advocates sustain that such a change could solve major issues of the Italian governance system, such as prison overcrowding, and significantly reduce social impact of organized crime associations. Supporters also claim that prohibition enforced by the Italian government has failed to reduce access to marijuana and has exposed the consumers to threats of arrest. Opponents, on the other hand, argue that such a proposal could lead to an increase in marijuana consumption, which may be the cause of negative externalities such as social damages and higher pressure on the health care system. Moreover, critics sustain that any move towards legalization will inevitably attract powerful for-profit businesses who may market aggressively hemp users and induce them to make abuse of the substance. (Carlo, 2021)

Not surprisingly, this debate has been prominent all over the world, and it is the consequence of several years of prohibition policies enacted in the XX century. As a response, some countries of the world have signed referendums to legalize marijuana for recreational purposes already. In late 2013, Uruguay became the first country of the world to explicitly legalize it, followed by Canada in 2018. In some European countries, like Spain, Italy, Austria, Belgium and The Netherlands, the possession of small amounts of this substance for own consumption is considered a misdemeanor, but the unauthorized sale of cannabis related products is illegal and punishable with detention. (European Monitoring Center for Drugs and Drug Abuse, 2018)

In the United States, 18 States have officially legalized the recreational use of such substance and 12 of them have allowed the sale of cannabis derived products and raised an excise tax on it. This paper focuses on whether allowing the consumption of cannabis for medical and recreational purposes and especially its sale through a state-controlled distribution channel is beneficial for

government tax revenues and for society in terms of employment and other macroeconomic factors. The proposed discussion is analyzed thanks to a cross sectional panel data regression. In chapter 1, history of marijuana usage and trends on its regulation will be discussed, followed by an economic definition of the type of good recreational drugs are. Chapter 2 will formalize a panel data regression by starting with descriptive evidence and an overview of the data observed. Chapter 3, finally, will analyze implications and consequences of the decision to legalize the recreational usage of soft drugs and provide a costs and benefits analysis of legalizing marijuana in Italy.

CHAPTER 1: History of Cannabis Usage and Regulation

1.1 From Ancient Civilizations to Modern Era

Cannabis, the native plant from which marijuana is derived, has been exploited by mankind since the early stages of its presence on earth: several studies trace its cultivation back to more than 10 thousand years ago. The plant seems to have originated in central Asia and was initially used for textile and medicine scopes rather than as a mind-altering substance (Collins, 2020). With the beginning of religious practices, social mores surrounding the recreational usage of plant strains with greater psychoactive compounds spread gradually in India and, from there, to the Mediterranean civilizations: the plant became known in Egypt and Arab countries, where it was considered a sacred medicine, while the Greeks and Latins used it mainly as a fiber for ropes and sailcloth and for nutrition purposes, as they consumed the seeds and sometimes the inflorescences (Collins, 2020). During Medieval times, the medical use of this plant started to be demonized in countries where Christianity had a major influence, as attested by the papal bill issued in 1484 by Innocent VIII, in which cannabis was labeled as "unholy sacrament of the satanic mass" (Frankhauser, 2002). However, its usage dedicated to manufacturing ropes, sails, and hawsers for warships was largely employed by the Italian Maritime Republics of Pisa, Venice, Genoa and Amalfi, and by the English and Spanish colonialist empires. The Italian peninsula, in particular, was prominent in the cultivation of this plant: Italian products derived from hemp were considered a valuable commodity and an important source of trade across all Europe (Marcelli, 2018).

In 1611, marijuana made its arrival in North America thanks to the first reported permanent English settlement in the colony of Jamestown (Robert, 2003). The British empire required colonies to grow hemp to produce clothing, paper, ropes, and fishing nets, as reported by George Washington and Thomas Jefferson in the 1770s. (Mount Vernon, 2018). The broad span of applications in which the cannabis plant was employed caused it to be the third largest crop in the United States, preceded by only tobacco and cotton, by the mid-1800s (Goldstein, 2016). Around the same time, the unified Italian peninsula became the second world producer of cannabis derived goods behind the Soviet Union: according to Coldiretti, more than 100.000 acres of Italian land were dedicated to the cultivation of marijuana at the beginning of XX century. The most productive regions were Emilia Romagna, Tuscany, Liguria, Umbria, and Campania (Coldiretti, 2020)

Up until the XIX century, the cultivation of hemp was considered as a mere source of income and power from the Western colonialist empires: the plant was well known by society, but its psychoactive effects were ignored. However, the development of sciences like psychiatry and

chemistry allowed the psychoactive compounds of this plant and their effects on the human brain to be observed and reported: after a trip to Calcutta, India, the Irish physician William Brooke O'Shaughnessy reported the medical benefits of cannabis in Europe by analyzing its effects on victims of cholera, tetanus and epilepsy: he was able to prevent symptoms like convulsions and alleviate the muscle spasms typical of these fatal diseases. (O'Shaughnessy, 1840). Thanks to him, the analgesic properties of cannabis became known to the western world, and the plant started to be used also by royals like Queen Victoria and Empress Sissi of Austria as a natural remedy against cough and painful menses (Reynolds, 1890).

At the same time, the French psychiatrist Jacques-Joseph Moreau, intrigued from the observations made during a trip in the Middle East, where resin (hashish) was used by customary users, began to study the psychoactive effects of cannabis on the human brain: he noticed that hemp produced pure bliss, but also disorganization of ideas and temporal distortions. (Aubert-Roche, 1843) Very soon its psychotropic use extended beyond therapeutic purposes, and the employment of cannabis for recreational usage became fashionable among artists and intellectuals: in Paris, the Club des Hashischins (The Hashish-Eaters Club) was frequented by famous artists like Alexander Dumas, Victor Hugo, and Charles Baudelaire (Booth, 2005). From Paris, interests for hemp resin disseminated across Europe and numerous scholars wanted to try it on themselves: Italy, for example, was leading in the experimentations on adult-usage of cannabis. In 1847, the Italian scientists Carlo Erba, pharmacist and founder of a famous Italian Pharmaceutical Company, and Giovanni Polli, physician and Director of the scientific journal "Annals of Chemistry applied to Medicine" imported in Italy the first experimentations on Cannabis in Milan (Samorini, 1996). The newly discovered psychotropic effects rapidly spread curiosity for this substance all over the world and led the XIX century to be the "Golden Age" for hemp and its derived products.

1.2 Prohibition Era

This high level of curiosity over the psychoactive effects of cannabis and other substances led the market of drugs to be very unregulated: at the end of the XIX century, beverages such as Coca-Cola contained cocaine, heroin was sold as an over-the-counter medicine, and hemp was available in tinctures (Das, April 1993). The remarkable variability of physiological effects among patients and regular users, together with the fact that the pharmacologically active principles had not been yet discovered and analyzed, led to an increase in government concerns for regulation of the drug market. The "Pure Food and Drug Act" of the 1906 represented the kick start for drug prohibition in the United States and all over the world: for the first time in history, this Act prescribed a mandatory

ingredient labeling for medical products containing cannabis (Young, 1989). Later, in response to the increasing criticism of the opium and cocaine trade, the first international drug control treaty was signed in The Hague in 1912 by USA, Germany, the UK, France, Italy, the Netherlands, Portugal, Russia, China, Japan, Persia and Thailand to control trade and usage of cocaine and opium. A revision of this agreement in 1925 wanted to include cannabis among the restrained substances under explicit request of USA, Egypt and China. The proposal did not pass because of the strong opposition imposed by India, where the cannabis usage was and is still today largely rooted to the social and religious traditions (United Nations, 2008) The denial of this proposal did not stop certain countries to ban marijuana cultivation and usage: in the USA, 29 States outlawed marijuana between 1916 and 1931 (Lee, 2012). Despite objections from the American Medical Association related to its medical applications, the disapproval towards hemp production and commerce grew up to the point where in 1937, behind specific request of the supervisor of the Federal Bureau of Narcotics Harry Anslinger, who kicked off alcohol prohibition in 1933, the United States of America imposed the "Marihuana Tax Act", which levied an excise tax of $1 for every business deal regarding medical and industrial purposes and an excise of $100 for hemp-related transactions for all other purposes: the purchase of cannabis became so expensive and violations of the Act so punitive that the use of hemp for both experimentations and recreation decreased significantly in the United States, marking the official beginning of the prohibition era (Frontline, 1998).

On an international level, prohibition of marijuana was favored not only by the economic boom following World War II, when new synthetic fibers, like nylon, entered the market thanks to the post-war industrialization, but also by the enforcement of the international treaty "Single Convention on Narcotic Drugs", signed by all 73 members of the United Nations (including Italy) on March 30th, 1961. The treaty aimed at enforcing an international legal framework for psychoactive substances, banning the production and trade of all narcotic drugs for non-medical and scientific purposes. These illegal substances were classified into four schedules according to their degree of danger and abuse: all drugs containing a marijuana base were classified as hard drugs under Schedule IV, which indicated "substances considered the most addictive and harmful to society" and included also LSD and heroin. Among the objectives of this convention there was the elimination of cannabis derived products within 25 years (United Nations, 1961). Despite following Conventions of the United Nations held in 1971 and in 1988 aimed at expanding the number of controlled substances in response to the diversification of drug use, the increase of drug prohibition on an international level gave rise to a mass-scale illicit production of cannabis, cocaine and heroin for recreational purposes, especially in the European and American countries: international drug-trafficking became a multi-billion dollar business controlled by mafia and criminal organizations, which lead to strong political responses by

most developed countries. In 1970, the United States' president Richard Nixon signed the Controlled Substance Act (CSA), the bill that makes marijuana illegal under US Federal law up to this date: cannabis was classified in Table I, the most restrictive category of substances which had "no currently accepted medical use and a high potential for abuse" (United States Drug Enforcement Administration, 1970). The US president Nixon defined all mind-altering substances "the public enemy number one of the United States". This caused the USA to incur into a total war on drugs aiming at preventing illicit drug trafficking from Mexico and South America, making it one of the world leading countries in the prevention of drug use (Barcott, 2015). Throughout the 1980s, under the presidency of Ronald Reagan, federal and state criminal penalties for marijuana trafficking became stricter and mandatory-minimum sentences were established: marijuana-related arrests increased dramatically from 1990 to 2002, from 327,000 to 697,000 annually (King, 2006). According to the Washington Post (2017), which gathered data on crime in the United States from the federal Bureau of Investigation, "in 2016, more people were arrested for marijuana related crimes than for murder, rape, aggravated assault and robbery combined" (Ingraham, 2017).

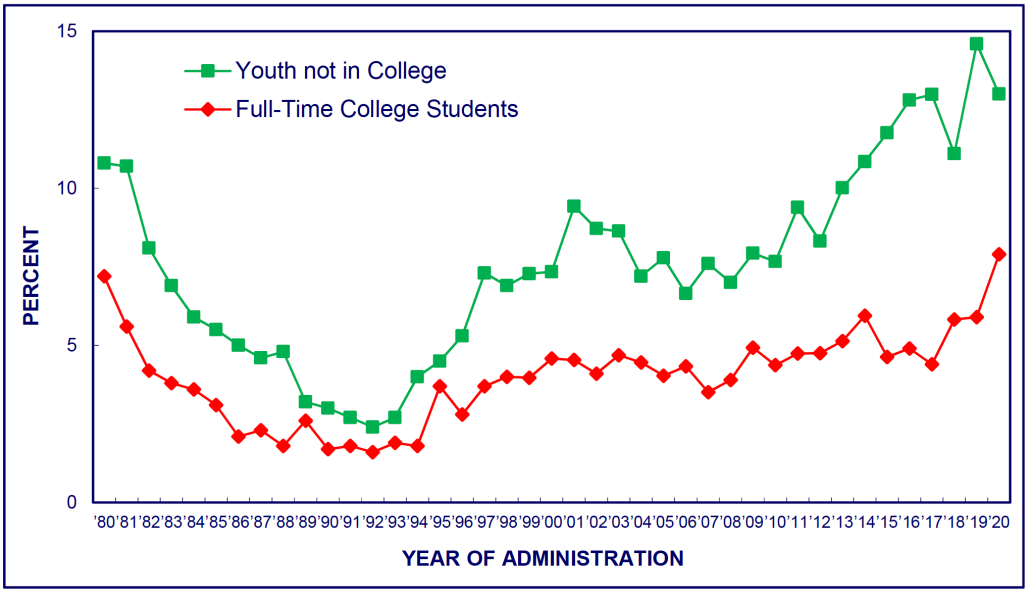

Figure 1: Trends in 30-day Prevalence of daily use among college students and youth not in college (Sherburne, 2021)

As shown in Figure 1, the prohibition policies enacted from the 1980s in the United States have not contributed to the elimination of marijuana trafficking but have instead caused a steady increase in marijuana consumption across all ages, especially among youth. The total war on narcotics, in fact, has not stopped regular consumers to recur to the black market to purchase marijuana and other substances, increasing the chance for them to engage into risky situations and get arrested.

1.3 Re-Legalization Era

Despite the worldwide battle against illicit drug dealing, the scientific research on Cannabis did not completely stop: in 1964, the scientists Yehel Gaoni and Raphael Mechoulasm identified and isolated for the first time the chemical structure of the tetrahydrocannabinol (THC), the main psychoactive compound of cannabis responsible for its mind-altering effects (Mechoulasm & Gaoni, 1967).
In particular, the last two decades were highly characterized by several research studies on the pharmacological properties of this substance, which shed light over the potential of this plant.
Consequently, the use of cannabis for medical and recreational purposes has been reconsidered in the light of scientific studies on the efficacy and safety of cannabinoid-based drugs, and reform policies have started across the world (Bifulco & Pisanti, 2015). Based on the scientific evidence, in fact, governments have employed two kinds of policy reforms which are often mistakenly used interchangeably: decriminalization and legalization.
Decriminalization of a substance is the act of removing any criminal sanction related to the use or possession of a drug up to a certain amount: it means that a once-banned drug is still prohibited by law, but the legal system will no longer prosecute a person for carrying it under a certain amount. In other words, decriminalization means people are allowed to use the substance without incurring the risk of facing a jail sentence, but may still be subject to fines or sanctions (Turnbridge, 2020).
In 1976, Netherlands was the first country in the world to decriminalize the possession of "soft drugs", a category drafted by the Dutch government which included cannabis: the Dutch Opium Act legalized the possession of up to 5 grams of marijuana for personal purposes and it enforced a toleration policy towards the sale of cannabis in licensed coffee shops (Lieuw, 1991). Today, some examples of countries in which either the possession, use, or cultivation of marijuana is decriminalized can be found in Spain, Costa Rica, and certain regions of Australia.
Legalization, on the other hand, is when a substance becomes permissible by law and people can use it without the risk of getting neither convicted nor fined. Legalization is a process which may also regulate the supply chain of the substance from its cultivation to its retail distribution, requiring suppliers to get a form of licensure. As for products like tobacco and alcohol, legalization of marijuana-based substances often includes restrictions up to a certain age limit (Turnbridge, 2020).
Evidence of marijuana legalization across the world can be found in Uruguay, which was the first country in the world to legalize the recreational use of cannabis in December 2013, followed by Canada and South Africa in 2018 (BBC, 2018). In Europe, Malta was the first country to amend its law and legalize the sale and consumption of hemp derived products in December 2021. According to its former minister of justice and innovation Owen Bonnici, the measure was taken "to stop the

actions of criminal gangs and to avoid the time-wasting process of prosecuting cannabis consumers" (Farrugia, 2021).

