

Weed Work

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If you were asked to cost a substantive policy change, how would you outline/detail your approach? Your working assumption would be that the possession of cannabis is legal and that a decision has been taken to create an offence to prohibit it. Consider the term "cost" in the broadest sense, as either expenditures or savings.

My inclination is to approach this question first by analogy and second by analysis. The first step for any significant policy issue is to establish whether there are precedents for this change. Is what has happened in the past relevant to current conditions?

Analogies

A reasonable step would be to assess prohibition of alcohol as an analogy to a cannabis prohibition. Both Canada and the US had alcohol prohibitions in the early 20th century although their forms were slightly different. The rise of the rumrunners should be of great interest to those contemplating the prohibition of cannabis. The expansion of the mob(s) should also be of obvious concern. Contrary to TV "history", legalization of booze in the US slowed the mob's growth, not Elliot Ness. Denied their sources of easy revenue, the scale of mob operations had to shrink. They turned to other activities: union pension plan manipulation, gambling, vice and extortion until illegal drugs once again provided a source of easy money. By making cannabis illegal we are opening the floodgates to the accumulation of illegal wealth.

There are other drugs in which prohibitions were established: opium, LSD and the like although none was nearly as extensive nor as important as alcohol.

I would strongly recommend a review of the literature and a serious reassessment of the prohibition era using modern tools and methods. What is striking at present is the extent to which such an analysis has not been done. A review of the economics literature will discover only a handful of references although recently there has been a ripple of interest in revisiting the US prohibition.

What will be the US reaction if by making cannabis illegal our policies are out of synchronization? This will have to be assessed. The US has serious migration problems along its Southern border. How different would their reaction be to a commodity problem along their Northern border?

The decision to make cannabis illegal is an exercise in both positive economics and cost benefit analysis. Positive economics makes a prediction that can be tested against the data. As will be described below, cost-benefit analysis provides a calculation that cannot readily be “tested” against the data since it involves idiosyncratic judgments about what constitutes the ambit of costs and benefits.

A Positive Analysis

The key to the effects of making cannabis illegal is the current demand and supply of the weed. Figure 1 shows the current state of the market. The demand schedule in the figure plots the quantity of grass demanded at every price. Currently we pay price p_0 and consume amount Q_0 . This market functions well, and the cost of producing cannabis is about \$4.20 per pound. The supply schedule of cannabis production is flat at p_0 . This reflects the observations that it is easy to replicate production. Many farms can produce cannabis so that any quantity can be provided at the same price. The total amount of output depends entirely on demand. The number of farms cultivating pot expands or contracts to fill the market. It is not a complex industry with only a few producers.

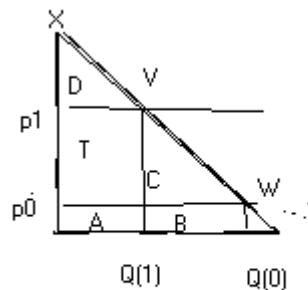


Figure 1

The demand function tells us how people consume the product at different prices when the price and quantities of alternatives are unchanging. Furthermore, the area under the demand schedule also has some meaning. At

current production levels Q_0 , the amount that is paid for cannabis is the rectangle p_0Q_0 : the sum of areas **A** and **B**. This is money received by the producer and paid by the consumer.

However, the benefit received by the consumer is greater than the amount the consumer has to pay. The demand schedule reflects the consumer’s evaluation of every addition to consumption. That is for any quantity *the vertical distance to the demand schedule* tells us how much the consumer values that quantity of cannabis. For example at quantity Q_1 , the value of the additional consumption is p_1 . Consequently the consumer’s benefit in paying $A+B$ for quantity Q_0 , is the entire area under the demand schedule above the cost of production: the area **DTC**. This area represents the value to the consumer of quantity Q_0 . It is the value the consumer would have been willing to pay rather than do without Q_0 . It is called the “consumer’s surplus” since it is in addition to the amount that is actually paid, $A+B$.

Why do we care?

