

The Cannabis Market in Canada and British Columbia

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1. Introduction

In much of the world, the consumption and sale of cannabis is illegal. The harshness of penalties has varied greatly. Several countries, such as Indonesia, Saudi Arabia, and the United Arab Emirates have carried out capital punishment on individuals convicted of drug trafficking, including for cannabis-related offenses (Associated Press, 2012; BBC News, 2014; The Times of India, 2015). In other countries, such as Brazil, although illegal, the possession of illegal drugs like cannabis entails a warning, community service and education on the effects of drug use, and drug traffickers, when convicted, face between five and 10 years in jail as per *Law 11.343*, 2006. A few countries, such as Uruguay and Portugal have legalized and decriminalized, respectively, the use and sale of cannabis (Independent, 2015; The Guardian, 2016).

In Canada, police and prosecutors in all jurisdictions are capable of pursuing criminal charges for cannabis possession, although criminal charges are not usually pursued. Nonetheless, there is a lack of consensus on the legal status of cannabis in Canada. Superior and appellate courts in Ontario have found Canada's cannabis laws to be of no force and no effect if a prescription is obtained (National Post, 2011). Cannabis as a drug is legal to possess, consume, or grow for medicinal purposes under conditions outlined in the *Marihuana for Medical Purposes Regulations* issued by Health Canada. However, challenges to cannabis laws at the federal level have not resulted in changes to the appropriate sections of the *Controlled Drugs and Substances Act*, 1996.

It is hardly questionable that cannabis consumption may cause health problems and consequently result in loss of productivity. This, undoubtedly, creates additional expenses for already overburdened government systems. Governments do, as such, have a stake in establishing policies that reduce social harm. While the goal of fostering a healthy,



productive society is legitimate one, it is undeniable that the current policy of criminalizing the consumption and sale of cannabis is not only failing, but also leading to greater social problems. Many a study show that criminalization leads to a vast and profitable illegal market, organized crime, lack of quality control, lost tax revenues, and the criminalization of users whose only offense is to have, arguably, inflicted self-harm. As is the case with most laws that attempt to inhibit consensual choices, criminalization inflicts much greater harms than the substance it aims to prevent.

The Canadian public is rather aware of these detrimental effects: since 1997, public opinion polls have found an increasing majority of Canadians agree with the statement "smoking marijuana should not be a criminal offence". A 2016 Globe and Mail/Nano Research poll found that approximately 68% of Canadians support legalization, a result that is in line with other surveys conducted in the past year (The Globe and Mail, 2016). The Liberal Government elected in 2015 has announced that it plans to introduce legislation legalizing marijuana in the spring of 2017 (Global News, 2016).

In light of the known harms of cannabis criminalization, and the shifting political environment for cannabis regulation, this paper aims to answer two questions: 1) What is the economic impact of the current illegal cannabis market in Canada? and 2) What are the potential tax revenues in a legalized environment? A special focus is given to British Columbia (BC) due to the large contribution it makes to the Canadian cannabis market – the province is estimated to be the source of roughly 40% of the national cannabis production.

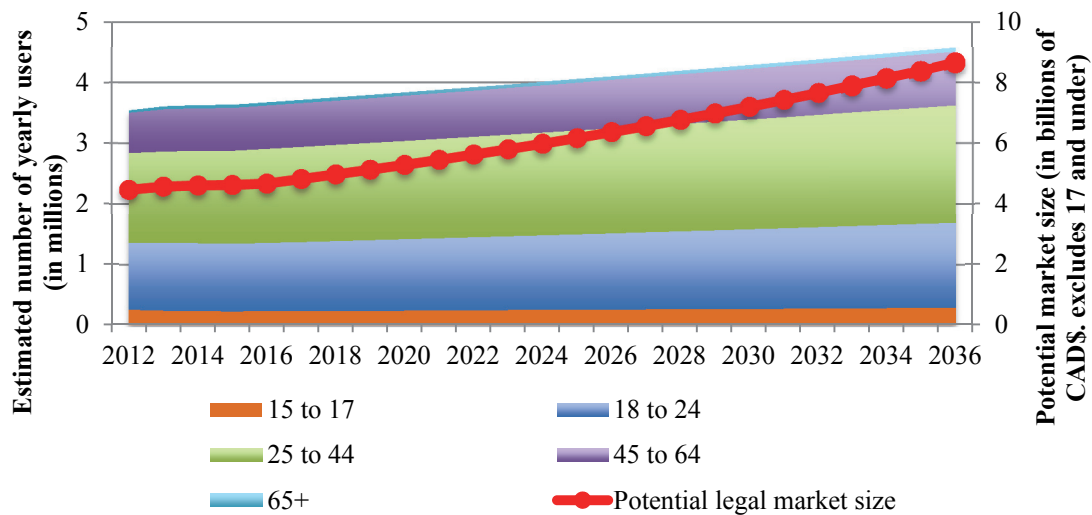
This paper is organized as follows: in addition to this introduction, Section 2 explores the Canadian cannabis market; Section 3 provides an overview of the BC cannabis market; Section 4 estimates the tax revenues in a legalized environment; Section 5 analyzes the health impacts of the current cannabis policy and the benefits to be gained from legalization; and Section 6 concludes.



