CHAPTER FIVE

Taxation and Other Sources of Revenue

Introduction

A state that legalizes marijuana by allowing limited private sales creates a privilege to sell it. That privilege is worth money, maybe lots of money. This chapter considers cases in which some of that money goes to private interests but looks at ways the state might keep some of it.

Taxes and fees are often thought of primarily as revenue-raising devices, but, in the case of marijuana, the collateral consequences, for good and ill—reduced heavy use and use by minors and reduced risks of export on the one hand and increased risk of in-state black-market activity on the other—could outweigh revenue in importance. Both revenue and collateral consequences will depend on setting of tax levels, a task complicated by the possibility that increasing firm size and technological innovation will drive pretax production costs for basic product forms down dramatically over time. The mix of product types could also evolve in ways that are difficult to foresee, e.g., with vaping gaining market share at the expense of traditional joints and bongs or the industry promoting products that contain both nicotine (tobacco) and THC (marijuana).

High taxes would work against some undesirable side effects. For instance, high taxes would tend to limit consumption and reduce a specific kind of black-market problem about which the federal government has warned: leakage to other states. Low taxes would tend to allow a nascent market to compete with local black and gray markets; to provide a low-cost product to consumers; to limit regressivity; and to increase compliance with tax laws, thus reducing enforcement and collection costs. But low taxes and low prices can increase underage use, substance-use disorders, and exports to other states substantially, while benefiting casual users only trivially—because, by definition, those casual users are not spending that much on marijuana anyway.

Taxes might aim to offset marijuana's negative externalities, its harm to nonusers, but those externalities are hard to measure (see Chapter Three and Gravelle and Lowry, 2014). The critical goal of curbing alcohol abuse and abuse of heroin and other opioids would be served by high taxes if marijuana and those drugs are complements and by low taxes if they are substitutes. The goal of nudging users away from risky and unhealthy products and practices might be served by high taxes on some marijuana products and lower taxes on others.

Vermont's constitution states that,

> [p]revious to any law being made to raise a tax, the purpose for which it is to be raised ought to appear evident to the Legislature to be of more service to community than the money would be if not collected. (Vt. Const. ch. I, art. 9)

Tax and other revenues could first pay for legalization (administratively and in terms of enforcing agreed-upon regulations). Then they could go into the general fund or instead be dedicated to particular uses. For example, certain Vermont taxes on energy are dedicated to Vermont's Weatherization Program for low-income households. Alcohol taxes are used to fund DLC. Alternatively, or in addition, some marijuana revenues could be shared with localities, as they are in Colorado.[1]

Jurisdictions considering legalization must not only choose taxation levels and goals; they must also navigate the largely uncharted waters about *how* to tax marijuana. Both Colorado and Washington have adopted ad valorem (percentage of sales price) taxes, but it is unclear whether other jurisdictions should use this approach.

This chapter aims to help decisionmakers in Vermont and elsewhere understand various approaches for taxing marijuana and generating revenue from a legal market.[2] "Bases for Taxing Marijuana" provides details about several bases—measuring sticks—for taxing marijuana, highlighting some intended and unintended consequences of these choices. "Collection Point" walks through issues surrounding where to collect these taxes, and "Mechanisms for Changing the Tax Burden" describes mechanisms for changing tax rates and the tax burden in anticipation of huge and unknowable transformations in the market. "Fees and Auctions" addresses fees, which can serve as an adjunct to taxes, and considers the use of auctions to raise revenue. "Other Revenue Considerations" looks at how legal marijuana could generate other sources of revenue for Vermont, and "Concluding Thoughts" concludes.

Bases for Taxing Marijuana

Before deciding who pays tax, or how much, the state might start by identifying something—or some things—it can measure accurately enough to tax. This section describes eight bases for marijuana excise taxes,[3] ranging from price to weight to features of the product (e.g., THC content) to how it is produced. For each base, we describe precedents and then discuss the potential consequences of this tax choice. "Collection Point" discusses issues surrounding who pays—where in the supply chain tax is collected.

In evaluating tax bases, we look at a range of criteria. The first criterion is prevention of after-tax price collapse. Given the likelihood that a maturing industry will achieve innovations and economies of scale that sharply reduce the price per hour of intoxication offered by basic or generic products (as opposed to name-brand or boutique versions), a revenue structure that provides after-tax price stability might seem advisable. The second criterion is swiftness of initial tax assessment: Will the taxpayer be able to file a return promptly? Although analytically useful, this criterion fits into the category of nice to have, and it deserves little weight. Third, we look at potential for gaming: whether the tax gives taxpayers an opportunity to find loopholes or to cheat outright. Fourth, we consider simplicity: Is the tax easy to calculate? Often, though not always, a tax that is not simple has large potential for gaming. For instance, we

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[1] In Colorado, localities allowing marijuana sales get 15 percent of a 10-percent retail tax (Colorado Revised Statutes § 39-28.8-203, 2014).

[2] Although this chapter provides a comprehensive assessment of many critical issues associated with taxation and revenue generation, it is not exhaustive. Those with a particular interest in this area should also consult Oglesby (2015).

[3] Excises, whether based on price, weight, or something else, are taxes imposed on only *particular* products or services.

can imagine an eventual potency base that is as difficult to game as alcohol content is as a federal tax base for spirits, but the chemical analyses that it requires remove it from the simple category. The fifth and sixth criteria deal with administrative costs—whether a tax is costly to set up initially, and then whether it requires substantial ongoing costs. The seventh criterion is whether a base allows for revenue maximization as the industry evolves. We anticipate that the industry would tend to gravitate toward products that are relatively low-taxed; some tax bases are particularly vulnerable to foreseeable industry responses. The final criterion considers whether the revenue scheme would provoke a conflict with the federal government.

We begin with the three bases that receive the most attention: weight, price, and potency (i.e., THC). We then focus on three mixed bases that serve as rough proxies for taxing by potency: taxing bud more than trim, by weight; taxing raw usable marijuana and concentrates differently; and a claimed-THC alternative minimum tax (that is, a potency tax assessed according to the THC content that the seller claimed was present in the product). Note that these taxes can be applied at various points in the production and distribution processes. We conclude with a brief discussion of two tax bases that are specific to producers: square footage and an indoor electricity add-on base.

Simple Weight Base

Vermont and the federal government tax cigarettes and many other tobacco products by weight, and S. 306 (Vermont State Legislature, 2014a), introduced in 2014, would have taxed marijuana at $50 per ounce. The federal government taxes beer and gasoline by volume, which is like taxing solids by weight.

A weight base is easier to set up and to administer than a potency base but harder than a price base, especially because moisture must be accounted for. It also provides more stable revenue than a price base. However, taxing based on weight creates an incentive to pack the most intoxicating material into each gram, which could be dangerous. Only an extremely low rate, like the low federal per-gallon tax on beer, tames the incentive, but that also reduces revenue potential. A weight base, incidentally, pushes industry away from mass production, toward organic, artisanal, and other high-value-added products. That is because luxurious or fancy products do not bear more tax.

Price (Ad Valorem) Base

Vermont taxes chewing tobacco and certain other noncigarette tobacco products ad valorem, literally, according to value, at 92 percent of wholesale price. Vermont taxes liquor with an ad valorem retail excise tax; that is in addition to a 6-percent sales tax and monopoly profits.