Today, more than 60 years have passed since the adoption of the Single Convention on Narcotic Drugs by the members of the United Nations. The reforms on the cannabis regulation system across the world are the consequence of scientific studies conducted on the psychoactive compounds of this plant and on its dangers. A 2015 study published on the journal "Scientific Reports" investigated the mortality risks associated with ten legal and illicit drugs by estimating the margin of exposure (MOE), namely the ratio of toxic dosage, taken as a benchmark, to predicted human exposure: conventionally, an MOE above 100 is considered not life-threatening for consumers and society. The research calculated the total risks for society and individual consumers and found out that the threats associated to consumption of marijuana have been overestimated in the past, while those correlated with other soft drugs like alcohol and nicotine are way higher than public opinion's belief, as shown in Figure 2 (Lachenmeier & Jürgen, 2015).

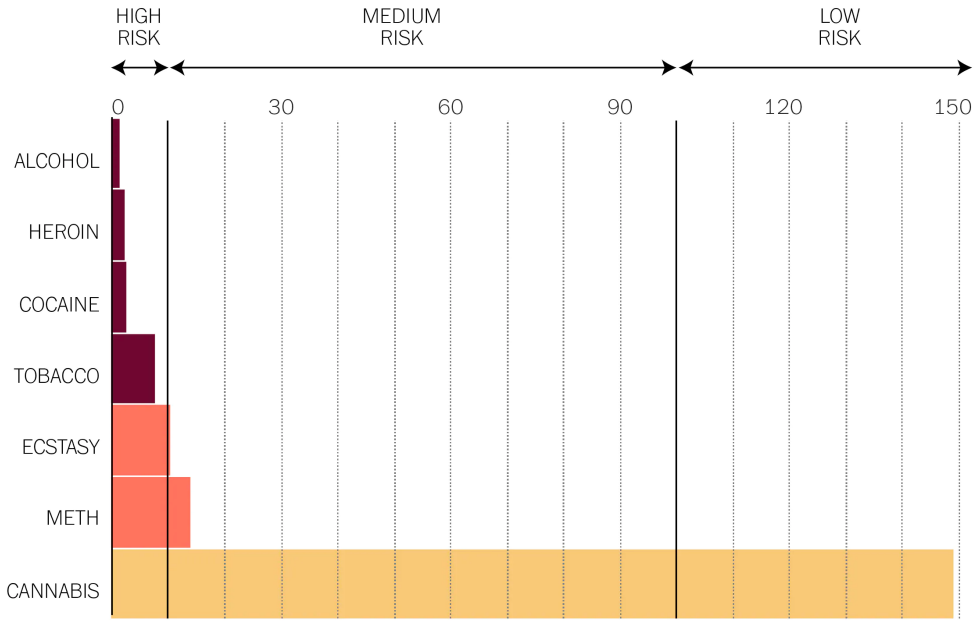

Figure 2: ratio between toxic dose and typical human intake (Lachenmeier & Jürgen, 2015)

After considering all the economic and social consequences given by the prohibition policies induced by the United Nations, and in light of the scientific evidence on the pharmacological properties of this substance, the UN Commission of Narcotic Drugs took action to adopt a rescheduling of marijuana on December 2nd, 2020: the psychoactive components of this substance were removed from Table IV, the most tightly restricted category of drugs, in order to facilitate the trade of hemp for medicinal and scientific purposes (Kwai, 2020).

1.4 Covid-19 Impact on Drug Consumption

The Covid-19 pandemic has had disruptive effects on the lives of people all over the world: the lockdowns enforced by the governments have caused people to develop forms of anxiety, depression and loneliness. Put together, these conditions had life-altering consequences correlated with drug consumption and abuse for people who already made use of drugs before the pandemic: provisional data processed by the US National Center of Health Statistics show that over 93,000 people have died from overdoses in the United States in 2020, the highest number ever recorded, with a 30% increase from 2019 (National Center for Health Statistics, 2022).

In Europe, Covid-19 and the lockdowns imposed have caused less consumer interest in drugs usually associated to outside events, like MDMA, and greater interest in drugs linked to home use: some research studies have found out that the pandemic has largely increased the consumption of dissociative drugs like ketamine and psychedelics and soft drugs like alcohol, nicotine, and marijuana, especially among teenagers. According to the European Drug report of 2021, this social phenomenon is correlated with the fact that drug traffickers have adapted to travel restrictions and border closures, which has favored the spread of illicit drug trafficking in online encrypted messaging services like Whatsapp or Telegram (EMCDDA, 2021).

For what concerns marijuana, neither the prohibition policies enforced by most European countries, nor the travel restriction dictated by the pandemic seem to have limited its consumption: the results of latest European Web Survey on Drugs, ran between March and April 2021 among 50000 residents of the EU, show that cannabis was the most used soft drug after alcohol, as 93% of the respondents reported to have used it at least once over the previous 12 months (Figure 3) (EMCDDA, 2022).

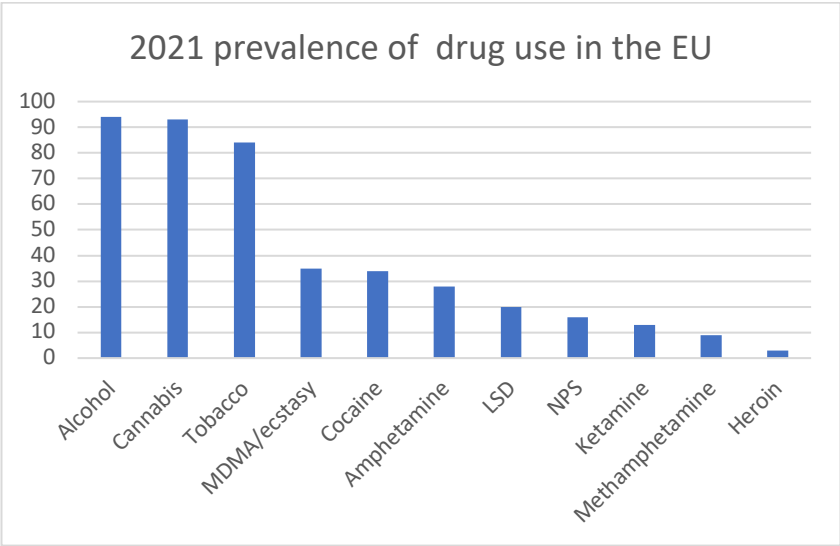

Figure 3: 2021 prevalence of drug use in the European Union (EMCDDA, 2022)

While all these findings necessitate future observations to assess their validity, they raised concerns of the central governments over a potential long-term persistent impact of the pandemic on drug consumption and must be addressed to avoid socially undesirable implications.
Today, according to the World Health Organization, cannabis remains by far the most cultivated and traded illicit drug in the world, with more than 147 million annual consumers, equivalent to 2.5% of the global population (World Health Organization, 2022)

1.5 Economic Definition

Today, one of the reasons behind the huge debate regarding cannabis legalization is the fact that this substance is considered, in the economic field, a demerit good: in economics, demerit goods are products or services considered socially undesirable because their overconsumption is considered unhealthy or detrimental to society due to the perceived negative effects on the consumers themselves (Harvey & Gayer, 2013). If left unregulated at the mercy of market forces, letting market mechanism govern its production and distribution, producers will set a price and consumers will determine their demand based on this price. The equilibrium reached maximizes consumer and producer welfare, but the problem is that demerit goods are addictive and thus may be over-consumed, causing undesirable effects both on the consumers, like forms of abuse or addiction, and on third parties, like forms of violence (Harvey & Gayer, 2013).
Examples of demerit goods are gambling, guns, junk food, pornography, prostitution, and all recreational drugs including marijuana. The issue with this type of goods is that consumers underestimate the indirect costs that come when making use of such goods: marijuana, as demonstrated by several studies, can affect decision making, memory, judgement and perception, which increase the chance for consumers to get engaged into risky behaviors for themselves and for third parties. In other words, overconsumption of goods like cannabis represents a burden of pleasure for the users but may represent a source of risk for society. As shown in Figure 4, this gap creates a negative consumption externality which reduces the marginal social benefit by the extent of the negative effects on others, creating a deadweight welfare loss given by the difference between utility of single consumers and that of society (EconomicsHelp, 2020). While measuring the social costs of marijuana can be quite controversial due to difficulty of quantifying its externalities, it appears quite clear that most of the social costs related to cannabis come from its illegality condition and are correlated to harmful criminal activities by distributors, mass incarcerations, and devastations of communities driven by over policing (Leff, 2021).

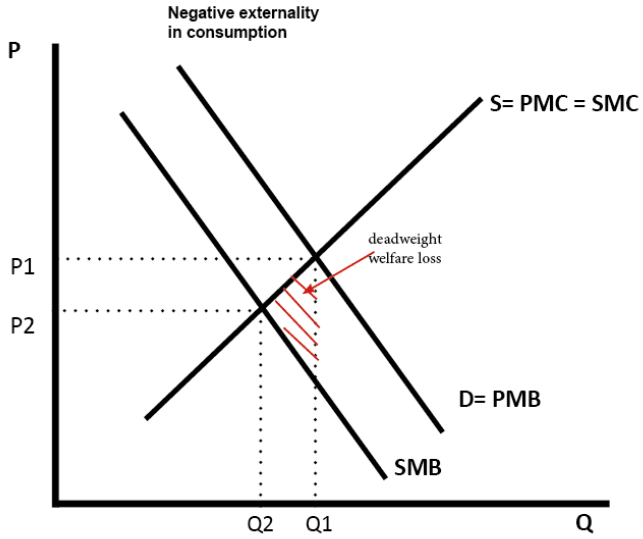

Figure 4: demerit good with negative consumption externality (EconomicsHelp, 2020)

On top of that, it is important to remark that a good with negative externalities such as marijuana isn't necessarily a demerit good but becomes such when people make abuse of it. Several research studies conducted on patients show that marijuana helps to kill cancer cells and slow tumor growth, alleviate chronic pain in people with multiple sclerosis, reduce anxiety disorders and lower blood pressure (US National Academies of Sciences, Engineering and Medicine, 2017). Because of this divergence in the consequences related to the use of this substance, different theories have been raised on how the governments should intervene in order to achieve social optimum and individual satisfaction. Generally, governments may take two kinds of actions based on two different philosophic approaches to demerit goods

(i) Ban any sort of distribution and consumption of the demerit good. This kind of intervention draws from the paternalistic approach to demerit goods, according to which the risk of negative externalities arising from the use of demerit goods outweighs the single user's perception of usefulness and thus the government feels free to circumvent the decision of consumers based on what it thinks it's good for people (Harvey & Gayer, 2013). This was the approach that the US government employed in the early XX century when it banned the sale of alcohol because it considered it a demerit good. The economist Irving Fisher supported alcohol prohibition because he claimed that consumers often make a mistake in fulfilling desires rather than maximizing satisfaction: *"Today I would like to see a study, partly economic and partly psychological, showing how the human animal following his desires often misses satisfactions instead of attaining them. The star example is narcotics."* (Fisher, 1956)

(ii) The government can regulate the production and distribution of the demerit good by allowing the use of it up to a certain amount, control its distribution an even levy an excise tax on its sale. This kind of intervention draws from the welfarism approach, which takes the individual's perception of usefulness of demerit good as an indicator of that person's satisfaction and defines the utility deriving from the purchase or consumption of it as a good net social transaction. When government decides to tax a demerit good, the supply curve given by the marginal social cost will shift left by the amount of the tax raised, making the final price consumers will pay higher. The increase in price is due to the fact that the equilibrium price without government intervention does not include the indirect costs for consumers and third parties correlated with the abuse of these goods, so the government has the power to internalize this negative externality by levying a tax on the demerit good (Harvey & Gayer, 2013). This kind of intervention relies on the fact that since the demand for a demerit good like alcohol or recreational drugs is supposed to be inelastic, most consumers would continue to purchase it regardless of the price increase, but the revenues collected from the excise tax could be used to educate people on the potential hazards associated to the consumption of the demerit good. As shown in Figure 5, taxing a demerit good like alcohol or marijuana causes the marginal social cost (the supply curve) to shift left because of the excise tax, creating a deadweight loss which reduces equilibrium quantity and increases equilibrium price (Harvey & Gayer, 2013).