The reason that this is important is that if we move to prohibit legal cannabis, *the area under the demand schedule reflects the value of resources that consumers are willing to pay for different amounts of cannabis rather than do without.* Consequently, the area under the demand schedule describes how much potential revenue is available to illegal producers of cannabis. Notice that this may be vastly greater than simply the amount currently sold at price times quantity: p_0Q_0 .

Furthermore, we could have raised price to p_1 by way of a tax, with a tax rate equal to the difference, $p_1 - p_0$, and gathered revenue of area “T” in the figure.¹ The tax would have reduced consumption to Q_1 and raised revenue to boot. We might prefer to put up with a little consumption without foregoing all that revenue.

What are the facts of the Cannabis Business today?

We currently produce marijuana at a cost of \$4.20 per pound². We are a nation of 20 million smokers happily addicted to our marijuana. We are very heavy users and consume 3 cigarettes of 0.43 grams of marijuana per day. This means that each of us consumes about 1.30 grams per day of marijuana. Since we smoke 365 days a year, this leads to total usage of 1 pound of marijuana per year per smoker. This costs our smoker about \$4.20 per year. Naturally, the cost of the weed is only a fraction of the total cost of the cigarette, but we harvest about 20 million pounds a year today to service our local market. This leads to a market value of domestic production of \$84 million per year. This is tidy sum, but not really very significant in the \$1 trillion dollar GDP.

Should we make marijuana illegal, we run the risk of moving from point W to point V. The demand schedule is likely to be inelastic in this lower region, so that higher prices mean greater revenue. In fact with a slope (of the demand schedule) of -200 ,³ then the ridiculous price of \$3,000 per pound (the current cost of a pound of BC marijuana at the Vancouver grow-op’s back door) will lead to total consumption of 5 million pounds and total revenue of \$15 billion. Although this vast sum is far in excess of current expenditure, it is a testimony to the government’s forbearance that they have not imposed a simple tax to harvest some of this lucre. A tax of \$2,894 per pound would have raised nearly \$15 billion and still have provided producers with their \$21 million in costs. Instead, by making it illegal we provide an endless source of revenue for the unscrupulous, and a lifetime of apprehension among our youth.

In Sum

¹ Indeed it is an easy exercise to calculate the revenue maximizing tax.

² This is actually the current price of tobacco, another weed of substance.

³ The fictional equation is: $P = 4,000 - 200xQ$; where P is price and Q is quantity measured in millions of pounds.

The first part of the “positive” analysis ends here. It has established the demand and supply schedules empirically so that a sensible choice can be made about the consequences of revenue loss and the amount of money that will be at stake to illegal providers of the service.

Cost-Benefit Analysis

This part of the exercise is inherently more speculative and possibly spectacular. The benefits and cost can be writ large or writ small. For example, we know that smoking cannabis causes lung damage. By reducing the amount of smoking we reduce health costs that saves money in the *provincial* health portfolio. This may not be interesting to the Federal government.

Alternatively, it may be that instead of smoking dope, people turn to alcohol. This may raise revenue since marijuana taxes are low and alcohol taxes are high. Alcohol may do more health damage than marijuana. The list of alternatives does not stop here. We can carry things much further as a matter of theory. It may be that people substitute tobacco smoking for marijuana smoking. Three joints a day is a big-time marijuana habit. But 20 tobacco cigarettes a day is certainly possible. Which does more damage? How likely is the substitution to take place? What about other sources of substitution? Perhaps by forcing people off their weed they turn to cocaine that may be far more damaging socially. Perhaps they feel the need to dose themselves on fats and sugars and reduce their exercise. We need to consider each of these alternative scenarios and probably several more.

What does a cost-benefit analysis of this proposal entail?

The basic theory of cost-benefit assumes that there are streams of revenues and costs that take place over time. These future costs and benefits are discounted so that they are all measured in current dollars. A project is worthwhile if it has a positive present value. That is, the sum of future benefits less costs measured in today’s dollars is positive.