In Colorado, voters approved two ad valorem taxes on marijuana ("Colorado Proposition AA," undated): A 10-percent tax on retailers is being collected; a 15-percent tax on producers has been de facto converted to a weight-based tax, as we explain later in this section, to avoid phony transfer pricing. Washington State enacted three 25-percent taxes (RCW 69.50.535), on retailers, processors, and producers, but companies that are both processors and producers pay only one tax. That drives processors and producers to combine, so most marijuana commerce in Washington pays just two levels of 25-percent taxes. Across the nation, many localities have enacted price-based taxes on medical marijuana.[4]

[4] A price-based excise tax might bear another name. Vermont taxes the gross receipts of retail sellers of heating oil, propane, natural gas, electricity, and coal at a 0.5-percent rate (33 V.S.A. § 2503). Berkeley, California, imposes gross-receipt

If consumers pay more for powerful products, taxing price is a little like taxing potency. But high price might not always mean high potency. Price could also be high because consumers like the blend of cannabinoids or the look, smell, feel, and taste of the product; because of marketing factors, such as branding, and convenience and ambience of retail location; or for other reasons.

A price-based tax has some advantages. First, an ad valorem base is simple; it does not require indexing or equipment. Weight or potency bases would take more time to set up. Second, a price base tempers regressivity. Taxes on prices of products other than luxuries tend to be regressive: They take a higher percentage of income from poor people than from rich people.[5] Price-based taxes tend to favor low-priced products and could therefore benefit scrimping purchasers, who might tend to be relatively poor.

But an ad valorem tax has disadvantages. The most serious one is that an ad valorem tax base amplifies changes in pretax prices automatically. Here is why that is a problem: At first, as the legal industry struggles to gear up, supply cannot meet demand, so pretax prices could be abnormally high early on. (That is what happened in Colorado and Washington.) A price-based tax amplifies those high pretax prices and makes early after-tax prices much too ***high***. So bootleggers benefit. That is, the black market and fake medical market retain market share.

But as time goes on, as legal operators learn and become efficient, and as they expand and achieve economies of scale, their costs can drop dramatically. If they pass cost savings on to consumers, pretax prices decline, and a price-based tax *automatically* declines with them. As after-tax prices drop, the dangers of youth use, abuse, and leakage to other states grow. So a price base then can lead to taxes that are too *low*, which could be a problem for a maturing marijuana industry.

Another problem with a price base is that taxpayers might manipulate or game it. Two ploys available with a price base are bundling marijuana with other products and related-party (and intracompany) transfers.[6]

Bundled sales charge one (undifferentiated) price for two items with different tax rates. The tax problem arises if taxable marijuana is given away, or bundled, with excise-tax-free purchases. So where the consumer buys an untaxed pipe or pays an untaxed cover charge and

business-license taxes per $1,000 of gross receipts. These vary by type of business. The standard rate is $1.20, but rates are $25 for medical-marijuana businesses and $150 for disfavored gun shops (City of Berkeley, 2014b). In case California legalizes recreational marijuana, Berkeley has a $100-per-$1,000 rate on its books already.

As early as 2010, several California localities had enacted laws taxing medical marijuana. A list appears in Oglesby (2011, Table 1). Several Colorado localities tax recreational marijuana as well.

5 For example, with a price base, two products with identical weight and potency could bear two different taxes. For example, assume that the pretax price of premium beer is $2 per bottle, and that of standard beer is $1 per bottle. Both have identical alcohol content. A tax of $0.40 per bottle would tax premium like standard, with resulting prices of $2.40 and $1.40. A tax of 25 percent would tax premium more than standard, with resulting after-tax prices of $2.50 and $1.25. A price base tends to shift the tax burden to branded, luxury goods and perhaps to consumers most able to pay. It tends to push the industry toward mass production. But "[s]urprisingly, the progressivity of a tax system's rate structure is negatively correlated with the reduction in inequality a country achieves" (Kleinbard, 2014, p. 362). Value-added taxes are Kleinbard's focus there. He argues that a fiscal system should be judged as a whole, not piece by piece. And although one might isolate the tax feature of a legalization plan and label it regressive, the plan ***as a whole*** would not be regressive if postlegalization taxed marijuana prices were lower than prelegalization untaxed prices.

6 Related parties for this purpose are individuals or entities that might be expected to share economic interests, such as parent and child or parent corporation and subsidiary. U.S. Code Title 26 Section 318 contains a commonly used list of related parties.

gets free marijuana, a price-based tax would be hard to calculate. Vermont already has detailed antibundling rules for some taxes (Vermont Department of Taxes, 2006), and a price tax base for marijuana could require more. But antibundling rules do not prevent disputes about valuations and thresholds. There is a way to protect a price-based tax from bundling: by allowing marijuana sellers to sell only marijuana. Then there is nothing with which to bundle.

Phony transfer prices turn up between related parties, who can charge one another any price they want. Naturally enough, the price they want is the one that results in the least tax.[7] So a price-based tax depends on the existence of a real price—normally, on an arm's-length sale between unrelated parties.

Washington and Colorado have already faced the problem of phony transfer prices. Washington insists on actual prices for its price-based taxes. It prohibits any cross-ownership between retailers and growers (RCW 69.50.328). So there, sales of marijuana should routinely reveal an actual arm's-length price.

Colorado's solution was much less straightforward: Colorado side-stepped its constitutional authorization of a 15-percent "excise tax to be levied upon marijuana sold or otherwise transferred by a marijuana cultivation facility to a marijuana product manufacturing facility or to a retail marijuana store" (Constitution of the State of Colorado, Art. XVIII, § 16) and ended up taxing something it could measure, so it taxed bud at $0.62 per gram, trim at $0.10 per gram, and seedlings at $1.35 each.

The problem arises when the cultivation facility does not sell marijuana to anyone and transfers it only to itself.[8] That is standard in Colorado, where, most of the time, marijuana is not "sold or transferred" before retail. That is because Colorado once *required* all marijuana businesses to be vertically integrated. *Vertical integration* means that only one company handles marijuana from farm to market—all the way from seedling to retail sale, with no sellers in between. Vertically integrated companies still dominate the market in Colorado—with no sale from a producer to a manufacturer or retailer. So there is no market-based or arm's-length price to tax at 15 percent. There is no sale of any kind, not even a related-party sale, just an intracompany transfer.

So Colorado had to alter tactics and tax not a price, but "fifteen percent of the average market rate" (AMR) of a producer's marijuana (Colorado Revised Statutes § 39-28.8-302, 2014). That rate is supposed to reflect the value of marijuana as it leaves the producer's hands ("Average Market Rate," undated). The Colorado Department of Revenue (CDOR) is in charge of finding that AMR. For 2014, it found the AMR of bud, the potent flower of the plant, to be $1,876 per pound, so it imposed on bud a tax of $281.40 per pound, or approximately $0.62 per gram (CDOR, date unknown). Finding immature plants to have an AMR of $9, it imposed a tax of $1.35 on each. Finding the AMR of trim (i.e., everything else) to be $296 per pound, it imposed a tax of $44.40 per pound, or approximately $0.10 per gram, on trim.

7 Uncertainty about transfer pricing or intercompany pricing among related parties in the cross-border context has especially bedeviled the field of international income taxation. It is not just the money. See Kingson (2005): "Deciding how much one's left hand contributes to one's right may constitute a career, but not much of a life." Arguing and litigating about uncertain taxes constitutes an economic deadweight independent of the taxes themselves.