2. The Canadian Cannabis Market

Estimates suggest consumption of cannabis for recreation purposes in Canada to be around 770,000kg a year, implying a domestic market worth around \$5 billion (CIBC World Markets, 2016). Additionally, Health Canada expects the medical marijuana market to be worth approximately \$1.3 billion (CIBC World Markets, 2016). There has been no large increase in cannabis usage in American states where recreational use has been legalized, and there is no reason to believe this would be otherwise in Canada. Figure 1 shows an of the number of cannabis users and potential size of the legalized domestic market, based on a 2016 Canada-wide market value of \$5 billion.

Figure 1. Estimate of the number of cannabis users, potential size of legalized domestic market



*Based on Canada-wide market value of \$5 billion in 2016.

** Legal market size excludes consumption by individuals aged 17 and under.

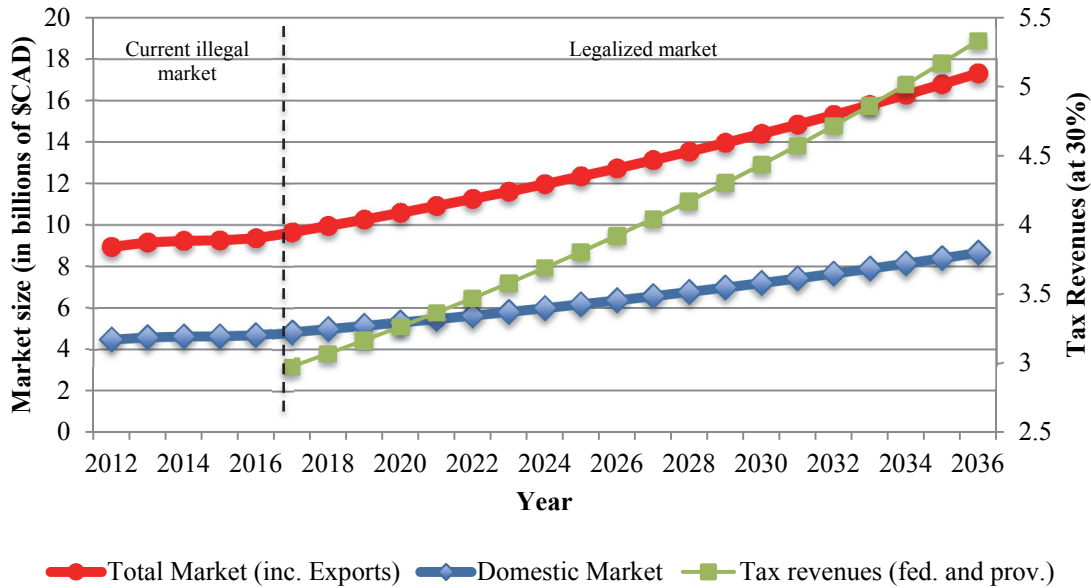
Sources: Created by the author based on Bank of Canada, 2016; CIBC World Markets, 2016; Parliament of Canada, 2002; Statistics Canada, 2015a, 2015b, 2014. See Appendix A for forecast calculation details.

Based on current usage rates, the domestic market may be worth as much as \$10 billion by 2036. Research indicates the value of the total Canadian market, including exports, could be as much as double the domestic estimate: according to CIBC World



Market, the current cannabis market in Canada could be worth as much as \$10 billion. Figure 2 shows this high-end estimate.

Figure 2. Potential size of legalized market (inc. exports)



*Based on total market value of \$10 billion in 2016.
 ** Legal domestic estimates exclude consumption by individuals aged 17 and under.
 Sources: Created by the author based on Bank of Canada, 2016; CIBC World Markets, 2016; Parliament of Canada, 2002; Statistics Canada, 2015a, 2015b, 2014.