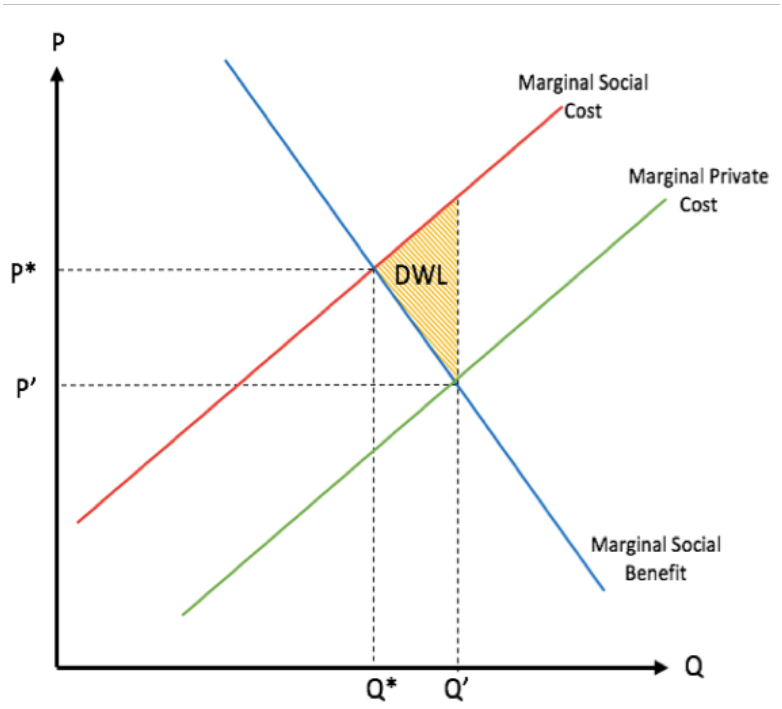

Figure 5: effects of tax on a demerit good (Harvey & Gayer, 2013)

For what concerns marijuana, governments can take actions to regulate the consumption and distribution of this substance by imposing a tax which acts both as a Pigouvian tax, since it imposes an additional cost on a socially harmful good, and as a sin tax, because it is designed to discourage negative internalities for the single consumer (Harvey & Gayer, 2013). Across the world, different reforms have been introduced aimed at enacting permissive policies towards cannabis consumption either for medical or recreational purposes, or both: some nations only legalized the therapeutical use of this substance by starting pilot test programs with selected patients, like Denmark ad Ireland (Cannabis deals, 2019). Other countries, like Italy, have made the medical use legal and enacted a decriminalization policy towards recreational consumption. As it is shown in Table 1, only 6 countries of the world and 19 states of the United States have made legal both recreational and medical consumption of this substance (Wikipedia, 2022).

Table 1 lists all countries in which either the medical or recreational use is decriminalized/legal

Country	Recreational use	Medical use
Argentina	Decriminalized since 2009	Legal since 21/09/2021
Australia	Decriminalized in Nothern Territory & Southern Australia. Legal in Australian Capital Territory for personal use but not for sale	Legal at federal level and in all states. Qualifying conditions and other details vary by state.
Austria	Decriminalized since January 2016	Only certain cannabinoids
Barbados	Legal for spiritual use in Rastafari religion	Legal
Belgium	Decriminalized up to 3 g or cultivation of one plant since 2003	Sativex only
Bermuda	Decriminalized up to 7 g	Legal since November 2016
Brazil	Illegal	Legal for terminally ill patients
Canada	Legal since 17/10/2018	Legal since 2001
Chile	Decriminalized for possession and cultivation	Legal
Colombia	Decriminalized up to 22g or cultivation of 20 plants	Legal
Costa Rica	Decriminalized but no maximum amount has been defined	Legal
Croatia	Decriminalized	Legal for patients with illnesses as cancer, multiple sclerosis, HIV/AIDS
Cyprus	Illegal	Legal
Czech Republic	Decriminalized up to 10g or cultivation of 5 plants	Legal since 2013
Denmark	Illegal	Legal (a 4-year pilot program began in Januay 2018)
Ecuador	Decriminalized up to 10g	Legal
Estonia	Decriminalized	With a special permit
Finland	Illegal but sometimes not enforced	Legal under license

France	Illegal, but fines are usually issued in place of prosecution	Legal since 2013
Georgia	Legal for possession and consumption but not for sale, per a July 2018	Use is legal, but no system for the dispensing of cannabis exists
Germany	Illegal, but prosecution may be refrained if possession is in small quantities and for personal use.	Legal for seriously ill patients who have consulted with a doctor and have absolutely no therapeutic alternative.
Greece	Illegal	Legal
Ireland	Illegal	Legal as part of a 5-year pilot program started in June 2019.
Israel	Decriminalized	Legal since April 2019
Italy	Possession decriminalized; home cultivation is legal in small amounts and for personal use only.	Legal
Jamaica	Decriminalized up to 2 oz or cultivation of 5 plant since. Legal in Rastafari religion.	Legal
Lebanon	Illegal	Legal
Luxembourg	Deriminalized	Legal
Malawi	Illegal	Legal
Malta	Legal for possession, consumption and cultivation. Distribution is allowed through non-profit cannabis clubs.	Legal
Mexico	Legal for possession, consumption and cultivation with a permit, but not for sale.	Use is legal, but no system for the dispensing of cannabis exists
Morocco	Illegal but often unenforced	Legal
Netherlands	Consumption and sale are tolerated in licensed coffeeshops. Possession of up to 5g is decriminalized. Cultivation of up to 5 plants in unenforced for non-commercial use.	Legal
New Zealand	Illegal	Legal since 2018
North Macedonia	Illegal	Legal
Norway	Illegal	Legal
Pakistan	Illegal but often unenforced	CBD only
Panama	Illegal	Legal
Paraguay	Decriminalized up to 10 grams	Illegal
Peru	Decriminalized up to 10g	Legal
Poland	Illegal but may not be enforced for small quantities. Legal beloe 0.2% THC	Legal
Portugal	Decriminalized up to 25g of herb or 5g of hashish	Legal
Rwanda	Illegal	Legal
Saint Vincent (Caribbeans)	Decriminalized up to 2 oz	Legal
San Marino	Illegal	Legal
Slovenia	Decriminalized	Sativex, Marinol and CBD only

South Africa	Legal for possession, cultivation and use in private places but not for sale.	Use is legal, but no system for the dispensing of cannabis exists
Spain	Decriminalized. Use and possession in private areas is allowed for own consumption. Cultivation for personal use is allowed in private areas.	Sativex
Sri Lanka	Illegal	Legalized since the 1980s through the Ayurveda Act
Sweden	Illegal	Legal for patients with a license.
Switzerland	Decriminalized. Legl below 1% THC	Legal
Thailand	Illegal but often unenforced	Legal
United Kingdom	Illegal	Cannabis derived medicines are legal only with a prescription of a specialist.
United States	Legalized in 18 states, 2 territories and the Discrict of Columbia. Decriminalized in other 13 states and 1 territory.	Legalized in 37 states, 4 territories and the District of Columbia, but illegal at federal level.
Uruguay	Legal, but buying is prohibited for foreigners. Cultivation is allowed up to six plants.	Legal for all uses.
Zambia	Illegal	Legal
Zimbabwe	Illegal	Legal

Source: Legality of cannabis across the world, Wikipedia, updated to May 2022

Some scholars claim that even though allowing consumption for therapeutic purposes is beneficial for those patients who can alleviate their chronic pains thanks to the prescription of marijuana-based medications, this reform does not directly address the issue because most of the negative externalities arising from abuse of some consumers are not internalized and costs associated to the enforcement of prohibition policies are not saved (Leff, 2021).

For the purpose of the regression contained in this thesis, I will try to estimate both the effects of legalizing recreational and medical consumption of this soft drug by looking at the USA case study, which will be defined in the next paragraph.

1.6 The USA Case

As of May 2022, both medical and recreational consumption of cannabis remain illegal under American federal law, as ruled by the Controlled Substance Act (United States Drug Enforcement Administration, 1970). Nonetheless, 38 States of the United States of America have legalized hemp derived products for medical purposes and 19 of these, plus the District of Columbia, have legalized its consumption for recreation. Of these 19, 12 have allowed its distribution through the so called "dispensaries", the equivalent of Dutch coffeeshops, which provide cannabis related products for both medical and recreational use. By controlling the distribution through these shops, some states were able to raise an excise tax on the sale of this substance: the first 2 states to do so, according to the Business Insider, were Colorado and Washington, which legalized recreational use and sale in 2012, followed by Alaska, Arizona, California, Illinois, Maine, Massachusetts, Michigan, Montana, Nevada, New Mexico, New Jersey, and Oregon. Adult use of hemp derived products is legal also in the states of New York, Rhode Island, Vermont, Virginia, Connecticut and the District of Columbia, but for these no system for dispensing cannabis exists yet (Hansen & Alas, 2022)

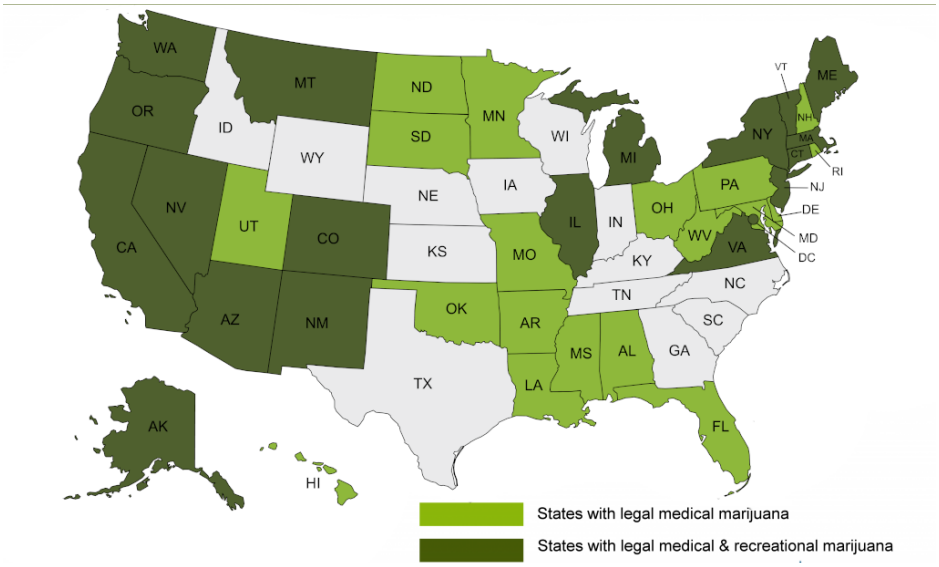

Figure 6: Legal medical and recreational marijuana states (ProCon.org, 2022)

Since the USA is Federal government, each state has the power to enact policies on commerce, trade, taxation, healthcare, education and many other issues as long as these do not get in contrast with national laws. This means that since cannabis products are still classified as "hard drugs" in Schedule I under federal law, they cannot cross state borders, and as a result, a state which decides to legalize the substance takes all the burden and responsibilities associated to this decision, meaning all marijuana derived products must be grown, processed, sold, and consumed within that state's borders (Boesen, 2021).

Therefore, since the decision on what type of excise tax to raise on marijuana pertains to individual states, three different kinds of tariff have been implemented so far (Federation of Tax Administrators, 2022):

1. Ad-valorem tax: like for retail sales tax, consumers pay a percentage of the total price of the substance as excise and the retailer remits it to the state. Some states apply this kind of tax on both the retail sale and wholesale of marijuana derived goods.
2. Weight tax: some states like California raise an excise tax from the sale of cannabis calculated as a fixed amount per ounce, which differs with respect to the marijuana product purchased.
3. Potency based tax: currently applied only in Illinois, this type of excise tax is based on the percentage of THC – the psychoactive compound of cannabis, like taxes based on percentage of alcohol for alcoholic beverages.

Table 2 shows the kind of tax raised in each US state where sale of recreational cannabis is legal

STATE	TYPE OF EXCISE TAX	TAX COLLECTED FROM
Alaska	Weight based tax: 50$/ounce for flowers, $15/ounce for leaves, $25/ounce for seeds	October 2016
Arizona	Ad-valorem tax: 16% of retail price	January 2021
California	Weight based tax on wholesale: $9.25/ounce for flowers, $2.87/ounce on leaves; $1.35/ounce for seeds; Ad-valorem tax: 15% on retail	November 2018
Colorado	Ad-valorem tax: 15% on wholesale, 15% on retail	January 2014
Illinois	Percentage of price: 7% on wholesale THC-based on retail: THC<35%: 10% of retail price; THC>35%: 25% of retail price. All marijuana-infused products are taxed at 20% of retail price.	January 2020
Maine	$335 per pound of flowers or mature plants, $94 per pound of trim, $1.50 per immature plant or seeding, and $0.35 per marijuana seed.	October 2020
Massachusetts	Ad-valorem tax: 10.75%	November 2016
Michigan	Ad-valorem tax: 10% of retail	November 2018
Montana	Ad-valorem tax: 20% of retail	January 2022
Nevada	Ad-valorem tax: 15% on wholesale, 10% on retail	Nevada 2016
Oregon	Ad-valorem tax: 17% of retail	October 2016
Washington	Ad-valorem tax: 37% of retail	July 2014

SOURCE: State taxation of Cannabis, National Conference of State Legislations, updated to May 27, 2022

The above table considers only the excise tax that the state governments decided to impose on the distribution of hemp derived products through state regulated dispensaries. On top of these, most state governments also levy a general sales tax which varies from 2.9% to 7.25% (KPMG Global, 2022). For what concerns medical marijuana, its distribution is sometimes not subject to a specific excise tax, but rather only to state and local sales tax. In some states like Delaware, New Hampshire, Washington, Vermont and Minnesota, medical marijuana is considered a tax exempt, and its purchase is not taxed at all. Interestingly, Alaska was one of the first countries to legalize medical marijuana in 1998 but still today the state has implemented no dispensing system for this substance (National Center for Biotechnology Information, 2019). Moreover, since all marijuana-based products remain illegal under federal law, doctors cannot prescribe marijuana medications, but only "recommend" them, and patients need to register for a medical marijuana endorsement (Levenson, 2021).

Table 3 shows the kind of tax raised in each US state where sale of recreational cannabis is legal

STATE	TYPE OF STATE TAX	TAX COLLECTED FROM
Arizona	General sales tax: 6.6%	December 2012
California	Ad-valorem tax: 15% on retail sale	2018
Colorado	General sales tax: 2.9%	2010
Connecticut	General sales tax: 6.35%	October 2014
Florida	General sales tax: 6%	September 2016
Hawaii	General sales tax: 4%	August 2017
Illinois	General sales tax: 1%	November 2015
Iowa	General sales tax: 6%	2019
Maine	General sales tax: 5.5%	March 2011
Michigan	General sales tax: 6%	August 2018
Missouri	General sales tax: 4%	October 2020
Montana	General sales tax: 4%	April 2018
Nevada	General sales tax: 4.6%	August 2015
New Jersey	General sales tax: 2%	December 2012
New Mexico	Gross receipts tax: from 5.125% to 8.125%	April 2010
New York	General sales tax: 7%	January 2016
North Dakota	General sales tax: 5%	March 2019
Ohio	Gross receipts tax: from 6.5% to 7.25%	January 2019

Oklahoma	Ad-valorem tax: 7% of retail price, plus a general sales tax: 4.5%	September 2018
Rhode Island	General sales tax: 7%	April 2013
Washington, D.C.	General sales tax: 5.75%	July 2013
West Virginia	General sales tax: 10%	November 2021

Source: Medical Cannabis Program Implementation Timelines (Marijuana Policy Project, 2021)

CHAPTER 2: Cross-sectional Regression

2.1 Population Multiple Regression Model

The regression developed in this paper is a panel data multiple regression model estimated with OLS: this model allows to estimate the effect on Y_i of the change in one variable Xi, while holding the other regressors constant. In a linear multiple regression model with k regressors, the dependent variable, Y, is given by the linear function

$$E(Y_i \mid X_{1i} = x_1, X_{2i} = x_2, X_{ki} = x_k) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + u_i,\ i = 1, \ldots, n \qquad (1.1)$$

Equation (1.1) is the population multiple regression model, where Y_i is the ith observation on the dependent variable; β_0 is the intercept; β_1 is the slope coefficient of X_{1i}, β_2 is the slope coefficient of X_{2i} and so on, and u_i represents the error term (Stock & Watson, 2014).