8 The only third-party sale or transfer is eventually to the retail customer. This is not a retail tax; Colorado has a separate 10-percent excise tax and a 2.9-percent sales tax on retail sales.

These rates apply, surprisingly, to sales even to unrelated parties, for which there is an actual arm's-length price. So Colorado essentially could not make its price-based tax on producers work and has de facto completely converted that price base to a weight base.[9]

A potential final drawback of an ad valorem tax might be the perception that it is excessive. In Europe, for instance, various tobacco taxes often combine to take more than 80 percent of the after-tax price that consumers pay (European Commission, 2014a). Stating that high a burden as a percentage of pretax price would show a rate of more than 400 percent.

Note that Vermont's normal 6-percent sales tax would apparently be collected on *recreational* marijuana unless the legislature created an exception,[10] even though, for now, no sales tax is being collected on *medical* marijuana (Vermont Legislative Joint Fiscal Office, 2012). If Vermont enacts a retail-level marijuana-specific excise tax, the legislation might clarify whether the standard sales-tax base should include or exclude the excise tax.[11]

Actual Tetrahydrocannabinol Potency Base

There are precedents for taxing alcohol as a function of potency (e.g., federal tax on liquor depends on alcohol content; see Alcohol and Tobacco Tax and Trade Bureau, 2013).[12] We are not aware of any jurisdiction that has levied a THC tax on marijuana, although a bill introduced in the Massachusetts legislature in 2013 proposed imposing a tax of $1,000 per ounce on THC (General Court of the Commonwealth of Massachusetts, 2014).

To clarify, a THC base might work this way: Say 10 g of marijuana were tested and determined to contain 12 percent THC content by weight. Then the THC potency base would be 1.2 g.[13]

A THC base, or potency base, could correlate with intoxication better than any other base.[14] Thus, taxing actual THC or potency has an important policy advantage if it can be

[9] Another possible solution to this kind of transfer pricing problem is a mechanism to defer assessment of a price-based tax until the first sale to an unrelated party, as discussed in Oglesby (2015).

[10] Many states and localities that impose retail sales taxes now collect them on sales of legal medical marijuana. Washington and Colorado impose their standard sales taxes on sales of recreational marijuana.

[11] Inclusion or exclusion can be arranged to produce the same total overall state-level revenue gain. For instance, the legislature could enact a 50-percent retail marijuana excise tax that is in the 6-percent sales-tax base or a 53-percent tax that is not. In the first case, the state tax on $1 of sales would be $0.50 excise tax plus sales tax of 6 percent of $1.50, for a total tax of $1.59. In the second case, the tax would be $0.53 excise tax plus 6 percent of $1.00, for the same total. Localities that impose add-on sales taxes might prefer a larger sales-tax base.

[12] In the early 1970s, New York City briefly taxed cigarettes by tar and nicotine content. Tar and nicotine were measured by the discredited smoking-machine method. The chair of Governor Nelson Rockefeller's New York State Committee of Investigation said that this tax base "opened up another hornet's nest in terms of enforcement and administration over and above the normal straight-out problems of too high a tax to start with" (Fleenor, 2003, p. 9). The tax was repealed by 1976. A rare contemporary document referencing the tax is Tobacco Tax Council (1973).

[13] More-nuanced potency bases might go beyond THC to favor, for instance, products with higher amounts of CBD, another cannabinoid. Some research suggests that the presence of CBD buffers some of the adverse effects of THC, e.g., anxiety and panic attacks (further discussed in Chapter Six). To the extent that that is true, one might want to tax products with not only high THC but also THC-to-CBD ratios that are higher than other products with the same THC content but more CBD and, thus, a lower THC-to-CBD ratio. But this is leaping out into uncharted territory. In light of all the unknowns at this early stage of marijuana science, the legislature might, at most, grant regulatory authority to deal with CBD, or even to tax other cannabinoids if science finds them harmful.

[14] But THC content does not correlate as well with intoxication as one might think. A sample's potency, even measured accurately, could change over time: Although raw usable marijuana anecdotally has a long shelf life, potency of some products increases during storage. And even for the blunter purpose of labeling,

made to work, but it does pose some important implementation challenges. We consider a THC or potency base for two very different marijuana products: concentrates and raw, usable marijuana.

Tetrahydrocannabinol Base for Concentrates

We can tax distilled spirits based on alcohol content because they are homogeneous liquids that can be stirred and mixed thoroughly, so one needs to extract and test only one sample taken from any corner of a well-mixed vat. Marijuana concentrates, such as oil, wax, or shatter (wax hardened to a glasslike state), are products made from raw marijuana and used in various forms, such as edibles (cookies, cooking oil), electronic-joint cartridges, tinctures, sublinguals, and dabs (an intensely powerful vapor material). Raw marijuana made into concentrates is something like wine distilled into brandy, an intoxicant made stronger. But concentrates are not simply stronger marijuana: Concentration changes the form of the intoxicant.[15] The production of concentrates could involve a stage when material is homogeneous enough for replicable testing, but resources will need to be devoted to develop and validate testing procedures.[16]

Tetrahydrocannabinol Base for Plant Matter

Raw, usable marijuana—that is, dry plant matter—is far from homogeneous. Indeed, THC content can vary from bud to bud within a single plant, and powerful trichomes make material even from a single bud heterogeneous. Thus, the threshold issue for a potency tax base is whether it can provide replicable, auditable results, close enough for the government work of honest taxation. If the tax base can be gamed,[17] some taxpayers will try to beat it, and the state will try to stop them—all at a cost, possibly a significant cost. To be clear, potency testing is already at work, informing and even warning consumers about products they are buying. For consumers, ballpark numbers are helpful and usually adequate. For taxation, though, ballpark numbers are problematic.

Ensuring representative samples would be critical for an auditable THC tax on raw usable marijuana. One possibility would be to sample 1-lb. lots of usable marijuana at the processor level and base the tax on the median THC value or even the maximum value. But this approach raises some issues. One is determining the appropriate number of samples. A more

> [t]he high variability in bioavailability of cannabinoids, both within and across different methods of intake, limits the usefulness of precision in potency labels. This variability introduces an uncertainty about psychoactive effect that cannot be eliminated, even if cannabinoid content is tested for with very precise methods, with small lot sizes, and conveyed to the consumer with effective product labels. An overwhelmingly large share of the variability in psychoactive effect arises from the method of use and drug metabolism, rather than the chemical contents of the product. (Habib, Finighan, and Davenport, 2013, p. 20)

[15] Another analogy is that concentrates would be to raw marijuana as wine is to grapes—if grapes were intoxicating.

[16] According to analytical chemist Rosemary Habib, "[V]alidated methods by which a specific test must be conducted" need to

> cover instrumentation, calibration curve, compensating for possible interferences and sample preparation methods. They must be proven to work through a series of standardized benchmarks including Precision, Accuracy, Appropriateness, Robustness, Linearity, Range, Repeatability, Detection Limit, Quantitation Limit, and Interlaboratory Reproducibility. (Oglesby, 2014b)

[17] According to Sexton and Ziskind (2013),

> Since a cannabis producer is typically aware which parts of the plant are most well lit, he often knows where to find the most potent flowers from the cannabis plant—typically, those at the top. Potentially, this represents a crucial information asymmetry between the producer and the testing agency. (p. 5)

serious challenge is monitoring the sampling. If processors sample, they can be expected to avoid trichomes, for instance, and select low-potency material. If the government samples, one danger is ignorance and randomness. Another is overreach—deliberately seeking nonrepresentative potent matter to increase tax collections.