Based on current usage rates and market estimates, the total Canadian market, including exports, has the potential to be worth approximately \$17 billion by 2036. Based on a total tax rate of 30.8%¹, the legalized market has the potential of raising annual tax revenues of \$2.97 billion in 2017 and up to \$5.33 billion by 2036. Further information on taxes is presented in *Section 4.1 Regular taxation*.

3. BC’s Cannabis Market

BC is known to possess one of Canada’s largest illegal cannabis industries

¹ The average tax rate of final goods and services in Canada is 30.8% (OECD, 2016). This accounts for all taxation throughout the chain of production, including sales tax.



(Easton, 2004; Hamilton, 2004). It is fast growing: data on electrical power usage and from police raids indicate that BC grow-ops had, on average, doubled in size between 2003 and 2010 (Diplock & Plecas, 2011). Data collected in areas that produce high volumes of cannabis in BC shows that the number of grow-ops has more than doubled in these settings (Plecas, Chaisson, & Garis, 2011; Plecas, Chaisson, Garis, & Snow, 2011).

There has been a significant societal shift away from criminalization and in favour of implementing a regulated framework for cannabis taxation and control in BC as well as in other Western jurisdictions (Emerson, 2011; Room, Fischer, Hall, Lenton, & Reuter, 2008; Wood, McKinnon, Strang, & Kendall, 2012). Such an approach would act to reduce policing costs associated with prohibition (such as organized crime) while providing a significant source of tax revenues for provincial governments.

3.1 Market Size

Given its illegality, the exact size of BC's cannabis market cannot easily be estimated. However, most estimates range between \$2 billion and \$7 billion:

- An estimate based on the assumption that 16% of illegal indoor grow operations are caught by the police, puts the total value of BC's market for cannabis in the range of \$2-7 billion (Diplock & Plecas, 2011; Easton, 2004); and
- A second estimate based on data on indoor cannabis cultivation in BC places the total value of the cannabis market at \$3.6 billion annually (Diplock & Plecas, 2011).

These estimates include gross profits from domestic and export sales combined. The domestic component represents around 10% of the total industry: out of a market worth roughly \$4 billion in 2012, approximately \$407 million was consumed by BC residents (Werb et al., 2012). Accounting for inflation and population growth, provincial



consumption in 2016 is estimated to be around \$440 million (Bank of Canada, 2016).

3.2 Consumption

Werb et al. (2012) estimated, using data from the 2009 CADUMS and the 2009 Youth Smoking Survey, that the number of cannabis users in BC was 366,032 in 2009. Adjusting for population growth, the number of users in 2016 is estimated to be around 392,422. Table 1 shows the extrapolation of consumption findings to account for population growth between 2009 and 2016, while holding the percentage of users constant.

Table 1. Cannabis Consumption in British Columbia in 2016

Frequency	Percentage of Total	Users
Daily	21%	82,408
Weekly	27%	105,953
Monthly	23%	90,257
Less than Monthly	29%	113,802
Total number of users in British Columbia		392,422

Source: Created by the author based on Werb et al. (2012), BC Stats (2016).

3.3 Employment – Domestic Market

For the same reasons that make official data on the size of the BC cannabis market inexistent, employment figures for the industry, the majority of which is illegal, are not easily captured. Employment in the cannabis industry is thus estimated by using Colorado, a state that has legalized the use and sale of cannabis and has a similar population size (5,456,574 versus BC's 4,683,139), as a proxy (BC Stats, 2016; The United States Census Bureau, 2016). As of 2015, approximately 16,000 individuals had been licensed to work in Colorado's cannabis industry. Adjusting for population, it is estimated that approximately 13,732 individuals work in the BC industry.

As mentioned, employment figures are imprecise due to the illegal nature of the market. However, an estimate may also be made based on the size of BC's market for



domestic consumption. According to an anonymous grower's account, it takes around 15 man-hours to produce one kg of cannabis. The employees involved in growing and processing cannabis, according to the grower's account, are paid around \$25 an hour. If each employee works part-time, at 1,125 hours per year, this implies that given an annual production of 308 metric tons in BC (40% of Canada's total, intended for domestic production alone), there are around 4,106 part-time individuals employed in the growing and processing segment, totaling \$115.5 million in wages for that segment alone. This number represents a fraction of the total amount of employees involved in processing and growing, as it does not account for employment figures related to exports. An estimate that accounts for exports is presented in *Section 3.4 Total Market (Domestic Consumption and Exports)*.