Differently from the single variable regression models, the coefficients βs of a multiple regression model represent the difference in the predicted values of Y between two observations with a unit difference in the slope coefficient of that β, holding the other slope coefficient constant. Consequently, the slope coefficient β_1 is the difference in the conditional expectations of Y between two observations with a unit difference in X_1, holding the other regressors fixed. In other words, β_1 is the partial effect on Y of X1, holding others constant (Stock & Watson, 2014).

Like in the regression models with a single regressor, the common technique to estimate the unknown population coefficients βs for multiple regression models is through an Ordinary Least Squares (OLS) regression, which describes the relationship between one or more independent variables and the dependent variable Y. The idea to estimate the coefficient is to minimize the sum of squares prediction mistakes by choosing estimates of $\beta_0, \beta_1, \ldots, \beta_k$ which minimize the sum of squared mistakes (Stock & Watson, 2014)

Thus, the OLS regression line is the straight line constructed using the OLS estimators and the predicted value of Y_i is:

$Y_i = b_0 + b_1 X_{1i} + \ldots + b_k X_{ki}$, where $b_0, b_1, \ldots, b_k$ are the ordinary least squares (OLS) estimators of $\beta_0, \beta_1, \ldots, \beta_k$.

Finally, the OLS residual for the ith observation is the difference between Y_i and its OLS predicted value (Stock & Watson, 2014).

In a multiple regression model, 4 conditions must be satisfied for OLS to provide an appropriate estimation of the regression coefficients (Stock & Watson, 2014):

1. The conditional distribution of u_i given $X_{1i}, X_{2i}, \ldots, X_{ki}$ has mean = 0. This means that in order for the OLS estimators to be unbiased, for any value of the regressors, the expected value of u_i is always 0.
2. $(X_{1i}, X_{2i}, \ldots, X_{ki}, Y_i)$, $i = 1, \ldots, n$ are identically and independently distributed random variables
3. Large outliers are unlikely: this implies that observations with values far outside the usual range of data are unlikely to happen, since the OLS estimators of the coefficients are sensitive to large outliers.
4. There is no perfect multicollinearity, meaning that no regressor is a perfect linear function of the other regressors. If this would not be the case, it would be impossible to estimate the OLS estimator because perfect multicollinearity produces division by zero in the OLS formulas

2.2 Data Observed

The cross-sectional regression of this paper questions whether legalizing the cultivation, sale and consumption of marijuana derived products for medical and adult use is a good long-term investment for the state government and, therefore, for society in terms of employment, government tax revenues and cuts from government spending for the prosecution of crimes related to the illicit drug dealing. My study draws from the idea that the decision to control the distribution of a demerit good like marijuana for recreation and medical purposes allows a state government to internalize the negative externalities correlated with the potential abuse of this good. The observations refer to the 50 States of the United States of America and the District of Columbia from 2015 to 2020. I chose to focus on these states because they provide the best examples of consequences and implications of legalizing a demerit good such as marijuana: although the USA is a federal government under which marijuana consumption and trade for any purposes are still prohibited by the Controlled Substance Act, signed by president Ronald Reagan in 1970, each state has its own central government and taxation system and can decide to legalize the sale of this substance independently of other states' decision as long as the cultivation, trade, and consumption of the substance happens within the border of that state. This allows the data to be easily broken down separately for each state and observable over different time periods.

In my regression, the dependent variable is represented by state government tax revenues. These data are taken from the Annual Survey of State Government Finances Tables by the United States Census Bureau (United States Census Bureau, 2015-2020)

The developed regression is a panel data model in which the independent variables are 8 macroeconomic determinants of tax revenues and one dummy variables:

1. Dummy variable which takes value 1 in years when a US state collects taxes from the sale of marijuana derived products either for medical or recreational purposes, 0 if the state does not collect any taxes from its sales or has not implemented any system for dispensing cannabis. Currently, the 12 states that have enforced taxes on the sale of cannabis derived goods for recreation are Alaska, Arizona, California, Colorado, Illinois, Maine, Massachusetts, Michigan, Montana, Nevada, Oregon and Washington. For the purpose of the regression, which estimates the effect on tax revenues of the decision to legalize this substance from 2015 to 2020, the dummy variable legal will never assume value 1 for Arizona and Montana, which started to collect revenues from sale of recreational marijuana in January 2021 and January 2022, respectively. The data is taken from the Federation of the US Tax Administrators, updated to May 27, 2022
2. GDP: independent variable expressed in millions of current USD. The data is taken from the Bureau of economic analysis. I chose to include GDP because it is often considered the most important indicator of economic growth and development of a state: on average, when economic activity of a state rises more rapidly, tax revenues will increase steadily too (Bureau of Economic Analysis, 2015-2020).
3. Population: independent variable which shows the amount of population per state in millions. The data come from the Bureau of economic analysis. Population is supposed to be one of the best determinants of a government's tax revenues as, in the long run, an increase in the number of people in a state will shift out the demand for public expenditure, causing an increase in the property taxes paid by the average homeowner (Bureau of Economic Analysis, 2015-2020).
4. Employed: independent variable which indicates the total number of people employed in each state. The data come from U.S. Department of Labor of the Bureau of economic statistics. I chose this independent variable because a state which legalizes adult-use and sale of marijuana for recreational use might implement a dispensing system aimed at trading the substance, creating new job opportunities which increase the amount of labor taxes collected by a state government (U.S. Bureau of Economic Analysis, 2015-2020).

5. Income: an independent variable indicating the disposable personal income per capita for each of the 50 states and for the District of Columbia. The data come from the Department of Commerce of the U.S. Bureau of Economic Analysis. Like for the GDP, income per capita is an indicator of a state's average wealth and standard of living, thus it can be used as a measure of development because higher income per capita means higher personal income tax (PIT) for a state (U.S. Bureau of Economic Analysis, 2015-2020).
6. Per_capita_exp: an independent variable which indicates the amount of expenditure per capita. The data are taken from the U.S. Bureau of economic analysis and include total expenditure, including housing, utilities, health care, off-premises food, beverages, gasoline and other services. I thought this data could be useful since it represents a strong determinant of government tax revenues as every US state collects taxes enforced on property, goods and services (U.S. Bureau of Economic Analysis, 2015-2020).
7. Bachelor_degree: independent variable indicating the yearly number of people between 25 and 44 years old who have obtained a bachelor's degree or higher in the span of years from 2015 to 2019. The data are taken from the decennial censuses of population estimate programs of the U.S. Census Bureau and are updated to June 2020 (U.S. Census Bureau, 2015-2019). In the United States of America, individuals who hold a bachelor's degree, compared with non-college-graduates, have higher lifetime earnings, lower odds of unemployment, and better health outcomes due to higher payments to social support and insurance programs such as Social Security and Medicare (Carroll & Erkut, 2009). Most importantly, highly educated people can find jobs which pay a higher-than-average salary, which increases labor tax payments collected by a state government.
8. State debt: independent variable which indicates the yearly amount of a state debt from 2015 to 2020, taken from the Annual Survey of State Government Finances Tables by the United States Census Bureau (U.S. Census Bureau, 2015-2020). As the USA is a Federal Union of States, any state has the power to raise its debt by issuing liabilities. Moreover, every state is divided into localities, which include counties and local governments. These have the power to issue debt to the same extent of states, and the sum of local debt plus the state debt equals the national debt of the United States of America, which today accounts for more than $30 trillion, 73% of which is held by its citizens. For the purpose of this regression, I chose to look at the state debt only because the decision to legalize a soft drug like cannabis belongs to the states and the revenues coming from the sale of marijuana related products are collected by the state governments. The debt of each US state is an indicator of their credit risk: a high

state debt might be the cause of a potential increase in state taxes to recoup the losses given by its debt.

As we will see, all the regressions run define the independent variable GDP as the most relevant variable influencing tax revenues of a US state: as shown in Figure 7, the scatterplot on Stata indicates a positive correlation between GDP and tax revenues for states in the United States of America. Moreover, the presence of few large outliers in the pattern suggests a strong relationship between the two. It is important to remark, though, that the tax revenues collected from a state government are subject to many other independent variables besides GDP and those observed, such as level of Forward Direct Investments, corruption, government efficiency, political stability, etc. Unfortunately, the only data available at a state level were those presented in this paragraph. This indicates that the pattern shown in Figure 7 is only meant to show a statistical pattern observed and no causality relationship can be inferred from it: higher GDP does not necessarily imply higher tax revenues for a U.S. state government.

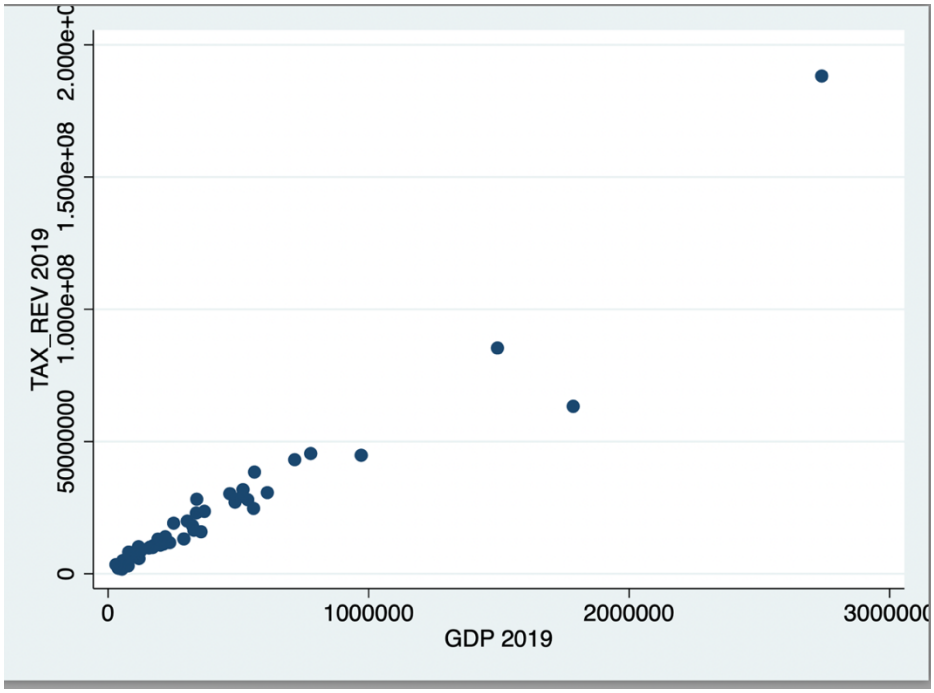

Figure 7 (Generated on Stata on the base of collected data)

Moreover, the dummy variable taxed is endogenous because the decision to legalize and tax the sale of cannabis for adult use might be correlated with the error term: for example, American states in financial distress could choose to legalize marijuana purchases to increase government tax revenues. In case of endogeneity of an independent variable (in this case a dummy variable), the cross-sectional regression estimated by OLS might be biased because the decision to decriminalize soft drugs might be correlated with an omitted variable.

2.3 Panel Data Model

The regression model presented in this thesis is a panel data model, also called longitudinal data, in which each observational unit described in the previous paragraph is observed at two or more time periods T. Panel data is useful for this type of analysis because it allows to construct a regression with both entity and time fixed effects, that yield a balanced panel in which all variables are observed for all entities (states) and at all time periods (years), a process which reduces the collinearity between the variables (Stock & Watson, 2014). In this case, the data are for n = 51 entities, given by the 50 American states plus the District of Columbia, and each entity is observed first for T = 4 time periods, from the year 2015 to 2019, and then for T = 5 time periods, from the year 2015 to 2020.
In addition, the panel data presented in this chapter employ robust standard errors, which is a technique used to obtain unbiased standard errors of OLS coefficient under heteroskedasticity, namely when the variance of the conditional distribution of the error term u_i given X_i is not constant for i = 1, …, n and depends on X_i. If the opposite applies, the error term u_i is said to be homoskedastic, a condition under which a simpler formula to calculate the variance of the error term exists. Since homoskedasticity is a particular case of heteroskedasticity, the robust standard errors are appropriate in both cases and become just the conventional OLS standard errors (Stock & Watson, 2014).

2.4 Panel Data Results

I estimated two kinds of panel data based on 4 and 5 time periods because I wanted to distinguish the effects of the Covid-19 pandemic on the tax revenues collected by the American states and the District of Columbia: as the pandemic had huge catastrophic consequences on society worldwide, several states have significantly increased their debt and experienced a large decrease in total tax revenues. As we will later observe, this will cause the correlation between the independent variables and the error term to vary significantly across the panel data.
The model also employs a variable of yearly fixed effects, which represents all the unmeasurable factors that do not vary from one year to another.

The estimated linear regression model is the following

$$Tax\_revenues_{it} = \beta_0 + \beta_1 Legal_{it} + \beta_2 GDP_{it} + \beta_3 State\_Debt_{it} + \beta_4 Income_{it} + \beta_5 Population_{it} + \beta_6 Employed_{it} + \beta_7 Per\_capita\_expenditure_{it} + \beta_8 Bachelor\_degree_{it} + u_{it}\ i.\ year,\ fe\ cve(robust)$$

In the first two panel data regressions presented in this paragraph, the dummy variable "legal" takes value 1 in years when a state collects taxes from the sale of cannabis for personal consumption only, and 0 otherwise. We want to see what the major determinants of tax revenues are and estimate if legalization of the consumption and sale of recreational marijuana can generate statistically significant tax revenues and can thus represent a long-term investment for a government.