Both Tetrahydrocannabinol Bases

Setting up the world's first tax-worthy THC-testing regime would require significant planning and resources. In Vermont, the costs associated with designing the regime and conducting the testing would be spread over a small number of taxpayers. Although possession of marijuana for a criminal case does not violate the CSA, testing by a state laboratory might—for the lab and state employees. Thus, a state could distance itself from the enterprise by hiring or authorizing third-party testing facilities.

At first, the cost of testing might be passed on to consumers, to the benefit of the black market. As the legal market takes market share, the black market will become less worrisome. When the black market is so marginalized that the legal market can bear high prices, the cost of testing could be more acceptable. Time is the friend of a potency base. Regulators might implement a particular potency base once they have time to set up a workable system.[18] That kind of implementation schedule is common administrative practice for a new tax law. In the meantime, tax could be imposed on some other base.

Taxing Bud More Than Trim by Weight

The many uncertainties in testing for THC content lead us to a discussion of other, indirect ways of approaching the goal of taxing THC. We start by looking at different weight bases for different parts of the raw, usable plant, because some parts are usually more potent than others. We then look at different tax bases for (1) raw, usable marijuana and (2) concentrated forms.

There is a precedent for this in Vermont with tobacco, for which cigarettes, roll-your-own tobacco, and snuff are taxed at different rates per ounce (Vermont Department of Taxes, 2014). The federal tax on wine is higher per ounce than the federal tax on beer (which generally contains less alcohol than wine).

For marijuana, Colorado taxes bud and trim at different rates. Colorado regulations define bud as "the product of the Flower or 'Flowering' stage . . . including the actual flower and the small leaves immediately below the actual flower which contain levels of THC comparable to the Flower" ("Colorado Proposition AA," undated).[19] Trim is "any part other than the Bud of a . . . Marijuana plant." Colorado's producer tax rate on bud is around \$0.62 per gram; on trim, around \$0.10 per gram. It chose those rates by concluding that bud, in the market, was worth some 6.2 times more than trim. In November, Oregon Ballot Measure 91 enacted statutory tax rates for bud and trim of \$1.23 and \$0.35 per gram, respectively ("Oregon Legalized Marijuana Initiative," undated). Alaska's newly passed law provides a general rate of \$1.76 per gram but allows regulators to reduce that rate for "certain parts" of the plant (Campaign to Regulate Marijuana Like Alcohol in Alaska, undated)—presumably trim. An introduced

[18] Other components might be taxed. Colorings and flavorings, which appeal to young users, might be taxed. Such taxation would tend to push such products into the luxury category and at the margin out of the financial reach of a disproportionate number of young users. Because only tiny amounts of chemicals are needed to color or flavor products, extraordinarily high tax rates would be required to make much of an economic difference and to actually tilt the market. Instead, an add-on tax might apply by weight or serving to colored or flavored finished products.

[19] The law uses different terminology—flowers and leaves—but follows the Colorado scheme.

bill in Rhode Island taxes bud at $1.76 per gram and trim at $0.35 (State of Rhode Island in General Assembly, 2014).

Trimming is a process in which some raw, usable marijuana is separated into two categories. Small leaves, which grow out of the powerful bud or flower, are removed from it and categorized as trim. Although machine trimming is possible, workers typically cut the trim off by hand (Hawken, 2013).

Bud is typically smoked in raw form in joints or pipes but is increasingly vaporized and is sometimes used to make concentrates. Trim is typically used to make concentrates, eventually used for edibles, dabbing, tinctures, and so on. Bud is generally stronger than trim. Higher tax rates for bud (flowers) than for trim (leaves and everything else) would roughly reflect potency, although potency can vary quite a bit within each category.[20]

In general, observers can agree on what is bud and what is trim—but not at the margin (Oglesby, 2014e). Thus, there is danger of tax evasion. One ploy would be to deliberately characterize a little bud as trim and sell it for concentrates. That is, sellers would have an incentive to put bud, normally more potent than trim, into the trim pile. Then its potency could flow through to concentrate form at a low tax rate and, finally, still undertaxed, into consumer products, such as edibles and electronic-joint liquids.[21]

Taxing Raw Usable Marijuana and Concentrates Differently

Different taxes for concentrates and for plant matter can reflect potency. Several distinct options are possible. An introduced New York bill would tax raw usable marijuana at $1.76 per gram and concentrates at $7.05 per gram (State of New York Senate, 2013). A proposal in Washington State would result in dry tobacco being taxed by weight, and e-cigarette liquids by potency (Smith, 2014). As noted earlier, the federal government taxes spirits by alcohol content; it taxes beer, which is weaker, by volume.

For marijuana, these options avoid two practical difficulties: measuring THC in raw usable marijuana, and drawing a line between bud and trim, both of which were discussed previously.[22]

The state could start by taxing all raw usable marijuana that is to be sold to consumers without processing at one weight-based rate. Then, concentrates could be taxed at *either* a high weight-based rate (the CW option) *or* by THC potency (the CP option).[23]

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[20] Trim from high-potency plants could even be more potent than bud from lower-quality outdoor-farmed plants. Although the ratio of bud *prices* to trim *prices* no doubt reflects potency somewhat, other factors could influence price. For instance, traditional consumer preference for using bud might boost the price of bud beyond the value of its THC content. Colorado's 6.2:1 ratio was designed to reflect prices in the market, not to reflect potency.

[21] Another ploy might prove less promising from the taxpayer's perspective: to mischaracterize high-taxed bud as low-taxed trim and sell it in raw form for smoking with that label. For the ploy to create an advantage for the seller, raw mislabeled product, not incorporated into concentrate, would have to sell for a high pretax price. That abnormally high price for "trim" (really bud) could risk catching the attention of law enforcement.

[22] These options reduce the benefit of the ploy of putting bud in the trim pile—that is, in the pile to be concentrated. Concentrates made from bud are not necessarily stronger than those made from trim; it just takes less bud than trim to make concentrates (Oglesby, 2014e).

[23] With any option, the legislature could set tax rates to nudge users toward one form or the other. Although an hour of intoxication from smoking bud is qualitatively different from an hour of intoxication from, say, consuming edibles, the legislature might crudely seek to make an hour of intoxication from bud more expensive—or less expensive—after tax than an hour of intoxication from products made from trim and concentrates.

Both options treat potent bud like weak bud—a flaw with weight-based taxation. So an ad valorem base for raw marijuana, instead of or in addition to a weight base, could be used in connection with CW or CP.[24] Tax rates on bud would need to be high enough to dissuade consumers from arbitraging the tax rates by concentrating bud themselves—often, a dangerous practice (Crombie, 2014).

Weight of concentrates is only a proxy for THC content. The CW option rewards sellers who pack the most intoxicating material into concentrates. The CW option is cruder and less targeted at potency than the CP option but easier to implement. The CP option is available only if testing provides auditable results.

Claimed-Tetrahydrocannabinol Alternative Minimum Tax Base

For a short time, the federal government imposed an alternative minimum tax on corporations' "book" income, the income they claimed in reports to shareholders, without regard to normal tax concepts (Lyon, undated), though taxing claims is unusual.