Future benefits (or costs) are worth less than current dollar benefits because of impatience and the consequent ability to invest a dollar today and get more dollars in the future. \$100 ten years from now is not worth \$100 today. If we can invest \$50 today at some interest rate i , then we can see that it will yield $\$50 \times (1+i)$ next year, and $[\$50 \times (1+i)] \times (1+i)$ the next year and so forth until ten years in the future it yields $\$50 \times (1+i)^{10}$. If the rate of interest is 7% (0.07), then today’s \$50 investment will be worth \$100 in ten years⁴. Now turn the problem around. \$100 ten years from now is only worth \$50 in today’s dollars.

To put it more formally, the usual problem is to invest today for a return tomorrow. If you invest \$100 today and receive \$110 tomorrow, then the investment has a positive present value if the value of the interest rate, the rate at which you discount the future is not too high. That is, the present value is as in 1:

⁴ Actually \$98.36 but close enough to \$100 for this example.

$$1. \quad PV = \$ -100 + \frac{\$110}{(1+i)}$$

Consequently if the stream of costs (\$-100) and benefits \$+110 are discounted by an interest rate that is less than 10%, the “project” will have a positive present value. Now this kind of algebra can be very complicated, but it really amounts to the same thing as 1. You need to assess the costs and the benefits and discount them so that all the values are in current dollars.

The critical things that have to be constructed are: the stream of costs, the stream of benefits (both the amounts and the periods that they will last), and the rate at which you discount the costs and benefits. This leads to a formula that is both complicated and simple at the same time. You need to net out the costs from the benefits each year, ($B_t - C_t$), where B_t is the benefit accruing in period t , and C_t is the costs; discount them at the assumed rate of interest, i , some number between 4% and 10% usually; and then add them up to see if the present value is positive.⁵

$$2. \quad PV = \sum_{t=1}^n \frac{B_t - C_t}{(1+i)^t} = \frac{(B_1 - C_1)}{(1+i)} + \frac{(B_2 - C_2)}{(1+i)^2} + \dots + \frac{B_n - C_n}{(1+i)^n}$$

In 2 we have assumed that the streams of cost and benefit persist for some known number of n periods into the future.

So what does this imply about policy?

What this kind of formula suggests is that you need to understand the horizon for policy effects. For example, if we make cannabis illegal we may think that we reap a windfall gain from less smoking which pollutes the lungs. Perhaps this saves us \$1,000 each year in medical services forever⁶. Since the implementation of this proposal is at the stroke of a pen so that the Government assumes there are no costs, and since T-bills currently yield 5% per year, the net present value of this “project” is

$$PV = [\$1,000 / (.05)] = \$20,000.$$

⁵ The “correct” formula is a little more complex, but 2 conveys the essence of the matter.

⁶ To keep algebra to a minimum, we use an “infinite” lifetime for the policy horizon and assume that the costs and benefits are constant throughout. A formula like 2 taken to infinity is the sum of a geometric

series: $\sum \frac{1}{(1+x)^n} = \frac{1}{1-x}$. This simple ratio is very easy to manipulate. The actual formula is

derived as $\sum_{t=1}^{\infty} \frac{B}{(1+i)^t} = B \left(-1 + \frac{1}{1 - \frac{1}{1+i}} \right) = B \left(-1 + \frac{1}{\frac{1+i-1}{1+i}} \right) = B \left(\frac{1}{i} \right) = \frac{B}{i}$

Looks like a good project.

But the DOJ reminds the government that the law will have to be enforced. This means that some cannabis smokers will have to be caught, charged and sentenced. A quick calculation shows that simple enforcement is going to cost about \$300 per year. We redo the calculation:

$$PV = (\$1,000 - \$300) / (0.05) = \$14,000.$$

The proposal still is viable as it has a positive present value.

Then the Department of Corrections insists that we have to account for the cost of imprisoning the convicted. At \$800 per year, putting violators away forever (we have a harsh realm), we now find that our present value is:

$$PV = (\$1000 - 300 - 800) / (0.05) = -\$100 / 0.05 = -\$2,000.$$

In other words, the costs outweigh the benefits.