Panel data 1: data from 2015 to 2019

VARIABLES	(1) Model 1
Legal	1.242e+06***
	(476,576)
GDP	93.44***
	(10.12)
State_debt	-0.258***
	(0.0651)
income	199.3
	(137.9)
Population	-3.598***
	(1.237)
Employed	-0.753
	(2.547)
Per_capita_exp	105.5
	(197.7)
Bachelor_degree	11.21*
	(6.289)
Constant	-3.391e+06
	(8.036e+06)
Observations	255
Number of count	52
R-squared	0.866

Robust standard errors in parentheses

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

In this first panel data regression, the data are observed from 2015 to 2019. This allows us to observe the effect of changes in the regressors on tax revenues independently of the consequences dictated by the pandemic. Nonetheless, government earnings are subject to many variables difficult to measure such as government efficiency, political stability, and tax compliance. In this first panel data, the overall R^2, which is a measure of fit of a regression, accounts for about 86.6%, which indicates that the regressors are pretty good at predicting the values of Y. However, a high R^2 does not necessarily imply that the regressors are statistically significant nor that there is no omitted variable bias: to check

for the validity of the independent variables, we look at their t-statistic, which tells us if we can reject the null hypothesis that the regressors are equal to zero ($\beta_{it} = 0$) and is obtained by just dividing the estimated coefficient by its robust standard error.

As we can see from the panel data 1, here we have 2 statistically significant variables, which are GDP and state debt. In particular, the independent variable GDP has t-statistic in absolute terms equal to 7.54 and it seems to be the best predictor of a US state governments tax revenues in years from 2015 to 2019: a unit change in GDP results in approximately $96 increase in tax revenues, while a unit change in the variable state debt has a close-to-zero negative impact on tax revenues.

Panel data 2: data from 2015 to 2020. Unfortunately, observations on bachelor's degree attainment per state was not available for 2020, because the data were taken from the decennial census of the US Census Bureau, which collected data from 2011 to 2019.

	(1)
VARIABLES	Model 1
Legal	1.265e+06**
	(502,276)
GDP	92.15***
	(6.360)
State_debt	0.0623
	(0.0630)
income	177.1
	(126.6)
Population	0.542
	(0.722)
Employed	-1.049
	(0.826)
Per_capita_exp	179.8
	(196.1)
Observations	304
Number of count	51
R-squared	0.764

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In this second panel data regression the entities are observed from 2015 to 2020: considering also the year of the Covid-19 outbreak, we can observe that the correlation between the regressors and the error varies significantly. By estimating the panel data from 2015 to 2020, in fact, we must be aware that the economic recession dictated by the Covid-19 pandemic has caused the tax revenues of many countries of the world to be subject to many other factors, such as decrease in collection of corporate

and labor taxes due to the lockdown imposed by most state governments and lower levels of personal consumption expenditure due to the travel restrictions.

Despite this negative correlation, the overall R^2 in this panel data is about 76.4%, so the variables might be good explanators of the dependent variable. This panel data suggests two statistically significant independent variables: GDP and the dummy variable legal, both with p-value less than 5% and t-statistic in absolute terms higher than 1.96.

Once again, GDP is depicted as the best indicator of economic development and thus best explains an American state's tax revenues: a unit change in GDP results in about $92 increase in tax revenues, a little less than its coefficient in Panel data 1. This result is consistent with the overall decrease in GDP during the outbreak year of the pandemic.

Interestingly, the dummy variable "legal" is also statistically significant and suggests that the decision to legalize the sale of marijuana and taxing it is associated with more than a $1.2 million increase in tax revenues, a result which might derive from the higher number of observations on the dummy variable.

In the next two panel data regressions, the dummy variable "legal" assumes value 1 when a state collects taxes from the sale of cannabis products for medical usage under the prescription of a specialist. Although the excise raised on this kind of goods is just a general sale tax, it still represents a source of revenue for a state and thus can be included in the panel data.

Panel data 3: medical sale

VARIABLES	(1) Model 1
Legal	-30,430
	(275,291)
GDP	101.8***
	(16.62)
State_debt	-0.269*
	(0.136)
income	235.1
	(159.5)
Population	-1.988
	(1.675)
Employed	-3.089
	(2.785)
Per_capita_exp	122.3
	(167.6)
Bachelor_degree	9.560
	(6.661)
Observations	255
Number of count	52
R-squared	0.860

Robust standard errors in parentheses

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

This third panel data regression estimates the determinants of tax earnings from 2015 to 2019 and questions whether allowing the dispensing of cannabis medications has a positive impact on a state government tax revenue. In this case, the dummy variable “legal” is not statistically significant to estimate the dependent variable as its p-value is above 5%. This result is consistent with the fact that the taxes enforced on cannabis based medical products are often too low to have a significant impact on total tax revenues collected: most states enforce just a general sale tax on the purchase of medical marijuana and some, like Delaware and Montana, do not even have a statewide retail sale tax and consider marijuana medical products as tax exempt.

However, this panel data shows once again that the two statistically significant independent variables which best explain tax revenues are GDP and State debt. In particular, the latter one exhibit a negative t-statistic, a result consistent with Panel data 1 which implies that the sample mean of the observed entities is less than the hypothesized mean.

Panel data 4: data from 2015 to 2020

VARIABLES	(1) Model 1
Legal	132,516
	(320,075)
GDP	95.66***
	(14.61)
State_debt	0.0506
	(0.123)
income	212.7
	(176.6)
Population	0.380
	(2.185)
Employed	-1.358
	(2.917)
Per_capita_exp	185.1
	(224.0)
Observations	305
Number of count	51
R-squared	0.758

Robust standard errors in parentheses

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

This last panel data regression estimates the regressors given data from 2015 to 2020. Once again, GDP turns out to be the estimator to explain the tax revenues of a state in the USA: its p-value assumes value of 0 and thus the finding is consistent with the previous panel data results.

Moreover, the variation of the dummy variable legal from 0 to 1 seem to be correlated with a positive increase in tax revenues collection, differently from the panel data 3. However, we cannot reject the null hypothesis that its $\beta = 0$ since the dummy variable is not statistically significant, so the coefficient of the dummy variable legal is insignificant.

Overall, the results of the panel data show that the decision to collect taxes on the retail of marijuana-based medications is not statistically significant to predict the value of the dependent variable. The dummy variable "legal" in Panel 3 and 4, in fact, is an imprecise and hard to measure variable because in almost all US states medical cannabis-based products are subject to general sales tax or are considered tax exempt. On the other hand, Panel data 2 indicates an effect on tax revenues induced by the recreational marijuana tax collection.

Finally, all the panel data estimate small negative coefficients for the independent variable population and employed: although not statistically significant, this result highlights the economic concept under which the demographic transition of a state is directly correlated with an increase in government's expenditure and decrease in tax revenues, as we will see in the next paragraph

2.5 Economic Interpretation of the Results

In this section I will provide an economic analysis of the results obtained on Stata by giving a general overview of the taxation system in the United States of America.

As a premise, it is important to remark that the United States of America tax code, like those of most OECD countries, is based on a progressive tax system, which means that labor and corporate tax rates increase progressively when taxable income increases. An average American worker is burdened by both labor tax and a payroll tax intended to finance federal fund programs such as Social Security and Medicare (Watson, 2020). The key issue relies in finding the efficient taxation rate a government should impose, because the revenues collected from taxes on labor depend on the responsiveness of labor supply to changes in tax rates and on the extent of substitutability between taxable and non-taxable forms of income: if labor supply is very elastic, an increase in the tax rate can substantially decrease people's incentive to work for a taxable income (Harvey & Gayer, 2013). This theory, developed in the 1980s by the American economist Arthur Laffer, sustains that there is a limit up to which a government can raise a labor tax rate that once passed will cause total tax revenues collected to decrease (Hayes A. , 2021). This relationship between taxation and tax rate is shown in Figure 8: when the tax rate surpasses the point corresponding to maximum revenues, the tax imposed is said to be prohibitive because it makes the tax revenues curve fall (U.S. Global Investors, 2016).

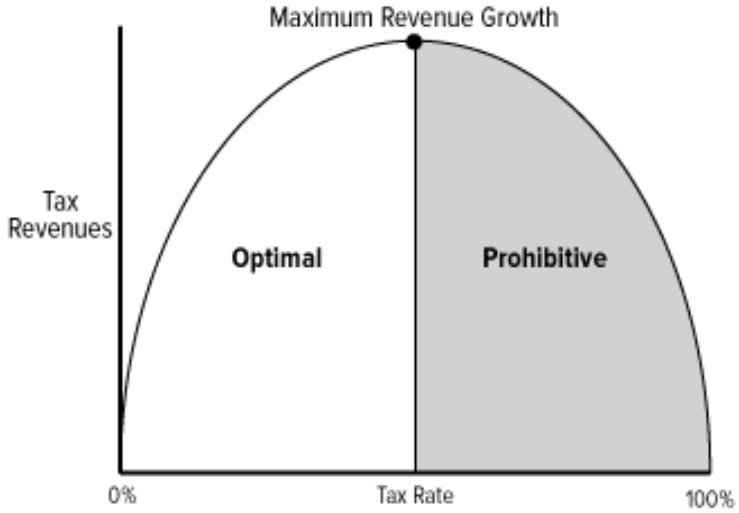

Figure 8: the Laffer Curve (U.S. Global Investors, 2016)

The Laffer curve thus suggests a negative relationship between employment and tax wedge, given by the difference between the labor costs beared by the employer and the net income received by the worker. Because of progressivity in tax system, the marginal tax wedge, i.e., the share of labor and payroll taxes applied to the next dollar earned in income, rises along with taxable income, and creates a disincentive for families to earn additional labor income (U.S. Global Investors, 2016).

This finding is consistent with the results obtained in the panel data, where a unit change of the independent variable "employed" resulted in a close-to-zero negative coefficient for tax revenues. As shown in Figure 9, the tax wedge for the average single worker of an OECD country has increased by two-thirds since 2019.

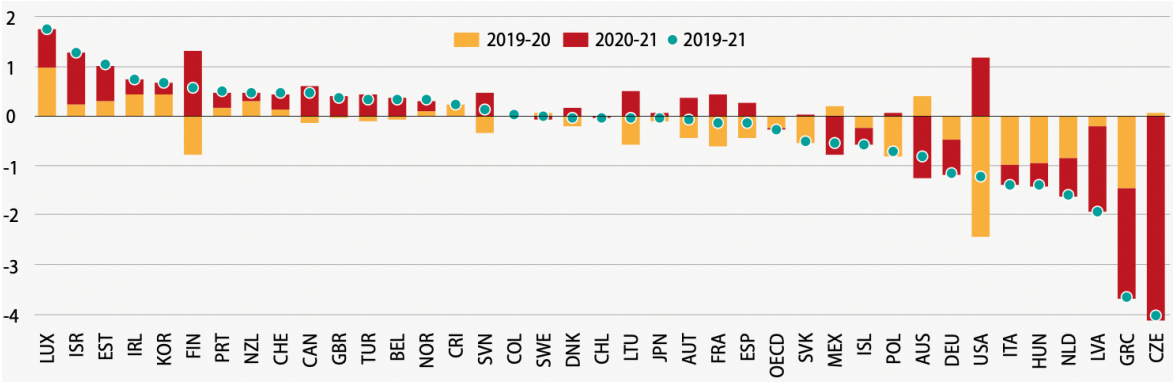

Figure 9: percentage change in the average tax wedge in OECD countries between 2019 and 2021 (OECD, 2022)

Because of this issue, scholars claim that policymakers in the U.S. and other OECD countries should explore ways of making the taxation of labor less burdensome to improve labor market efficiency and guarantee higher tax revenues (Watson, 2020).

Another independent variable from the regressions which seem to have an almost zero effect on tax revenues is population. In economics, population is a strong determinant of tax revenues as an increase in the former allegedly shits the demand for public expenditure and thus brings higher tax revenues collected (Weber & Buchanan, 1980). However, an important aspect correlated with population and tax revenues is age: in most OECD countries, the demographic transition due to population ageing has an indirect effect on the government fiscal stability, as it is the cause of decreases in tax revenues and increases in a state government's public expenditure for healthcare and pension funds programs (Colin & Bert, 2020). The USA, like Italy and most Western countries, has experienced a gradual decrease in the annual population growth since the end of the XX century, as shown in Figure 9: the 2020 US Population Census, in fact, showed a population growth of 0.35%, the lowest annual growth rate since 1900 (Frey, 2021).

Consequently, this demographic trend became the cause of many issues for western countries' governance systems, among which we find fiscal imbalances between the government expenses and tax revenues.

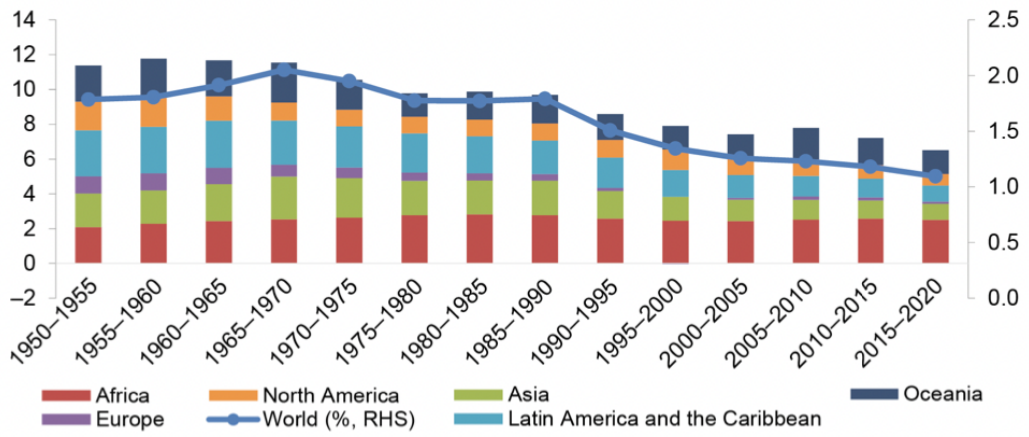

Figure 10: World Population Growth by Region, in percentage (ADBI Institute, 2021)

Therefore, the last decades have been characterized by an emerging need to deal with increasing fiscal instability of the governments of the industrialized world: some scholars claim that a possible solution to this issue would be to establish cost-sharing measures, such as pension schemes through individual contributions or healthcare reforms that prioritize accessibility for everybody (OECD, 2005). These measures are supposed to mitigate the age-related fiscal burden, allowing governments to better monitor its fiscal balance, but represent a social and political commitment difficult to implement, especially in the United States of America. Therefore, many US states saw in the reform to allow the retail of cannabis derived goods a source of fiscal solution and possibility of development for employment and personal expenditure. The implementation of a marijuana state dispensing system, however, comes with many difficulties, first of which is to find an efficient excise tax capable to beat the black market and offsets the negative externalities arising from the consumption of a demerit goods like cannabis (Leff, 2021). Ideally, a tax on marijuana should be dynamic, meaning low enough to permit legal suppliers to draw consumers out of the illegal market at the outset, but able to adjust to future redistribution and insurance considerations. This last necessity draws from the rationale that legalization creates a surplus given by the elimination of the burden of prohibition: this surplus grows over time as the legal firms will benefit from economies of scales due to decreases in their costs of production, distribution and selling of legal marijuana (Leff, 2021). The crucial point relies on who should capture such surplus: since no conventionally agreed taxation system on marijuana exists, most US state governments and countries like Canada applied the so called “Goldilocks” principle, according to which the economy must pursue an ideal state of steady economic growth in order to avoid recession (Chen, 2021). Most “Goldilocks” tax raised on marijuana are thought to be low enough to enable the regulatory regime to bring consumers into the newly legal market and, at the same time, high enough to capture a significant portion of the legalization surplus (Leff, 2021).