But if the state cannot verify *actual* THC content for any product, the state might use the seller's *reported* or claimed THC content as a secondary or backup alternative minimum tax of sorts (Oglesby, 2014a; Ball, 2014). If the producer's report of THC content is exactly right, a stated-THC tax is a potency tax. If the producer overstates THC, a stated-THC tax penalizes deception of consumers.

But sellers might intentionally *understate* THC. Sellers could dodge this tax entirely by falsely understating the THC content, although, if the tax were modest, they might not do that because high THC content is appealing to consumers. Sellers might also react to the tax by making non-THC claims to lure consumers—by a whisper campaign to discredit a low stated-THC number, for instance, or by claims that other, non-THC cannabinoids provide desirable intoxication. Claims might extend beyond cannabinoids: "In popular wisdom, different strains of cannabis are thought to produce distinct experiences, even where cannabinoid content is identical" (Habib, Finighan, and Davenport, 2013).

So stated THC seems too easy to game to serve as the sole or as a primary tax base for marijuana—or to be more than a supporting element in a package of marijuana revenue provisions. So, to mitigate gaming, reported THC could be only an *alternative minimum* tax base. That is, the stated-THC base could apply only when the primary tax base—say, weight or price—yielded a low number, one that is inconsistent with high stated potency. The tax owed would be the greater of (1) the tax computed using the primary base and (2) the tax computed using the alternative base—claimed THC.

Square-Footage Base

For medical marijuana, many California localities tax growing area. Rancho Cordova, California, taxes each 12.5 sq. ft. of outdoor grow area at the same rate as one indoor square foot.

Vermont could also choose to tax square feet of grow space. Such a tax would be only moderately difficult to set up and collect, just requiring decisions about exactly what square footage to count (Caulkins, Cohen, and Zamarra, 2013).[25] Its administration overlaps with regulatory oversight. It allows the option of higher rates for indoor growing. Collection per

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[24] We do not examine all possible combinations in depth. The rate for an ad valorem tax on raw marijuana might more easily be held down to a nonalarming level if other taxes supplemented that tax. See "Combination of Bases," below.

[25] For instance, the state would need to decide whether to count walkways, storage space, and areas used for seedlings.

plant cycle (not per year) would reduce the incentive to choose strains that produce more crops per year. (Counting plant cycles in indoor facilities would require some government oversight, perhaps as an element of a comprehensive tracking system.)

A square-footage base correlates poorly with potency, so it could be used as one element of a package of revenue measures. The tax could be collected up front, providing cash flow to the state in the start-up phase of legalization and reducing the danger of leakage into the gray market but straining undercapitalized growers.

Indoor-Electricity Add-On Base

Indoor growing uses valuable energy and could harm the environment. Vermont taxes certain electric generating plants at the rate of $0.0025 per kilowatt-hour (kWh) of electrical energy produced (32 V.S.A. § 8661). That tax applies regardless of who consumes the electricity. On marijuana growing, that low rate would be inconsequential.

The City of Arcata, California—an area where marijuana growing is intense—is collecting a more ambitious excessive residential electricity–user's tax aimed at indoor marijuana growing and designed specifically to curb electricity use (Arcata Municipal Code § 2628.5). When a customer exceeds 600 percent of a baseline designed to reflect normal use, the city taxes 45 percent of the customer's entire electric bill.

Arcata presumes that abnormally high use of electricity correlates with marijuana growing under high-powered lights. After enactment of the tax, the number of residences exceeding the 600-percent threshold fell, from a pretax level of 633 to 82. Although designed primarily to reduce use of electricity, the tax was, at one point, bringing in more than $40,000 a month, in a city with fewer than 18,000 people (Scott-Goforth, 2014).

An electricity tax could apply to legal indoor grows without any threshold, on the theory that outdoor growing is ordinarily preferable on environmental grounds. To be sure, that theory would tax any crop grown indoors—not just marijuana. Taxing only legal grows because they are easy to find would work in favor of the black market. Arcata's approach, targeting all excess use, has the advantage of taxing both legal and illegal growers.

A central problem with electricity as a tax base is that, in the long run, at least after national legalization, one would expect most growing to be done outdoors or in greenhouses. So this base would best serve as a green add-on to another, more substantial base.[26]

Concluding Thoughts on Base

Table 5.1 puts those criteria in columns and presents our view of how the various bases (in the table's rows) meet those criteria. It summarizes the tax bases discussed in this section and compares them on a number of dimensions.

Finally, it might be prudent to consider combining several bases. Vermont could adopt a variety of cumulative add-on taxes, like it does with its motor-fuel regimen,[27] or a greater-of

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[26] Oglesby (2015) discusses another environmentally targeted tax approach: discriminating against products that were grown indoors.

[27] The Vermont motor-fuel tax consists of four components: the Motor Fuel Tax Assessment, which is "the amount of $0.134 per gallon or 4% of the tax-adjusted retail price upon each gallon of motor fuel sold by the distributor not to exceed $0.18, whichever is greater"; a $0.121-per-gallon state tax; a $0.01 petroleum cleanup fee, and a Motor Fuel Transportation Infrastructure Assessment in the amount of 2 percent of the average quarterly retail price. See Vermont Department of Motor Vehicles (undated).

Table 5.1
Tax Bases

Item	Prevention of After-Tax Price Collapse	Swiftness of Initial Tax Assessment	Potential for Gaming	Simplicity	Start-Up Costs to Administer	Ongoing Costs to Administer	Revenue Maximization as Industry Evolves	Federal Conflict
Simple weight	Low	Fast	Low	High	Medium	Low	Low	Ordinary
Price	Very low	Fast	High unless transfer pricing is solved	High if transfer pricing is solved	Low	Low if transfer pricing is solved	Low	Ordinary
Potency	Low	Slow	Low, eventually	Low	High	High	High	Labs need state involvement
Different weight rates for bud and trim	Low	Medium	High	Low	Medium	Medium	Medium	Ordinary
CW: Different weight rates for raw and concentrates	Low	Medium	Low	High	Medium	Low	Medium	Ordinary
CP: Raw by weight, concentrates by potency	Low	Slow	Low, eventually	Low	High	High	Better than medium	Labs need state involvement
Claimed-THC alternative minimum tax	Low	High	High	High	Low	Low	Medium	Ordinary
Square feet	Low	Fast	Low	High	Low	Low	Medium	Ordinary
Electricity add-on	No	Fast	Low	High	Low	Low	Low	Ordinary
Monopoly (for comparison)	Yes	N/A	No	High	High	Medium to High	High	Extraordinary

NOTE: CW = concentrate by weight (concentrates are taxed at a high weight-based rate). CP = concentrate by potency.

alternative minimum tax. An example of the latter is from Europe, where cigarette taxes must be at least the greater of (1) 57 percent of price, and (2) €64 per 1,000 cigarettes (European Commission, 2014b). (Value-added taxes impose a separate, additional burden.)

Collection Point

In addition to choosing a tax base, jurisdictions that decide to tax marijuana need to decide where the tax will be collected. Taxes can be collected at various points along the supply chain, and this decision will have important implications for the industry structure, state budgets, and the black market. The ideal collection point depends on what the tax is measuring—that is, its base. Collection points for square-footage and electricity taxes are self-evident. Collection points for other bases are discussed in detail in Oglesby (2015).