The informal figures allow for total wage estimates. In addition to growing and processing, there are individuals involved in making secondary products like oils or edibles, account cloning, room turnover, trade work, sales, management, finances, legal, and cleanup. Given that the average wage for employees in the cannabis trade is likely not as high as that for those involved in other parts of sale (e.g. legal, sales, finances, etc.), total wages are calculated based on \$25/hour at full-time rates. It should be noted that such hourly wage is significantly higher than BC's minimum wage of \$10.45/hour (Ministry of Jobs, Tourism and Skills Training, 2016). This hourly rate suggests that for the 13,732 individuals involved in the cannabis industry, wages are likely to be in excess of \$618.1 million. For employment calculations, see Appendix B.

3.4 Employment – Total Market (Domestic Consumption and Exports)

It is estimated that the majority of cannabis grown in BC is exported to the United States (Easton, 2004). The total size of the BC market is thus markedly higher than the one presented in *Section 3.3 Employment - Domestic Market* section. Building on the



figures estimated for the domestic market, this section aims to estimate the total economic and labour impact of the cannabis market in BC.

Cannabis is one of the principal illicit substances smuggled across the United States-Canada border. It is also the most widely produced, trafficked and consumed illicit drug in both Canada and the United States. Public Safety Canada reports that most marijuana trafficking activity is southbound, although it is smuggled in both directions across the border. As a matter of fact, Canada is second only to Mexico as an exporter of cannabis to the United States. In 2001, United States law enforcement seized 4.4 metric tons of cannabis entering the United States from Canada. In 2002 that number had tripled to 12.2 metric tons and in 2003, the latest year for which data was publicly available, reached 15.8 metric tons – an increase of 29% in comparison to the previous year, and of 259% in two years. This increase is, to some degree, due to better detection methods by border patrol, given that after the September 11th, 2001 attacks investments in border security increased significantly. It is unlikely that such a high annual growth rate of exports to the United States has continued to occur throughout the years; nonetheless, Canada, and especially BC, has built a thriving cannabis-export market. In 2014, The Economist estimated the BC cannabis-export market to be worth \$2 billion annually (2014). Given that BC is estimated to account for 40% of Canadian production, that put the total export market in Canada at approximately \$5 billion in 2014. The Economist's estimates of BC's export market imply that the total market is likely to be at least twice the size of BC's domestic market. If the BC total market is estimated to be worth approximately \$4 billion, including sales to other Canadian provinces and exports, the employment figures directly related to the cannabis industry would most likely exceed 27,464². There is also a trickle down effect on employment, as other positions that are

² Employment figures for the domestic market were initially calculated based on the legal employment figures for Colorado. However, Colorado's figures do not account for exports, since only its domestic industry is legal. As such, if the BC export industry accounts for half of BC's market, its employment figures should roughly double.



indirectly related to the industry, such as legal services, are not included in the aforementioned figures. Following the same logic set out in *Section 3.4 – Employment Domestic Market*, at hourly rates of \$25, wages for positions directly related to the cannabis industry in BC are forecasted to exceed \$1.24 billion.

4. Potential Tax Revenues

Current drug policies have created substantial profits for drug dealers and producers; profits that could, were cannabis to be legalized, be partially transferred to the government's coffers. Stephen T. Easton (2004) estimates that cannabis production costs account for 17.44% of the final retail price in the illegal market. Profit margins of roughly 82% would be fleeting in a free market, as new entrepreneurs would be induced into the market, increasing drug supply³ while driving down its retail price. However, in the illegal market, such a large profit has staying power because the possibility of facing jail time serves as a barrier to entry, creating an effective risk-premium for those who participate in the illegal production and sale of illegal substances (Flister, 2012).

Two taxation models could be applied in a legal cannabis market. Cannabis could be taxed at the same rate as regular goods and services, or at the higher rates applied to goods that are subject to sin taxes, such as liquor and tobacco. Both approaches are described below.