CHAPTER 3: Evidence and Consequences of Legalization

This chapter provides an overview of the consequences and implications correlated with the decision of legalizing cannabis for both medical and recreational purposes.

3.1 Tax Revenues and Their Implications

In many American states that have raised an excise tax from the sale of cannabis in state regulated dispensaries, the tax collected from the sale of marijuana have exceeded initial estimates: in April 2022, the Institute on Taxation and Economic Policy has declared that the tax revenues from cannabis sales have outperformed those from alcohol sale by 20%, on average (Davis & Hegeman, 2022). Furthermore, every state who has enacted permissive reforms aimed at allowing the distribution of cannabis has employed a distribution plan for the revenues generated by the sale of this substance: most states use the tax collected to fund educational programs, public safety, health care system and R&D: in the state of Washington, for every $1 billion in revenues collected from the cannabis sales tax, $600 million is funneled into public health initiatives which provide insurance for low-income families (Marijuana Policy Project, 2021).

Table 4 lists total revenues collected from sale of recreational marijuana and its implications

STATE	TOTAL TAX COLLECTED	IMPLICATIONS OF TAX REVENUES
Alaska	$102.274.177	50% to programs aimed at reducing criminal offenses, 25% to drug education, 25% to a general fund
Arizona	$169.153.405	1/3 to community colleges, 1/3 to law enforcement, 1/4 to highway fund, 10% to Justice Department fund, remainder to Arizona Attorney General's Office
Colorado	$1.819.517.031	10% to local governments, 90% to state (of which: 15.56% to general fund, 12.59% to public school, 71.85% to marijuana tax cash fund).
California	$3.440.801.614	Administrative costs associated with legalization; 60% to programs related to drug use, 20% to economic development and youth, 20% to public safety

Illinois	$679.487.694	Administrative costs associated with legalization; 35% to general fund, 25% to Illinois Recover, 20% to mental health and substance abuse, 10% to pay state bills, 8% to local governments, 2% to public education.
Massachusetts	$444.381.123	Public safety programs (School Building Authority; Alcoholic Administration and Cannabis Control Commission)
Maine	$16.437.036	50% to public health, 50% to safety programs and law enforcement training programs related to legalization
Michigan	$333.289.620	Education, transportation, transfers to local governments.
Montana	$5.535.119	Substance abuse prevention and treatment, veterans' services, health care, local governments, and expungement and resentencing efforts for people previously convicted of marijuana offenses. Additional funds will be sent to the state's general fund.
Nevada	$508.287.750	Public education programs
Oregon	$675.053.157	40% to state school fund; 20% to mental health, alcoholism, drug services, 15% to Oregon state police, 5% to Oregon health authority, 20% to cities and counties.
Washington	$3.041.947.860	Health care, marijuana related educational programs, State's health department, research and testing.

Source: data on excise tax raised since the beginning of selling, updated to February 2022

(Marijuana Policy Project, 2021)

As of May 2022, the 12 American operating adult-use markets and the 26 medical-only states combined sold marijuana for more than $24.6 billions in tax revenues, without considering revenues generated from general sales tax and other local taxes raised on this substance. Additionally, the legalization turned out to be an efficient means of saving money on the enforcement of prohibition policies: a 2013 report published by the American Civil Liberties Union estimated that the costs of marijuana enforcement policies accounted for $3.6 billion per year at that time (American Civil Liberties Union, 2013).

The legalization enacted by several North American states has also benefited medical consumers of cannabis-based products: as medical marijuana has become legal in 38 states, its overall price will likely drop as a result of commodization, the process of converting a product into a standardized and

marketable object. With New Mexico, New Jersey, New York and Connecticut expected to open their dispensaries within the next 18 months, the forecasted total annual legal cannabis revenues are expected to hit $45 billion by 2025 (Leafly, 2022)

In Canada, a recent Deloitte report on the status of the Canadian economy shows that the marijuana industry has contributed $43.5 billion to Canada's national GDP: the legalization has generated over $11 billion in sales and about $29 billion in capital expenditure (Deloitte, 2022)

3.2 Job Creation

The wave of legalization reforms has led the demand for skilled and unskilled labor in the marijuana industry to increase steadily since Washington and Colorado first legalized adult-use in 2014: according to an analysis of ZipRecruiter, the cannabis industry is currently one of the fastest growing sectors in the United States, with a 693% increase in marijuana-related job postings between 2016 and 2017, rivaling the numbers of cybersecurity and cryptocurrency (ZipRecruiter, 2018).

Since the prohibition enforced on a federal state level prevents the US Department of Labor's Statistics from counting the state-legal marijuana jobs, the research center Whitney Economics publishes annually the most comprehensive cannabis employment study by collecting analytics on cannabis firms' financial statements, capital availability, income tax declarations, etc.

According to the 2022 annual report in partnership with Leafly Jobs, the cannabis industry currently supports 428.059 full time jobs in the whole United States of America, a 33% growth from 2021. Since last year, this industry has generated, on average, 280 jobs per day, which include direct jobs such as cultivators and retailers, but also accountants, human resources, legal affairs, security, manufacturing, construction and other ancillary jobs such as occupations in lobbies, public relation, technological platforms and associations related to cannabis (Barcott & Whitney, 2022). To put that in perspective, the incredible pace of the marijuana industry's growth in the United States surpasses by a lot those of self-established industries such as business and finance, for which the US Bureau of Labor Statistics projects an employment growth of 8% over the next decade (U.S. Bureau of Labor Statistics, 2022).

Looking ahead, the report suggests that the total employment potential in a mature US legal cannabis market is between 1.5 to 1.75 million workers (Barcott & Whitney, Leafly Jobs Report, 2022)

3.3 Effects of Society

Since medical and recreational cannabis became legal in the American States and Canada, several research papers have been published on the effects of this reform on society.

First, the re-legalization policies adopted by several US States contributed to change the public's opinion about marijuana and the dangers associated to it. According to the latest Pew Research Center, the perception of risk associated to consuming marijuana has been decreasing steadily all over USA, bringing public support for legalization of some form of marijuana up to nine out of ten Americans in 2021 (Schaeffer, 2021). By breaking down the consensus on an age level, we can observe that majorities across all age groups – except 75 and older, are in favor of legalization of marijuana (Figure 10).

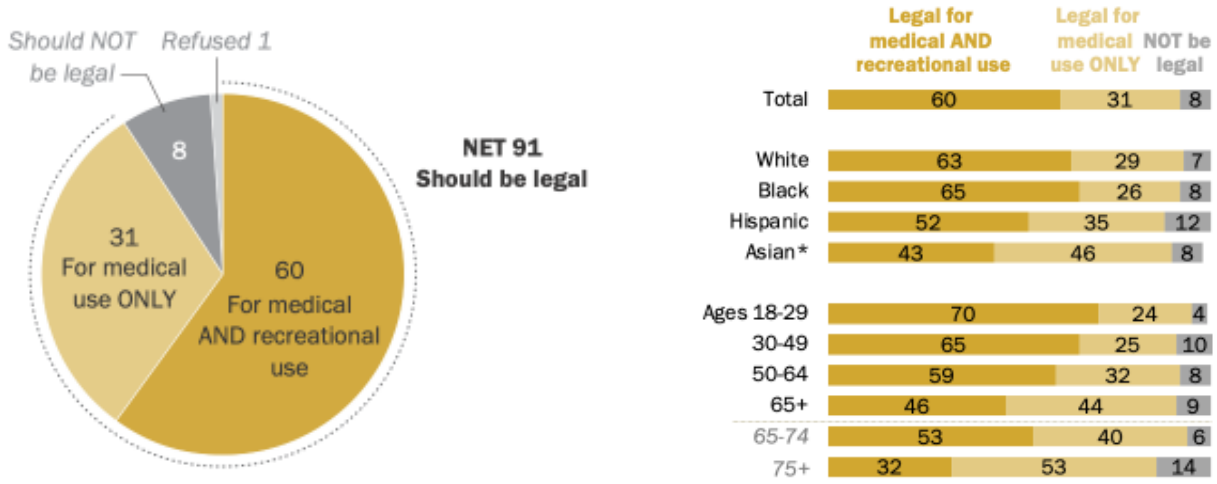

Figure 11: survey on US adults' consensus on marijuana, conducted April 5-11th, 2021 (Schaeffer, 2021)

Opponents of legalization point to the potential increase in the number of car accidents involving drivers who use marijuana or to the higher number of people using stronger and more addictive drugs, while Americans in favor of legalization sustain the drug's perceived medical benefits and claim that the reform would make law enforcement policies focus on other more serious types of crimes (Schaeffer, 2021). This latter reasoning has been showed by a recent study published on the International Journal of Drug Policy, which took data on the number of convicted crimes from the 18 states that have legalized recreational consumption of cannabis. The results show that legalization is correlated with a gradual increase in effectiveness of armed forces, such as policies and intelligence, because "legalization can contribute to create an environment which positively affects performance of police officers in the resolution of serious crimes" (Wu, Li, & Lang, 2022).

Specifically, a team of researchers from the University of Utah has examined the spread of crimes in Oregon and other states before and after legalization and it has calculated the percentage of violent crimes solved over the whole number of violent crimes signaled to police. The results point out that "in Colorado and Washington, the percentage of solved violent crimes has been steadily increasing with respect to the whole rest of the nation" (Wu, Li, & Lang, 2022).

Another interesting research study conducted by the University of Mississippi and published on the Economic Inquiry shows that legalization of cannabis is associated, on average, to a decrease in 10% in foster care, including reductions in relocation of children due to physical abuses, malpractice, incarcerations of parents and abuse of alcohol and other drugs. The study has also highlighted that a legalization reform at a federal state level would mean a saving on the financial burden of the foster care system by around $675 million per year. The researchers claim this tendency could be due to "direct effects given by the decreasing probability of using other substances" (Gardner & Osei, 2022).

3.4 Counter-effects and Drawbacks

The current legal landscape of marijuana in Northern America has not come without difficulties.

To begin with, the implementation of permissive policies towards cannabis consumption and sale has been upon the sole willingness of some American states: the illegality of marijuana under American federal law, in fact, makes it impossible for a legal state to trade the substance nationally and puts a burden on the producers who cannot export cannabis to other states, a constraint which acts as a deterrent to legalization (Boesen, 2021). A rescheduling of this substance under federal law would create a national market where products grown in Oregon can be processed in Colorado and sold in New York. This would revolutionize markets in states, which, given the federal prohibition, are currently able to discriminate against interstate commerce regulated under the Dormant Commerce Clause of the U.S. Constitution. On top of that, a rescheduling of marijuana from the high-risk substances table would allow firms who produce and distribute cannabis to be listed in the United States stock exchange and guarantee them access to more capital investments, as well as set the base for future scientific research on the effects of this substance (Mikos, 2020).

Besides the drawbacks dictated by the current classification of marijuana in the United States, in fact, the effectiveness of legalization of this substance is still subject to future assessments of its short- and long-term effects on the human brain: most notably, the long-term impact of the use of cannabis can affect brain development, especially in those under the age of 18 years old. The US Center for Control and Prevention points out that "the frequent use of marijuana can cause disorientation and unpleasant states of disorder such as anxiety, paranoia, or even depression" (Shank, 2022). Most importantly,

scientists consider marijuana derived substances as “gateway drugs”, which act as introductory, habit-forming substances that pave the way to future consumption of more severe drug use (Centers for Disease Control and Prevention, 2020). Gateway drugs include all easily accessible substances like alcohol and nicotine and can represent serious threats to a person’s capability to develop states of addiction and abuse of more serious substances, increasing the financial pressure on the medical system: in Colorado, for instance, the number emergency department visits related to marijuana increased by 54% after 3 years of after the opening of the first dispensary in 2014 (National Center for Biotechnology Information, 2019).

Because of the imbalances between pros and drawbacks of the effects of cannabis, legalization remains a controversial topic whose consequences need be further observed: the scientific research at our disposal is not yet sufficient to fairly assess the benefits and downsides of legalization policies.

3.5 Estimation and Analysis of the Illegal market of Marijuana in Italy

In order to estimate the potential government revenues arising from marijuana legalization in Italy, the dimensions of the market must be outlined first. Differently from the USA and Canada, this comes with many difficulties as there are no official data available and the estimations on the Italian demand-side for marijuana is conditioned by price oscillations and temporal dynamics of drug consumption, which depend upon the evolution of consumers’ habits. The estimated data on the cannabis consumption for recreational use come from the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) and from official data related to confiscated substances coming from the Italian Ministry of Internal affairs.

3.5.1 Consumption

Data from the 2017 Italian Drug report show that cannabis is the most used psychoactive substance in Italy and its consumption among all ages has been increasing steadily over the past decades. As of 2017, 32.7% of the Italian population has consumed marijuana at least once in their lifetime, the fourth highest percentage in Europe after France, Spain, and Denmark (EMCDDA, 2017).