Federal taxes on alcohol and tobacco are collected from the manufacturer or importer. Vermont takes a similar approach, taxing the in-state manufacturer if there is one, and upon entry to the state otherwise. Vermont's taxes on cigarettes are imposed on the wholesaler, which puts a tax stamp on each pack (32 V.S.A. § 7774). Vermont, like most states, typically collects tobacco tax in the middle of the supply chain, after manufacture and packaging.

Colorado collects marijuana tax from retailers and from producers—but most often, in practice, from vertically integrated businesses. Washington collects from retailers and typically from integrated processor-producers, although, if processors and producers are separate, it collects from both. Both Colorado and Washington hope to track marijuana from seedling to retail store, to prevent leakage—diversion of legally grown product before collection of tax.

Other things being equal, it is best to assess excise taxes from a small number of taxpayers and locations—from choke points in the supply chain. There, fewer people will need to pay and collect tax, so the cost of tax administration should be less for taxpayers (as a whole) and for government. Collecting at a choke point could allow adequate audit coverage with fewer audits. When retailers are numerous, as with beer, wine, and cigarettes, a retail tax could prove particularly impractical (Gravelle and Lowry, 2014).

Large corporations could be easy to collect from, and some argue that, in the context of drugs, they are "likely to be concerned with keeping the image of the industry clean and respectable" (e.g., Levine and Reinarman, 2004). But the tax goal of easy collection could conflict with other policy goals, such as a desire to prevent industry concentration of the big-tobacco model.

Other things being equal, it is also advisable to assess tax before leakage can occur. That criterion suggests collection early in the supply chain.

This conventional preference might be moot if tracking of product were as bulletproof as Colorado and Washington would like to make it. The hope is that thorough tracking, combined with adequate no-fault penalties for lost product, could turn leakage and late collections into small problems. However, it is far from clear when, if ever, tracking will meet that promise. Video surveillance, for instance, requires more eyes on monitors than states might be able reasonably to afford.

One final, technical point applies uniquely, and perhaps temporarily, to collection of state marijuana excise taxes: The state can choose a collection mechanism that will reduce federal income taxes on marijuana businesses. Section 280E of the federal Internal Revenue Code (26 U.S.C. § 280E, discussed in Appendix B) allows marijuana businesses to deduct only the cost of goods sold, amounts paid to produce or purchase marijuana. Washington's producer excise taxes, for instance, are imposed on the sale of marijuana. Those taxes do not seem to qualify as a cost of production, so they prima facie do not qualify as cost of goods sold and might not be federally deductible under Section 280E. To lessen the federal tax burden on marijuana businesses, the state might structure any excise tax (on any base) to apply to the privilege of growing or doing business or to *production* rather than sale (Roche, 2013). In that way, the tax would be part of cost of goods sold and federally deductible—even if collected at the time of sale.

Mechanisms for Changing the Tax Burden

Writing revenue laws for a nascent and tumultuous marijuana industry could be like buying clothes for a newborn baby. Whatever you choose will not fit for long. This new industry will evolve in unpredictable ways, so taxes on marijuana will need to be revisited and updated. But how? Here we begin by looking at the need to adjust. We then review five options for doing so and contrast their pros and cons.

The Need to Adjust

A brand-new legal marijuana market will not soon be stable. Fluctuating pretax prices would push after-tax prices around. Early on, the industry would likely suffer from lack of production capacity. Short supply would result in high early legal pretax prices.[28] Adding high taxes to those high pretax prices would tend to drive consumers to bootleggers, whose main selling point would be lower prices. So revenue and drug policy would suffer from too ambitious a tax plan.

Over time, legal businesses' pretax costs should drop, for two reasons. One is that the state prohibition premium, extra costs caused by illegality under the laws of Vermont, will disappear. Continuing federal illegality will impose some continuing premium. The other is that maturing businesses generally tend to see costs go down because of such factors as innovation, increased capacity, amortization of start-up costs, movement along the learning curve, economies of scale, and the need to meet competition.

Lower costs are likely to result in lower pretax prices to the consumer. If so, *unless taxes go up*, after-tax prices will go down, encouraging use by youth and abusers.[29] A tax burden that was just right at first could prove too low. If the state's goal were steady after-tax *prices*, neither steady tax *rates* nor steady tax *collections* in dollar terms would achieve it.[30] If, as we think likely, an increasingly high tax burden is appropriate as the legal marijuana industry matures, a tax increase will face the opposition of by-then vested interests. An old saying has it that raising taxes repeatedly and gradually is like cutting off a cat's tail an inch at a time.[31]

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[28] On the demand side, novelty purchases or pent-up demand in early days of legalization might tend to push prices up (Hartmann, 2014; Belville, 2014).

[29] Elasticity of demand among youth is reportedly greater than for users generally (Gravelle and Lowry, 2014). The problem of lower after-tax prices is especially acute if taxes are based on price, as discussed in "Bases for Taxing Marijuana."

[30] A discussion of the goal for the tax burden appears in Oglesby (2015).

[31] If the federal government legalizes marijuana, it could also seek tax revenue. New federal taxes, combined with until-then appropriate levels of state taxes, might make the total tax levels too high. But a well-designed federal tax could honor

In any event, the need for change in the tax burden is foreseeable. Whatever goal the state sets for after-tax prices, static tax laws, like a frozen airport flight-status screen, might be right only once. A dynamic tax burden is a facet of the need for adjustment generally. As Caulkins, Hawken, Kilmer, Kleiman, et al. (2013) note, "Since we are still learning about cannabinoids and how they interact, one may want to design a tax regime that can be easily amended to incorporate new insights" (p. 1054).

The federal government foresaw just this problem for another newly legalized intoxicant in 1933, after repeal of alcohol prohibition. As Congress and the administration studied "post-repeal liquor taxation, . . . [i]t was generally agreed that the immediate objective should be directed to the elimination of the bootlegger" (Hu, 1950, p. 73). Their plan, once legal businesses and law enforcement succeeded with that objective, was to raise taxes. President Franklin D. Roosevelt's team put it this way:

> It seems reasonable to suppose that a more drastic price competition by the legal industry will be necessary in the early post-prohibition period while the illegal industry is still organized and well financed. It would probably require a considerably higher price to revive a defeated illegal industry [than] it would to keep a well entrenched one in business. This price could be facilitated by keeping the tax burden on legal alcoholic beverages comparatively low in the earlier post prohibition period in order to permit the legal industry to offer more severe competition to its illegal competitor. When that competitor has been driven from business the tax burden could be gradually increased. Investigators . . . estimate that it will require three years of such competition to break the organization of the illegal industry. (Choate, 1933b, p. 309)

The plan worked. As Hu (1950) noted, "The syndicated type of illicit operation was virtually destroyed by the end of 1937, and since that time the control of production and distribution of illegal distilled spirits became largely a problem of coping with relatively small violators" (p. 95).

As bootlegging faded, Congress enacted four tax increases within 12 years.[32] The tax increased by 450 percent (from $2.00 in 1934 to $9 in 1944). In after-inflation real dollars, the increase was 414 percent.[33] When the revenue was needed, the tax base was there.

Legislative bodies routinely arrange for tax rates or rules to change in advance—without contemporaneous legislation. Here we discuss five of these options: indexing, scheduled future rate increases, staggered starts for tax bases, discretional rate changes, and nonrate adjustments.