4.1 Regular taxation

Currently, taxes account for approximately 30.8% of Canadian GDP (OECD, 2016). If such a rate were applied to the legalized cannabis market, it would lead to growing annual tax revenues that would start at \$2.97 billion and reach approximately \$5.33 billion over the next two decades. At the provincial level, taxes account for

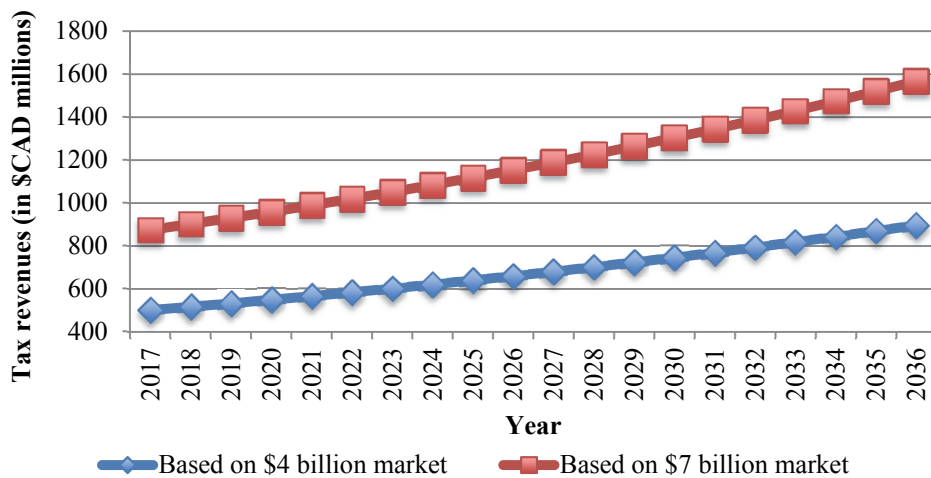
³ It is worthy of mention that this would not necessarily increase consumption; rather, supply would decrease to the equilibrium point – the level at which supply equals demand.



approximately 12.1%; this could lead to annual revenues to provincial governments of \$1.17 billion in 2017 and up to \$2.1 billion by 2036. Figure 3 shows total potential tax revenues forecasted until 2036, based on a rate of 30.8%, estimated for both a \$5 billion market (low-end estimate) and a \$10 billion market (high-end estimate).

As mentioned, BC is estimated to produce roughly 40% of Canadian cannabis (Canadian Business, 2013). As such, the BC provincial government would, at a rate of 12.1%, collect annual revenues starting at approximately \$468 million in 2017 and reaching up to \$840 million by 2036. This is based on BC’s market representing 40% of total Canadian output, or around \$4 billion; however, research suggests that the real size of the BC market could be around \$6-7 billion (Burgmann, 2012). This would lead to annual revenues between \$768 million and \$1.54 billion for the BC government. Figure 3 shows total potential tax revenues for the BC Government forecasted from 2017 until 2036, based on a tax rate of 12.1%, estimated for both a \$4 billion market (low-end estimate) and a \$7 billion market (high-end estimate).

Figure 3. Total BC Government potential tax revenue – 2017-2036 forecast – tax rate of 12.1%



Source: Created by the author.



Given the BC government's anticipated 2016 budget of \$48.1 billion, a 12.1% provincial tax on cannabis products, in a market that is estimated to be worth up to \$7 billion, would represent an annual increase starting at \$837 million in 2017 and growing to up to \$1.56 billion by 2036 (Government of British Columbia, 2016a). In 2017 alone, this would represent an increase of 1.74% in government revenues. While this may appear to be a modest increase, it would, for example, be more than sufficient to fund the BC Government's commitment to increase the Ministry of Health's budget, currently at \$17.97 billion, by 3% annually (Government of British Columbia, 2016b). Even at the low end of the estimated market, \$4 billion, revenues would still be sufficient to cover the provincial government's commitment to increase the health care budget.

4.2 Sin tax rates

The forecasts shown under *Section 4.1 Regular taxation* assumed that cannabis would be taxed at a similar rate to that of other economic activities. This is not, however, the current practice for similar goods such as tobacco and alcohol. Such goods are typically subject to sin taxes. A sin tax is an excise tax specifically levied on goods considered to be undesirable, with the goal of increasing their final prices and raising new sources of government revenues. Government revenues raised over "undesirable" goods, however, are not always labeled as taxes. The BC Government, for example, applies a markup of 124% to spirits, with a lower graduated markup for cost portions over \$21/litre, and 89% to wine, with a graduated lower markup for cost portions over \$11.75/litre (Government of British Columbia, 2015). Such high markup levels would not be recommended for cannabis. As the cannabis market currently operates illegally, significantly increasing prices would undermine efforts to transition illegal activities into regulated, legalized ones. As such, initial markups should not have revenue raising as a first priority; rather, the priority at the initial time of legalization should be to starve the illegal market of cash flows, so that all illegal activity is eventually transitioned into the desirable regulated market.