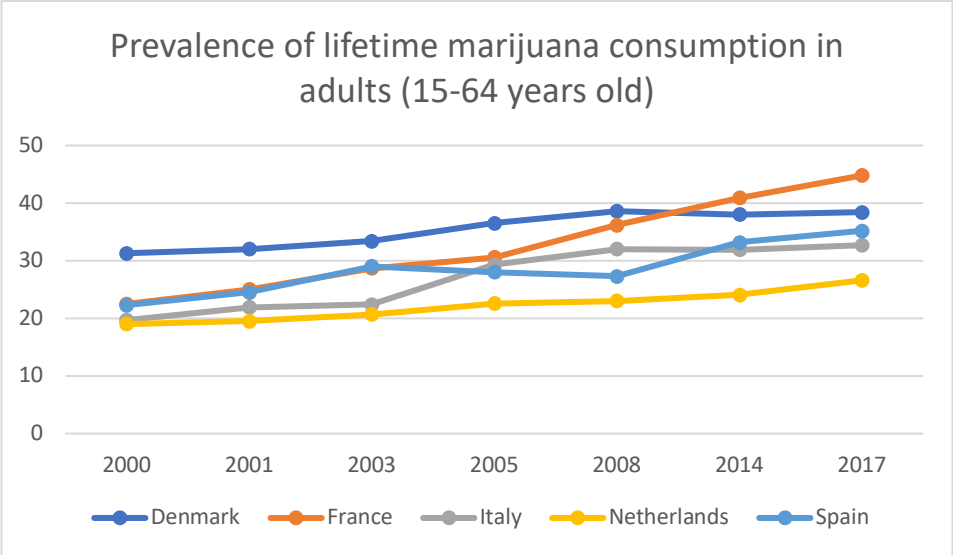

Figure 12: statistical bulletin of the European Monitoring Center for Drug and Drug Addiction (2000-2017)

By breaking down the prevalence of cannabis use with respect to sex and time periods, we can see that males are the most assiduous users in Italy, as shown in the following tables (EMCDDA, 2017)

		LAST MONTH PREVALENCE			LAST YEAR PREVALENCE			LIFETIME PREVALENCE		
Country	Sample size (15-64)	Males	Females	Total	Males	Females	Total	Males	Females	Total
Italy	10502	7,4%	3,6%	5,5%	12,6%	7,8%	10%	39,1%	26,4%	32,8%

Table 5 shows the last month prevalence consumption of marijuana among 15-64 years old adults

Additionally, the high frequency of marijuana consumption among youth in Italy raises many concerns. The European School Survey Project on Alcohol and Other Drugs (ESPAD) is a cross-sectional analysis which collects comparable data on substance use and other forms of risky behaviors among 15 to 16-year-old students in order to monitor trends within 49 European countries between 1995 and 2019. According to these data, the Italian illegal market of soft drugs is estimated to be very widespread: the consumption of marijuana among Italians is widely dispersed across all ages, with a particular remark among young individuals: in Italy, almost one out of three teenagers (27%) between the age of 15 and 16 years of age has smoked marijuana at least once in their life, the second highest percentage in Europe after Czech Republic. This percentage is very large if compared to the European average: 16% (EMCDDA, 2020).

The report analyzed also variations in frequency of consumption: in 2019, Italy was ranked first across all European countries for the number of teenagers (15 and 16 years) who have made use of cannabis in the last 30 days before the survey: 15% (EMCDDA, 2020).

The data observed depict a frightening scenario in which thousands of young adults make use of this substance without possibly knowing the harmful consequences correlated with its consumption: the lack of information and public awareness can potentially expose thousands of people to threats of abuse.

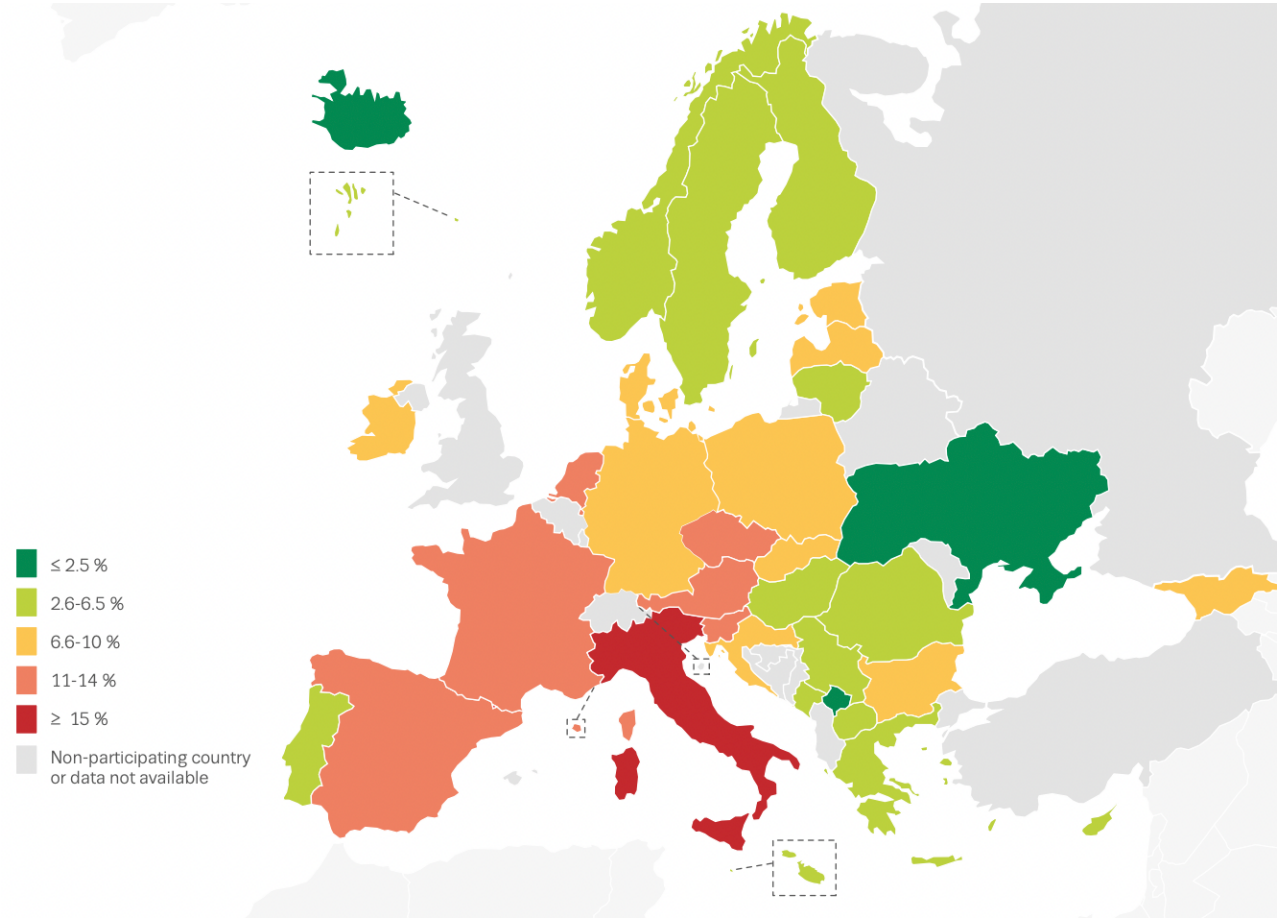

Figure 13: prevalence of cannabis use in the last 30 days among students of 15- and 16-years old students

3.5.2 Fiscal costs of prohibition in Italy

In Italy, the prohibition enforced against drug possession, production and trade is regulated by art. 73, 74, 75 DPR 309/90. As we can see from the following table, the entrances into prisons due to violation of this article average at around 30% of all entrants since 2005, versus a European mean of 18% (Presidenza del Consiglio dei Ministri, 2021). Of the 32879 violations of art. 73 DPR 309/90 reported in 2020, over 74% was related to detention of marijuana and 19% for cocaine (Presidenza del Consiglio dei Ministri, 2021).

	Entries into Italian penitentiary institutions for any offence			Entries into Italian penitentiary institutions for violations of art. 73 DPR 309/90			
Year	Italians	Foreigners	Total	Italians	Foreigners	Total	Percentage of crimes in violation of art. 73 DPR 309/90 on total offences
2005	49.281	40.606	89.887	15.670	10.107	25.777	**28,68**
2006	47.426	43.288	90.714	15.074	10.325	25.399	**28,00**
2007	46.581	43.860	90.441	15.392	11.593	26.985	**29,84**
2008	49.701	43.099	92.800	16.564	12.301	28.865	**31,10**
2009	47.993	40.073	88.066	15.909	12.460	28.369	**32,21**
2010	47.343	37.298	84.641	15.695	10.446	26.141	**30,88**
2011	43.677	33.305	76.982	14.226	10.226	24.452	**31,76**
2012	36.014	27.006	63.020	11.376	9.088	20.464	**32,47**
2013	33.572	25.818	59.390	10.042	8.109	18.151	**30,56**
2014	27.470	22.747	50.217	7.225	6.747	13.972	**27,82**
2015	25.302	20.521	45.823	6.384	5.900	12.284	**26,81**
2016	26.239	21.103	47.342	6.571	6.785	13.356	**28,21**
2017	27.067	21.077	48.144	7.294	6.845	14.139	**29,37**
2018	27.013	20.245	47.258	7.333	6.785	14.118	**29,87**
2019	28.924	17.277	46.201	7.219	6.458	13.677	**29,60**
2020	20.814	14.466	35.280	5.906	4.946	10.852	**30,76**

Table 6 shows the percentage of prison entrants due to marijuana related arrests over total

Besides Belgium, no other country in Europe suffers the prison overcrowding issue like Italy, which accounts for 107.5% on average and surpasses 150% for 16 Italian penitentiaries institutions (Ciucci, 2022). The huge burden of trials has a strong impact on the functioning of the Italian justice as well: in 2020 alone, there have been 92875 judicial trials related to art. 73 DPR 309/90, involving more than 189.707 people among men and women.

3.5.3 Projection of benefits and costs

According to the latest "Relazione Annuale al Parlamento Italiano sul Fenomeno delle Tossicodipendenze in Italia" (2018), the illicit market for psychoactive substances in Italy accounts for 16,2 billion euros, of which 6,3 billion (around 40%) attributable to cannabis (Presidenza del Consiglio dei Ministri, 2018). Moreover, the depenalization of this substance in a country like Italy would have huge consequences on society in terms of savings and employment: a recent study conducted in 2019 by the University of Messina estimates a the potential creation of 350000 full-time jobs, a reduction in public expenditure for prison judiciary by more than 542 million euros, calculated on the number of arrests for possession of soft drugs, and 228 million euros for costs related to special police operations (Ofria & David, 2017).

Conclusion:

The world is going an epoch of significant cultural and scientific changes regarding the implications of cannabis in our society. Its history is the demonstration of how a recreational drug can achieve a widespread popularity and afterward experience sudden decline, depending on social, cultural, and economic reasons. Now that the scientific evidence on the pharmacological potential of cannabis agrees with the economic interests linked to this massive new market, moral and social concerns have been forgone: especially nowadays, the lesson from the past is crucial to manage the cannabis affair properly, emphasizing first and foremost the health benefits for patients and the potential revenues coming from both a regulated dispensing system and savings on the prohibition enforcement.
Legalization of marijuana-based products is still a contentious issue in many nations of the world, but the reforms enacted by several countries and some states of the United States show that, while society bears the full cost of the negative externalities associated with excessive marijuana consumption, tax revenues can help offset these costs.

Bibliography

ADBI Institute. (2021). Demographic Transition and its Impacts on Fiscal Sustainability in East and Southeast Asia. *ADBI Working Paper Series* .

American Civil Liberties Union. (2013). *Report: the War on Marijuana in Black and White.*

Aubert-Roche, L. (1843). *Essai sur le hachisch et son bon emploi dans le traitement de la peste [On hash-ish and its proper use in the treatment of the plague].* Paris, France: Librairie des sciences médicale de Just Rouvier.

Barcott, B. (2015). *Weed the People: The Future of Legal Marijuana in America.* Time Home Entertainment Inc.

Barcott, B., & Whitney, B. (2022). *Leafly Jobs Report.* Leafly Holdings, Inc.

BBC. (2018, October 17). *Canada becomes second country to legalise recreational cannabis*. Retrieved from https://www.bbc.com/news/world-us-canada-45806255

Bifulco, M., & Pisanti, S. (2015). Medicinal use of cannabis in Europe: the fact that more countries legalize the medicinal use of cannabis should not become an argument for unfettered and uncontrolled use . In M. Bifulco, & S. Pisanti. EMBO press.

Boesen, U. (2021, November 15). *Republican Cannabis Bill Would Tax by Category.* Retrieved from taxfoundation.org: https://taxfoundation.org/republican-cannabis-bill-states-reform-act/

Booth, M. (2005). *Cannabis: a history.* New York: Picador.

Bureau of Economic Analysis. (2015-2020). *Level of Gross Domestic Product.* U.S. Department of Commerce.

Bureau of Economic Analysis. (2015-2020). *Population estimates.* U.S. Department of Commerce.

Cannabis deals. (2019, August 31). *Ireland introduces a medical cannabis program following Denmark's success.* Retrieved from cannabisdeals.co.uk: https://www.cannabisdeals.co.uk/ireland-introduces-a-medical-cannabis-program-following-denmarks-success/

Carlo, A. (2021, October 6). *Italy mulls pros and cons of decriminalising cannabis as referendum momentum gathers pace*. Retrieved from euronew.com: https://www.euronews.com/my-europe/2021/10/06/italy-mulls-pros-and-cons-of-decriminalising-cannabis-as-referendum-momentum-gathers-pace

Carroll, S. J., & Erkut, E. (2009). *How Taxpayers Benefit When Students Attain Higher Levels of Education.* Santa Monica, CA: RAND Corporation.

Centers for Disease Control and Prevention. (2020, October 19). *Marijuana and Public Health*. Retrieved from cdc.gov: https://www.cdc.gov/marijuana/health-effects/risk-of-other-drugs.html#:~:text=Researchers%20disagree%20on%20whether%20marijuana,drugs%2C%

20like%20cocaine%20or%20heroin.&text=However%2C%20there%20is%20limited%20evidence,risk%20of%20using%20other%20drugs.