Five Options for Adjusting Taxes

Indexing

Indexing dollar amounts for inflation changes the tax burden automatically. For instance, Vermont indexes income-tax brackets, conforming to federal indexing (V.S.A. § 5822[b][2]).[34]

state taxes and resist interstate marijuana tax competition by giving credit for a certain level of state taxes against the federal tax owed (see Humphreys, 2013).

32 All the rates come from Ripy (1999).

33 The $2 tax was imposed in January 1933. The $9 tax was imposed in April 1944. Between those months, cumulative inflation was 35.66 percent (McMahon, 2014).

34 Vermont also indexes, for instance, the cap on the tax on tracked vehicles (32 V.S.A. § 9741[38]). In nontax law, Vermont indexes the minimum wage (21 V.S.A. § 384).

Indexing has distinct advantages when taxes are imposed on nonprice bases. In the long run, as the market stabilizes, indexing nonprice bases (weight, THC, plants, square feet) would prevent inflation-based erosion of tax receipts in real terms. Federal collections for alcohol and tobacco taxes would be billions of dollars higher per year in real terms if rates were indexed. But indexing aims at a steady tax *burden* in real, inflation-adjusted terms—not at a steady after-tax *price*—or at any price level. Thus, it is of only marginal use in adjusting to a dynamic marketplace.

Scheduled Future Rate Increases

To try to maintain marijuana prices that consumers pay or to aim at any price goal, the state could schedule rate increases in advance. That is, current legislation could provide that tax rates would increase at specified future times by specified amounts.

Scheduled future tax rate increases have been huge, in dollar terms. In late 1977, Congress enacted the Social Security Amendments of 1977 (Pub. L. 95-216, 1977, § 101), boosting the employer's share of hospital insurance under FICA from 0.90 percent for 1977 to 1.00 percent for 1978, to 1.05 percent for 1979 and 1980, to 1.30 percent for 1981 through 1984, to 1.35 percent for 1985, and to 1.45 percent thereafter. Other increases to FICA taxes were stretched over longer periods: The same act of Congress increased Old-Age, Survivors, and Disability Insurance (OASDI) taxes by seven discrete steps over 13 years (Pub. L. 95-216, 1977).

Setting tax rates that go up in advance is a variation on the concept of an income-tax holiday—a temporary zero or low rate for new activity, long used by developing countries (see, e.g., President of the Republic of Indonesia, 1970). Conceptually, rates that stair-step up over time are like a sunset of low rates. The old, low rate expires in favor of the new, higher rate, unless the legislature intervenes.

With respect to the repeal of alcohol prohibition, arguments against automatic increases then were that bootleggers would "hive up" inventory until taxes went up and that the future was too unpredictable (Choate, 1933a). But to the extent that bootleggers wait for higher taxes with which to compete, their cash flow suffers, and they are squeezed—perhaps squeezed out. To be sure, setting rates for out-years involves guesswork and will not achieve perfection. But prescribed, increasing tax rates could achieve a better result than static rates. Even in the best case, the legislature is likely to have to revisit early iterations of any legalization plan. A series of increasing rates would address, however tentatively, one of the uncertainties that legalization entails.

Staggered Start for Tax Bases

Introducing tax bases one by one—that is a lesson one could draw from the historical evolution of alcohol revenue measures (see generally Rabushka, 2008, and Hu, 1950). The simplest, least evadable revenue sources come first. Flat annual license fees are easy to collect: Authorities have to find the enterprise just once and do not have to measure anything. Import duties are easier to collect than excises: They require policing just the borders, not the entire territory. Capacity-based license fees (e.g., fees based on the size of a liquor still) require just a modicum of tax administration, perhaps annually. With progress, volume-based excises are collectible across the jurisdiction. Private so-called tax farmers, who buy the right to collect taxes at auction, give way to state officials. Potency-based taxes for homogeneous materials, such as proof-based liquor taxes, mark the final step in the tax-base march of progress.

As if speeding up tax history, the state could adopt revenue bases one by one, using later-adopted bases to replace or supplement early ones. Some marijuana bases are easier to implement from a standing start than others. For instance, square-footage taxes and electricity taxes could get an immediate start. Price-based taxes would require little lead time. Weight-based taxes, which require establishment of standards, procedures, and weighing locations, could follow. Potency-based taxation would require more time to implement.

Colorado, in effect, adopted a staggered start for its 15-percent producer tax in early 2014, by a one-time-transfer exemption for marijuana transferred from existing medical-marijuana businesses to commonly owned recreational businesses (Sullum, 2014a). Marijuana in inventory of a medical-marijuana business as of December 31, 2013, did not bear any 15-percent tax either when it entered the recreational channel or ever.[35]

Discretionary Rate Changes

The legislature might consider delegating rate-setting authority to the executive branch. That is what Colorado does. Its marijuana tax statute says that CDOR must reset, every six months, the AMR to which a 15-percent producer excise tax applies. In August 2013, the department was officially notified that the AMR had increased.[36] If the department had gone along, taxes would have gone up. Using its discretion, the department disregarded the notification and continued a lower marijuana tax rate that will advantage the early legal market versus the black and fake-medical markets. Delegation of tax-rate setting would allow rapid administrative action. A legislature's strength could lie more in prudent deliberation than in speedy reaction to a dynamic market. Delegation could in particular help avoid legislative impasses that tend to arise when statutory tax increases are proposed.

A more limited form of delegation would allow administrative action only to *postpone* legislatively scheduled rate increases. The administrative authority could be merely binary: to allow a scheduled increase to take place or to delay it until further action. That is, the legislature would enact a set of scheduled future rate increases but would authorize their delay until such time as they would advance the goals of the legalization plan. Such delays could be automatic (hard trigger) or discretionary (soft trigger).

A hard trigger to raise federal taxes—a "'failsafe' that will automatically trigger should Congress and the Administration not succeed in enacting legislation by 2013 that meets specified revenue targets"—was recommended by the National Commission on Fiscal Responsibility and Reform (also known as the Simpson-Bowles Commission) in 2010.[37] That recommendation would have meant that bureaucratic counters of fiscal flows, not Congress, would have said yes or no to a tax increase. In the marijuana context, setting criteria for a hard trigger

[35] Ordinarily, inventory on hand at the time of imposition of a tax or a tax increase is subject to the new tax or rate (Hu, 1950; Gravelle and Lowry, 2014).

[36] Colorado's Marijuana Policy Group, assigned to research the price so as to provide a July–December 2014 tax rate, reported that the AMR for bud had risen to $2,865 from $1,876 per pound of plant matter. If the group's reported price were right, Colorado's 15-percent tax on bud for the last half of 2014 should have been $429.75 per pound, or $0.95 per gram, an increase of more than 50 percent over the $0.62 rate for the first half of 2014. The Department of Revenue balked. Without numerical analysis, it stated, "[The department] will not be adjusting the market rate at this time" ("Average Market Rate," undated).

[37] Hard triggers for federal spending cuts were enacted and fine-tuned in the 1980s in the Balanced Budget and Emergency Deficit Control Act of 1985 (Pub. L. 99-177, 1985, Title II), known as the Gramm-Rudman-Hollings Act, and subsequent legislation (Lynch, 2011).

seems difficult. A possible criterion for allowing a scheduled tax increase to proceed would be strength of the legal market versus the black market. If the black market were found weak, the scheduled tax increase could proceed. But measuring that strength would seem a subjective task, without easily quantifiable guidelines. Instead, a soft trigger, granting discretionary authority, might allow flexibility to take all relevant facts and circumstances into account. In all cases, a simple act of the legislature could override or undo any trigger at any time.