4.3 Framework for markup setting

While it is beyond scope of this paper to estimate what the appropriate markup for legalized cannabis products should be, a general framework for markup limits is provided. It is based on two main factors, one from the customer's perspective and one from the supplier's:

- 1) Customer's break-point: The markup price at which consumption shifts from the legal to the illegal market; and
- 2) Supplier's risk premium: The effect of legal punishment on illegal supply. To what extent do efforts to punish unregulated activities affect supply and prices in the illegal market? This depends on two main factors: the likelihood of a supplier getting caught, and the costs (punishment) of getting caught.

Current prices are indicative of the supplier's risk premium. The difference between the final sale price of cannabis and the supplier's costs of production corresponds to the supplier's profit and risk premium. Equation 1 demonstrates how the supplier's risk premium (SRP) is derived:

$$SRP = (\text{chance of getting caught}) * (\text{cost of punishment}) \quad (1)$$

On the supply side, the costs of production and the SRP are the main determinants of final sale prices. There are two ways for the government to drive up prices in the illegal cannabis market, both of which rest on increasing the SRP. The government may intensify enforcement efforts, so an illegal supplier's chances of getting caught are consequently increased. In an environment where recreational cannabis is legal, enforcement efforts that had previously been directed at catching users may be redirected towards reducing illegal cannabis sales. A second method by which the government may



increase the SRP is by increasing the harshness of punishments for illegal suppliers, such as higher fines and lengthier prison sentences.

On the consumer side, the consumer's risk premium (CRP) is calculated in a similar manner to the SRP. Equation 2 shows the CRP calculations.

$$CRP = (\text{chance of getting caught}) * (\text{cost of punishment}) \quad (2)$$

The CRP is added to the price of cannabis in the illegal market to determine the costs to the consumer of purchasing cannabis illegally. The total consumer costs of purchasing cannabis illegally determine the price point which government markups must not surpass, lest they move consumption from the legal market to the illegal market. Equations 3 and 4 show the break points for the consumer's decision to purchase cannabis legally or illegally.

Consumers will turn to the illegal market if:

$$CRP + \text{price of illegal cannabis} < \text{final marked up price legal market} \quad (3)$$

As such, in order to maintain cannabis purchases in the legal market, the costs incurred by consumers resorting to the illegal market must be higher than the final retail price of government-marked up cannabis. Put differently, the final marked up price must be lower than the illegal price and the risk of buying illegally combined, as shown in equation 4:

$$CRP + \text{price of illegal cannabis} > \text{final marked up price legal market} \quad (4)$$

Using this framework, policy-makers may use information on current prices of cannabis in the illegal market, the economic costs of punishment to consumers (e.g. lost employment opportunities because of a criminal record) and the likelihood that consumers will be caught to determine the maximum mark up governments may charge.



5. Impact on the Health Care System

The main current deterrent against cannabis consumption is imprisonment and/or criminal charges. Legalization of cannabis eliminates such risks. This may lead to a slight, although not large, increase in cannabis usage. Some individuals fear this will, in turn, create additional burdens to the health care system. But what if cannabis legalization actually reduced health care costs?

Cannabis is known to be a substitute for, not a complement to, alcohol (Graham, 2014). This means that if cannabis becomes easier to acquire, people may use cannabis instead of alcohol, not in addition to it. The social costs of alcohol are known to be high; consequently, if the substitution effect is large, increasing cannabis consumption could provide significant public health benefits. The decline in drinking is likely to have real significance on a population-wide scale. Alcohol is one of the top ten risk factors for disease among all Canadians, and the top risk factor for Canadians aged 15 to 49 years (Government of Canada, 2016).

Cannabis, on the other hand, is not reported to be a significant risk factor for diseases. As a matter of fact, there were zero documented cases of death by marijuana overdose in the world until a German study by Hartung et al. (2014) claimed to have found exactly two cases. In Colorado, a few dramatic deaths since the law went into effect have been widely publicized, including that of a college student who jumped off a hotel balcony after consuming a cookie infused with marijuana (Graham, 2014). However, one reason why these cases make headlines is that death resulting from marijuana use is so rare. As found by Graham (2014), cannabis causes very few acute deaths.

Cannabis may be a substitute for more than just alcohol. A study by Bachhuber, Saloner, Cunningham, and Barry (2014) found that states with medical



marijuana laws have significantly lower rates of death caused by painkiller overdoses. Further, a working paper published by Yu-Wei Luke Chu (2013), a lecturer at Victoria University of Wellington School of Economics in New Zealand, suggests that medical marijuana laws also lead to a decrease in heroin use. Using data on drug possession arrests and treatment admissions, Chu found a 20% decrease in heroin treatments after medical marijuana laws went into effect.