Chen, J. (2021, May 17). *Goldilocks Economy.* Retrieved from Investopedia: https://www.investopedia.com/terms/g/goldilockseconomy.asp#:~:text=A%20Goldilocks%20economy%20describes%20an,inflation%20rises%20by%20too%20much.

Ciucci, C. (2022, April 14). Carceri, Italia tra i primi Paesi Ue per sovraffollamento. *Il Fatto Quotidiano*. Retrieved from Ritretti Orizzonti: https://ristretti.org/carceri-italia-tra-i-primi-paesi-ue-per-sovraffollamento

Coldiretti. (2020, November 19). *Cannabis: bene Corte Ue, in Italia 4mila ettari*. Retrieved from coldiretti.it: https://www.coldiretti.it/economia/cannabis-bene-corte-ue-in-italia-4mila-ettari

Colin, C., & Bert, B. (2020). *Population ageing and sub-central governments: Long-term fiscal challenges and tax policy reform options.* Retrieved from OECDiLibrary: https://www.oecd-ilibrary.org/sites/f749fcd0-en/index.html?itemId=/content/component/f749fcd0-en

Collins, J. (2020, October 12). *A Brief History of Cannabis and the Drug Conventions.* Retrieved from Cambridge University Press: https://www.cambridge.org/core/journals/american-journal-of-international-law/article/brief-history-of-cannabis-and-the-drug-conventions/A8547C998A1D05173495BCD6012329C0

Das, G. (April 1993). *Cocaine Abuse in North America: A Milestone in History.* Journal of Clinical Pharmacology.

Davis, C., & Hegeman, M. (2022, April 19). *Cannabis Taxes Outraised Alcohol by 20 Percent in States with Legal Sales Last Year.* Retrieved from Institue on Taxation and Economic Policy: https://itep.org/cannabis-taxes-outraised-alcohol-by-20-percent-in-states-with-legal-sales-last-year/

Deloitte. (2022). *Cannabis has contributed $43.5 billion to Canada's GDP since legalization.* The Canadian Press.

EconomicsHelp. (2020). *Demerit Good Definition*. Retrieved from EconomicsHelp.org: https://www.economicshelp.org/blog/glossary/demerit-goods/

EMCDDA. (2017). *European Drug Report 2017: Trends and Developments.* Lisbon: European Monitoring Center for Drugs and Drug Abuse.

EMCDDA. (2020). *ESPAD Report 2019.* Luxembourg: Luxembourg: Publications Office of the European Union.

EMCDDA. (2021, June). European Drug Report 2021. *European Drug Report*, p. 60.

EMCDDA. (2022, January 20). *Latest European Web Survey on Drugs finds cannabis and ecstasy use most impacted by COVID-19.* Retrieved from European Monitoring Center for Drugs

and Drug Abuse: https://www.emcdda.europa.eu/news/2022/1/latest-european-web-survey-drugs-finds-cannabis-and-ecstasy-use-most-impacted-covid-19_en

European Monitoring Center for Drugs and Drug Abuse. (2018). *Cannabis legislation in Europe.* Luxembourg: Publications Office of the European Union.

Farrugia, C. (2021, December 20). 'This is no smokescreen' - Owen Bonnici interviewed on cannabis reform . *Times Malta*.

Federation of Tax Administrators. (2022). *Status of Syaye Taxation/Sales of Marijuana.*

Fisher, I. (1956). Survey Sampling and Measurement.

Frankhauser, M. (2002). History of Cannabis in the western medicine. In M. Frankhauser, *History of Cannabis in the western medicine* (pp. 37-51). New York: The Haworth Integrative Healing Press.

Frey, W. H. (2021, January 11). *What the 2020 census will reveal about America: Stagnating growth, an aging population, and youthful diversity.* Retrieved from brookings.edu: https://www.brookings.edu/research/what-the-2020-census-will-reveal-about-america-stagnating-growth-an-aging-population-and-youthful-diversity/#:~:text=The%20initial%20results%20from%20the,rate%20since%20at%20least%201900.

Frontline. (1998). *"Busted: America's War on Marijuana: Historical Timeline.* Washington, D.C.: Public Broadcasting System.

Gardner, J., & Osei, B. (2022, April 1). Recreational marijuana legalization and admission to the foster-care system. *The Economic Inquiry*.

Gazzetta ufficiale. (1990, Ottobre 9). *Decreto del Presidente della Repubblica del 9/10/1990 n.309.* Retrieved from https://www.federserd.it/files/download/drp_309_9-10-90_aggiornato.pdf

Goldstein, M. J. (2016). *Legalizing marijuana: promises and pitfalls.* Minneapolis: Twenty-first century books.

Hansen, C., & Alas, H. (2022, May 27). *Where Is Marijuana Legal? A Guide to Marijuana Legalization.* Retrieved from U.S. News: https://www.usnews.com/news/best-states/articles/where-is-marijuana-legal-a-guide-to-marijuana-legalization

Harvey, R., & Gayer, T. (2013). *Public Finance.* McGraw-Hill Higher Education.

Hayes, A. (n.d.).

Hayes, A. (2021, May 19). *Laffer Curve.* Retrieved from Investopedia: https://www.investopedia.com/terms/l/laffercurve.asp

Ingraham, C. (2017, September 26). *More people were arrested last year over pot than for murder, rape, aggravated assault and robbery — combined.* Retrieved from The Washington Post :

https://www.washingtonpost.com/news/wonk/wp/2017/09/26/more-people-were-arrested-last-year-over-pot-than-for-murder-rape-aggravated-assault-and-robbery-combined/

King, M. (2006). *The war on marijuana: The transformation of the war on drugs in the 1990s.* Harm Reduction journal.

KPMG Global. (2022). *United States - Indirect Tax Guide*. Retrieved from home.kpmg: https://home.kpmg/xx/en/home/insights/2018/10/united-states-indirect-tax-guide.html#:~:text=There%20is%20no%20national%20sales,from%201%20to%205%20per cent.

Kwai, I. (2020, December 2). *U.N. Reclassifies Cannabis as a Less Dangerous Drug.* Retrieved from The New York Times: https://www.nytimes.com/2020/12/02/world/europe/cannabis-united-nations-drug-policy.html

Lachenmeier, D. W., & Jürgen, R. (2015). Comparative risk assessment of alcohol, tobacco, cannabis and other illicit drugs using the margin of exposure approach. *Scientific Reports 5.1*, 1-7.

Leafly. (2022, February 23). *Legal Cannabis Industry is the Most Prolific Job Creator in America*. Retrieved from leafly.com: https://www.leafly.com/newsroom/210641-legal-cannabis-industry-is-the-most-prolific-job-creator-in-america-supporting-more-than-428-000-jobs

Lee, A. M. (2012). *Smoke Signals: A Social History of Marijuana - Medical, Recreational and Scientific.* Scribner.

Leff, B. (2021). Marijuana Taxation: Theory and Practice. In A. U. Law, *Law Reviews & Other Academic Journals* (pp. 915-932).

Levenson, M. S. (2021, March 15). *Marijuana tax rates: a state-by-state guide* . Retrieved from Leafly: https://www.leafly.com/news/industry/marijuana-tax-rates-by-state

Lieuw, E. (1991). Drugs and Drug Policy in the Netherlands. *Crime and Justice*, pp. 229 - 276. Retrieved from Government of the Netherlands: https://www.government.nl/topics/drugs/difference-between-hard-and-soft-drugs

Marcelli, E. (2018, May 9). *Cannabis light: la weed economy sbarca in Italia.* Retrieved from Starting Finance: https://startingfinance.com/approfondimenti/cannabis-light-italia/

Marijuana Policy Project. (2021, May 28). *mpp.org*. Retrieved from Medical Cannabis Program Implementation Timelines: https://www.mpp.org/issues/medical-marijuana/state-by-state-medical-marijuana-laws/medical-marijuana-program-implementation-timeline/

Mechoulasm, R., & Gaoni, Y. (1967). Recent advances in the chemistry of hashish. In R. Mechoulasm, & Y. Gaoni. Fortschr Chem Org Naturst.

Mikos, R. A. (2020). *Interstate Commerce in Cannabis.* Vanderbilt Law School.

Mount Vernon. (2018, August). *George Washington Grew Hemp*. Retrieved from mountvernon.org: https://www.mountvernon.org/george-washington/farming/washingtons-crops/george-washington-grew-hemp/#:~:text=George%20Washington's%20initial%20interest%20in,nets%20used%20at%20the%20fisheries.

National Center for Biotechnology Information. (2019, September). *The Legalization of Marijuana in Colorado: The Impact*. Retrieved from ncbi.nlm.nih.gov: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6913861/

National Center for Health Statistics. (2022, May 1). *Provisional Drug Overdose Death Counts*. Retrieved from Centers for Disease Control and Prevention: https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm

OECD. (2005). Ageing and Pension System Reform. *Implications for Financial Markets and Economic Policies*.

OECD. (2022). *Taxing Wages 2022.* Paris: OECD Publishing.

Ofria, F., & David, P. (2017). *Perché legalizzare la cannabis: una analisi di costi e benefici.* Università di Messina.

O'Shaughnessy, W. (1840). *The Journal of the Asiatic Society of Bengal.* Calcutta, India: Bishop's College Press.

Presidenza del Consiglio dei Ministri. (2018). *Relazione Annuale al Parlamento sul Fenomeno delle Tossicodipendenze in Italia.* Dipartimento per le Politiche Antidroga.

Presidenza del Consiglio dei Ministri. (2021). *Relazione Annuale al Parlamento sul Fenomeno delle Tossicodipendenze in Italia.* Dipartimento per le Politiche Antidroga.

ProCon.org. (2022, June 6). *State-by-State Marijuana Laws*. Retrieved from ProCon.org: https://medicalmarijuana.procon.org/legal-medical-marijuana-states-and-dc/

Reynolds, J. R. (1890). Therapeutic uses and Toxic effects of Cannabis indica. *Lancet*, 637-638.

Robert, D. (2003). *Hemp: American history revisited: the plant with a divided history.* Algora Publishing.

Samorini, E. (1996). *L'erba di Carlo Erba, per una storia della canapa indiana in Italia: 1845 - 1948.* Nautilus.

Schaeffer, K. (2021, April 26). *6 facts about Americans and marijuana* . Retrieved from Pew Research Center: https://www.pewresearch.org/fact-tank/2021/04/26/facts-about-marijuana/

Shank, L. (2022, March 7). Cons of Legalizing Recreational Marijuana Use. *Liberty Champion*.

Sherburne, M. (2021, September 8). *Daily marijuana use among US college students reaches new 40-year high.* Retrieved from University of Michigan: https://news.umich.edu/daily-marijuana-use-among-us-college-students-reaches-new-40-year-high/

Stock, J., & Watson, M. (2014). *Introduction to Econometrics.* Pearson College Div.

Turnbridge. (2020). *DECRIMINALIZATION VS LEGALIZATION OF DRUGS: WHAT IT MEANS FOR STATES IN 2020-2021*. Retrieved from Turnbridge: https://www.turnbridge.com/news-events/latest-articles/decriminalization-vs-legalization/

U.S. Bureau of Economic Analysis. (2015-2020). *Estimates on per capita personal consumption expenditure.*

U.S. Bureau of Economic Analysis. (2015-2020). *Levels of employment in millions.* U.S. Department of Labor.

U.S. Bureau of Economic Analysis. (2015-2020). *Per Capita Personal Income estimates.* Department of Commerce.

U.S. Bureau of Labor Statistics. (2022, March 18). *Business and Financial Occupations*. Retrieved from United States Department of Labor: https://www.bls.gov/ooh/business-and-financial/home.htm#:~:text=Employment%20in%20business%20and%20financial,adding%20about%20750%2C800%20new%20jobs.

U.S. Census Bureau. (2015-2019). *Decennial Census on Bachelor degree attainment levels, per state.*

U.S. Census Bureau. (2015-2020). *Annual Survey of a State Government Finances Tables.*

U.S. Global Investors. (2016, July 27). *Laffer Curve*. Retrieved from usfunds.com: https://www.usfunds.com/resource/romania-did-this-and-now-ites-among-the-fastest-growers-in-europe/

Ufficiale, G. (1990, Ottobre 9). *DPR 309/90.* Retrieved from https://www.federserd.it/files/download/drp_309_9-10-90_aggiornato.pdf

United Nations. (1961). *Single Convention on Narcotic Drugs.* The hague: United Nations.

United Nations. (2008). A centuryof interntional drug control. *World Drug report 2008*, 101.

United States Census Bureau. (2015-2020). *Annual Surveys of Government Finances Tables* .

United States Drug Enforcement Administration. (1970). *The Controlled Substances Act*. Retrieved from DEA.GOV: https://www.dea.gov/drug-information/csa

US National Academies of Sciences, Engineering and Medicine. (2017). *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research.* Washington D.C.: National Academies Press.

Watson, G. (2020, March 14). *The U.S. Tax Burden on Labor.* Retrieved from Tax Foundation: https://taxfoundation.org/us-tax-burden-on-labor-2020/

Weber, B., & Buchanan, S. (1980, February). *The impact of population growth on residential property taxes.* Retrieved from Research Gate: https://www.researchgate.net/publication/23948190_The_impact_of_population_growth_on_residential_property_taxes

Wikipedia. (2022). *Legality of cannabis*. Retrieved from wikipedia.org: https://en.wikipedia.org/wiki/Legality_of_cannabis

World Health Organization. (2022). *Alcohol, Drugs and Addictive Behaviours Unit*. Retrieved May 2022, from https://www.who.int/teams/mental-health-and-substance-use/alcohol-drugs-and-addictive-behaviours/drugs-psychoactive/cannabis

World Health Organization. (2022). *World Health Organization*. Retrieved from https://www.who.int/health-topics/drugs-psychoactive#tab=tab_1

Wu, G., Li, Y., & Lang, X. (2022, February). Effects of recreational marijuana legalization on clearance rates for violent crimes: Evidence from Oregon. *International Journal of Drug policy*.

Young, J. H. (1989). *Pure food: securing the Federal Food and Drugs Act of 1906.* Princeton: Princeton University Press.

ZipRecruiter. (2018, January 31). *Will Cannabis Job Growth Continue to Outpace Tech Job Growth?* Retrieved from ZipRecruiter Blog: https://www.ziprecruiter.com/blog/cannabis-job-growth-tech-job-growth/