Upstream-Downstream

This simple scenario does not capture the importance of the pattern of the flows of benefits and costs. Typically in a project, you incur costs “up front” and receive the benefits “downstream” – in the future.⁷ In this example, imagine that we incur all the judicial enforcement costs today. Let these cost be \$300. We receive the downstream benefit from reduced smoking in 30 years. In other words, 30 years from now we receive (for simplicity) a one-time benefit of \$1,000.

$$PV = -\$300 + [\$1,000 / (1.05)^{30}] = -\$300 + [\$1000 / (4.32)] = -\$300 + \$231 = -\$69$$

Notice that with the benefits received so far in the future, the costs today lead to a negative present value. It is no longer a very good idea from a cost-benefit perspective.

These examples can be made increasingly complex and realistic, but the ingredients of the choices are clear.

What matters for the exercise is: 1) what costs and benefits are attributed to the program; 2) the amounts and timing of these streams of costs and benefits; 3) the policy cost and benefit horizon; and 4) the discount rate that is chosen.

Other Issues

⁷ A model might be a dam. You incur a huge cost today in exchange for a steady stream of revenue in the future.

Enforcement

It is likely that enforcement will cost additional resources. This is a new law that substantially increases the likelihood that there will be more offenders who will have to be caught, processed and sentenced to jail time. What is the optimal punishment for this crime? Here we have to trade-off the cost of the sentence that is imposed – the cost of jail and prosecution for the offence, against the incentive it gives others not to do the same bad acts. Consequently we need to establishment what a reasonable sentence may be for this crime so as to decide the costs that it is likely to impose both for policing and for incarceration and control (probation).

Other crimes may be committed to get money for the vastly more expensive weed. How much crime is simply to get money for marijuana? This is a tough one to answer sensibly, but some estimates are possible both at the level of the individual and the aggregate.

International Markets

It is of course of the utmost importance that we study this issue taking account of the United States. The US represents a large market for our cannabis today. With a population of 300 million, although they have their favourite flavours, any change in our law may be dwarfed by their reaction. Should they continue to have legal marijuana, then even if we are successful in stamping out local supply, just like in the Roaring 'Twenties, dope will flow across the border. It is very unlikely that we can prevent a weed flow. It is simply too cheap to ship.

Technology

If we assume no change in US production, then weed will develop. It is unrealistic to expect that marijuana production will remain in the fields. With higher prices being paid, smaller and more easily hidden quantities will have to deliver the same “kick”. Modern advances in hydroponics and genetic engineering will permit the same weight in weed to deliver a bigger kick. The indigenous industry will move from the fields to the houses of the nation. The relatively high cost of cottage production will be outweighed by the higher prices being offered.

Substitution and Complementarity

If we prohibit cannabis consumption, there will be substitution into other drugs like alcohol and tobacco. We need to know the “cross-elasticity of substitution” of these substances with cannabis. This can be estimated to give some sense of the extent to which other markets will pick up the slack or whether the cannabis market is sufficiently robust that people will be undeterred by higher prices. Alternatively, there may be no cannabis market at higher prices because people can find a cheaper alternative with legal substances at lower prices.

To what do people substitute once they stop smoking dope? Do they buy books from the local bookstore, go to hockey games, or play with their kids?

These are kinds of empirical issues that limit the ease with which estimates can be made of the impact of the policy. It also highlights the usefulness of looking at past prohibition changes to see which of these kinds of concerns are likely to be significant as opposed to “possible”.

Sideswipes

There will be unintended casualties along the road to progress. The loss of legal cannabis production will mean that the legitimate trucking and cartage industry will suffer. They will probably default on their current federally subsidized small business expansion loans that made them the poster-boy of the past administration. They will probably sue because they were on the China trip last year and were told that Canada was expanding all transportation to the Far East.

Final Comment

The list of concerns for the introduction of cannabis prohibition is endless. What is important in all of the above is to estimate the demand for the activity or product. The demand schedule also identifies the kinds of goods and services that are related to it as substitutes and complements. Once these activities are identified then a present value can be constructed to assess the policy.

Past examples of similar situations are important because they point the way to separating the wheat from the chaff. As a matter of theory almost everything is always *potentially* important. Experience tells us what things can be ignored and makes it possible to obtain results that are sensible.