Moreover, recent studies suggest that more lenient restrictions on cannabis may decrease traffic fatalities, reduce violent behaviour and even lead to a reduced suicide rate. In a recent study, Anderson, Hansen and Rees (2013) found that in the 19 states with medical marijuana laws, the first full year after the laws went into effects was associated with a drop in traffic fatalities between 8% and 11%. The estimated effects of the laws were largest at night and on weekends, when most drinking occurs. The authors are careful to say that their research does not imply that driving under the influence of cannabis is necessarily safer than drunk driving. However, the authors suggest that even if driving while high on cannabis is as dangerous as drunk driving, it may be that individuals using cannabis are more likely than drinkers to stay home and smoke, rather than drive from bar to bar. Furthermore, according to Caulkins, Kleiman, Hawken, and Kilmer (2012), alcohol causes between three and four times as much dependence as marijuana, and more than 10 times the violence and crime.

6. Conclusion

Cannabis prohibition has imposed high costs on Canadian society while offering relatively little benefit. Currently, Canadian police and prosecutors in all jurisdictions are capable of pursuing criminal charges for cannabis possession, although criminal charges are rarely pursued. While it is hardly questionable that cannabis consumption may cause health problems and consequently result in loss of productivity, it is also undeniable that the current policy of criminalizing the consumption and sale of cannabis is not only



failing, but also leading to greater social problems. Criminalization has led to a vast and profitable illegal market, organized crime, lack of quality control, and lost tax revenues. Equally harmful, the current policy criminalizes individuals whose only offense is to have, arguably, inflicted self-harm. As is the case with most laws that attempt to inhibit consensual choices, criminalization has inflicted much greater harms than the substance it aimed to prevent.

The Canadian public is rather aware of these detrimental effects: since 1997, public opinion polls have found an increasing majority of Canadians agree with the statement "smoking marijuana should not be a criminal offence". A 2016 Globe and Mail/Nano Research poll found that approximately 68% of Canadians support legalization, a result that is in line with other surveys conducted in the past year (The Globe and Mail, 2016). In light of a failed policy and the clear support of a majority of Canadians, the Liberal Government elected in 2015 is working to introduce legislation legalizing marijuana in the spring of 2017.

This paper analyzed the impact that transitioning to a legal environment is anticipated to have on the Canadian economy and, more specifically, on the BC economy, given that the province is estimated to be the source of roughly 40% of the national cannabis production. Given current usage rates and market estimates, the total Canadian market, including exports, has the potential to be worth approximately \$17 billion by 2036. Based on a total tax rate of 30.8%, the Canada-wide legalized market has the potential of raising annual tax revenues starting at \$2.97 billion in 2017, and reaching \$5.33 billion by 2036.

Assuming the low-end estimate of the BC cannabis market, \$4 billion, the provincial government could potentially, at a rate of 12.1%, collect annual revenues starting at approximately \$468 million in 2017 and reaching up to \$840 million by 2036. A higher end estimate, based on a BC market size of \$7 billion, would lead to annual



revenues between \$768 million and \$1.54 billion for the BC government. Given the BC government's anticipated 2016 budget of \$48.1 billion, a 12.1% provincial tax on cannabis products, in a market that is estimated to be worth up to \$7 billion, would represent an annual increase starting at \$837 million in 2017 and growing to up to \$1.56 billion by 2036 (Government of British Columbia, 2016a). While this may appear to be a modest increase, it would, for example, be more than sufficient to fund the BC Government's commitment to increase the Ministry of Health's budget, currently at \$17.97 billion, by 3% annually.

More than simply raising tax revenues, legalizing cannabis is the most sensible policy alternative, both economically and in terms of public health and safety. The current enforcement of cannabis prohibition requires substantial fiscal and organizational resources that could be used towards education, health care, and other pressing public policy goals. Additionally, the enforcement of cannabis laws imposes a range of social, psychological, and familial costs on individuals arrested for cannabis violations. This turns otherwise law-abiding citizens into criminals whose only offense was to consume cannabis for recreational purposes – a “crime” around one in 10 Canadians commits annually.



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APPENDIX A – Forecast Calculation

User projections were calculated as follows:

- The percentage of individuals who, in 2012, reported having used marijuana at least once in the past 12 months – based on Statistics Canada (2015b);
- Yearly growth in the percentage of individuals who reported having consumed marijuana in the past 12 months in 2002 versus 2012. Yearly growth rate was calculated per age group (see Table 1) – based on Statistics Canada (2015b);
- Growth rate per age group is applied to the current Canadian population for each age bracket and forecasted for the next 20 years based on annual population growth of 1.1% - based on Statistics Canada (2015a, 2015b, 2014);
 - Forecasts are divided in five age brackets, based on anticipated growth or decrease in the number of individuals who consumer marijuana at least once a year in each bracket:
 - 15 to 17 years old – annual decrease of 3.48% in the percentage of users (20% in 2012);
 - 18 to 24 years old – annual decrease of 0.78% in the percentage of users (33.3% in 2012);
 - 25 to 44 years old – annual increase of 1.09% in the percentage of users (15.6% in 2012);
 - 45 to 64 years old – annual increase of 4.53% in the percentage of users (6.7% in 2012);
 - 65+ years old – annual increase of 14.87% in the percentage of users (0.8% in 2012).

Market size projections are calculated as follows:



- Based on CIBC's World Markets estimate that the current Canadian market for marijuana is worth approximately CAD\$5 billion;
- Future forecasts are based on current estimated market size and adjusted for estimated number of users and annual inflation of 2% - inflation is based on the Bank of Canada annual inflation midpoint of 2% (2016).



APPENDIX B – Employment in BC

Employment in the cannabis industry is thus estimated by using Colorado, a state with a similar population size (5,456,574 versus BC's 4,683,139), as a proxy (BC Stats, 2016; The United States Census Bureau, 2016). As of 2015, approximately 16,000 individuals had been licensed to work in the cannabis industry. Adjusting for population, it is estimated that approximately 13,732 individuals work in the BC industry.

Employment figures are imprecise due to the illegal nature of the market. However, an estimate may also be made based on the size of BC's market for domestic consumption. An anonymous grower presented the following account:

For every 50 1000w flowering lights I have one full time employee. If we say an average of 10 weeks, because I have always run longer flowering sativas, etc., then the total man-hours for 50 lights in flower is 400hrs.

Vegetative stages are less costly. One employee at 25 hrs per week can take care of enough plants for 100 eventual flower lights. At 4 weeks veg, that adds another 100hrs, cut in half for 50 lights. That means that without setup, processing, management, or sales considered, 450 hours for 50 lights to harvest.

Under ideal conditions, 1g per watt of light is the goal inside. This would mean a kilo per light. Let's lower that to 75%, because the ideal restricts variety, and because this is agricultural at its core so things happen. That means 75 kilos, or 165 lb. 450 divided by 75 brings it to six hours per kilo.

The next consideration is processing and packing. The goal is to stay under \$100/lb in processing costs. So add \$220 to each kilo just for that, which is the equivalent of adding around 9 hours at \$25 per hour, which is pretty standard.

So, the total per kilo for growers and processors is about 15 man-hours per kilogram of cured product.

This does not consider the use of trim to make secondary products like oils or edibles.

(...) This is all estimated based on my personal experience, and doesn't take into account cloning, room turnover, trade work, sales, management, finances, legal, or cleanup. It also ignores any non-labour related costs.

The employees involved in growing and processing cannabis, according to the grower's account, are paid around \$25 an hour. If each employee works 1,125 hours per year, this implies that given an annual production of 308,000kg in BC (intended for domestic production alone), there are around 4,106 part-time individuals employed in the



growing and processing segment, totaling \$115.5 million in wages for that segment alone. In addition to growing and processing, there are individuals involved in making secondary products like oils or edibles, account cloning, room turnover, trade work, sales, management, finances, legal, and cleanup. Given the average wage for employees in the cannabis trade is likely not as high as that for those involved in other parts of sale (legal, sales, finances), total wages are calculated based on \$25/hour at full-time rates. This indicates that for the 13,732 individuals involved in the cannabis industry, wages are likely to be in excess of \$618.1 million.

About the author

Larissa Flister holds a Master of Arts in Applied Economics and Policy Analysis (University of Regina '15), a Bachelor of Arts in Economics (Unisinos – Brazil '13) and an Associate of Arts in Business Management (Santa Fe College, Florida '09). Her areas of research interest include microeconomics, behavioral economics and public policy. Ms. Flister currently works as a Consultant at the City of Regina, and her past experiences include interning with the Deputy Minister of Health and working at Deloitte Canada. She currently serves on the boards of the Saskatchewan Economics Association, the Canadian Progress Club (Regina Wascana), and Toastmasters (Plains). Ms. Flister is also an avid cyclist and half-marathon runner.





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