Nonrate Adjustments

Although delegation of tax-rate setting is an unusual way of avoiding possible legislative impasses, administrators often adjust tax rules that legislatures have enacted. One scenario is this: A legislature enacts a rule, but regulators delay its application and make adjustments that are prospective only. That is, administrative rules change the tax base or other rules, but only for transactions or taxable years after regulations have been written. The regulatory process can bog down, so regulatory adjustments could take effect long after legislative action.

An example is the delayed effect of antidiscrimination rules of Section 2716 of the Patient Protection and Affordable Care Act:

> Because regulatory guidance is essential to the operation of the statutory provisions, the Treasury Department and the IRS, as well as the Departments of Labor and Health and Human Services (collectively, the Departments), have determined that compliance with § 2716 should not be required (and thus, any sanctions for failure to comply do not apply) until after regulations or other administrative guidance of general applicability has been issued under § 2716. (IRS, 2011)

In the marijuana tax context, administrative discretion might advance the legislature's goals. For instance, administrators would need time to get a weight-based taxation process up and running. Potency-based taxation would need even more time. In the sound exercise of administrative discretion, state officials could allocate time and expense to the projects of instituting new tax bases in light of the urgency for those bases to operate. That is, as the marijuana market became ready to bear a higher tax burden, officials could bring that burden, in the form of a new base, on line—by shifting scarce resources toward establishing that new base and certifying that it is operative. Such a procedure could aim in the direction of a particular after-tax price target, if only on an interim basis.

Table 5.2 presents a visual comparison of those options on the basis of several criteria, including effectiveness (whether a mechanism can respond quickly enough both to defeat bootleggers at first and to prevent a collapse in after-tax prices in the long run); delegation (whether a mechanism requires the legislature to delegate some of its power to other actors); finality (whether a mechanism is likely to require repeated legislation); and revenue potential.

Fees and Auctions

This section describes two options for charging money for the privilege to sell and grow marijuana: set fees and auctions. For each option, we describe precedents and then discuss the potential implications. We then discuss the option of charging fees for the privilege to buy marijuana, with particular attention to nonresidents.

Table 5.2
Mechanisms for Changes in the Tax Burden

Change	Example	Effectiveness Against Bootleggers and Price Collapse	Delegation of Legislative Power	Need for Ongoing Legislation	Revenue Maximization Potential
Static tax burden	Federal liquor tax	Lowest	None	Highest	Low
Indexing	Vermont income-tax brackets	Negligible	Minimal—to statisticians	High	Low
Schedule future rate increases	FICA changes	Medium	None	Requires midcourse correction	Moderate
Staggered start for tax bases	Colonial alcohol taxes	Medium	None	Requires midcourse correction	Low to medium
Discretionary rate setting	Colorado marijuana market rate	High	High	Only oversight	High
Discretionary nonrate adjustments	Patient Protection and Affordable Care Act (Pub. L. 111-148, 2010)	Low to medium	Varies	Medium to high	Low

NOTE: FICA = Federal Insurance Contributions Act (Pub. L. 74-271, 1935, Title VIII).

Set Fees

In Vermont, applicants to run medical-marijuana businesses pay a $2,500 nonrefundable fee. Successful applicants then pay a "registration fee of $20,000 for the first year of operation, and an annual fee of $30,000 in subsequent years" (18 V.S.A. Chapter 86). Those are sizable fees. Because there are approximately 1,500 medical-marijuana patients spread across four dispensaries, those fees, in total, approach $100 per patient per year.[38] Colorado collects a fee from marijuana businesses that depends on the number of their plants ("New Retail Marijuana Establishments Licensed Pursuant to 12-43.4.-104[1][b][II]," undated).

Sometimes fees are set at only nominal levels to discourage frivolous filings or to compensate the associated bureaucracy for its costs of processing applications.[39] There is nothing unique to marijuana about such fees, so nothing further needs to be said about them. However, fees are also sometimes set high enough to matter, both in terms of generating nontrivial revenue streams and in terms of influencing the structure and behavior of people and organizations who are subject to those fees. At these levels, fees serve purposes comparable to those of taxes, but, because of their different character, offer a distinct set of pros and cons and can be used either as an alternative or as an adjunct to taxes.

[38] Still larger fees have been contemplated. For example, in 2010, the Oakland, California, City Council adopted a $211,000 annual fee for "marijuana factories" and would have allowed four of them (Sanchez, 2010). That fee never took effect, in light of federal concerns expressed in the Cole memo about large-scale private operations (Downs, 2011).

[39] The line between fees and taxes is often fuzzy (Cummings, 2011). Unlike a tax, a fee cannot be coerced: The payer chooses to pay a fee but not a tax. In addition, the fee amount should relate somehow to a benefit to the payer or a cost to the government. A sale by the government of a privilege to sell or buy marijuana would grant the willing buyer a benefit the buyer thinks is worth the price and so would be considered a fee, not a tax.

The state could impose flat license fees on all marijuana businesses. Business privilege licenses are a standard tool for identifying market participants, so as to regulate them. Fees for the out-years could be scheduled to increase to reflect the likelihood that other producer costs will drop—like a tax holiday. The out-year increase in the Vermont medical-marijuana business fee already follows that model.

If one wants a relatively small number of outlets for law enforcement to monitor, charging a fairly large fixed fee will tend to limit the applicant pool. Using a substantial fee as a barrier to entry could reduce the difficulty of dealing with appeals from applicants who do not succeed in obtaining licenses.[40] In addition, a large fee encourages substantial, well-capitalized operations that could exhibit a degree of professionalism in the industry. But to hit a total production goal that provides just enough supply, but not too much, fee-setters would periodically need to estimate the demand curve for the privilege of growing (or selling) marijuana legally. So some other restricting mechanism would need to help allocate the privilege.

Fees need not necessarily be per business. Fees could pay for weighing or potency testing. Vermont, like Colorado, could impose a fee based on number of plants to complement a regulatory scheme that tracks plants—recognizing that, if the fee were too large, growers would tend to shift to tree-like plants.

Fees Set by Auction

Governments routinely sell property, including intangible rights, at auction. In 1993, for electromagnetic spectrum, Congress authorized the Federal Communications Commission (FCC) "to use competitive bidding to choose from among two or more mutually exclusive applications for an initial license," replacing "comparative hearings and lotteries" (FCC, 2006). Spectrum licenses are issued for a period of years but are generally renewable as a matter of course if the licensee meets standards.[41]

Government auctions of *short-term* intangible rights are not common, but they are not new. In New Hampshire in the mid-1700s, for instance, when excise taxes on spirits were imposed at set, statutory rates, "[t]he method of collection was tax farming, in which the right to collect excises was sold at auction to the highest bidder" for periods as short as two years (Rabushka, 2008, pp. 619–620). We are aware of no current short-term auctions of nonrenewable business licenses.[42]

Vermont could auction off licenses to produce marijuana, more plausibly as a complement to taxation than as a complete replacement. Auctions could raise revenue by selling permanent or annual quotas. An auction method of allocating licenses could avoid arbitrariness and cronyism, which are problems that turn up when on-the-merits allocation goes wrong.

An auction would allow the market, rather than government, to allocate a scarce resource—the privilege to sell recreational marijuana legally. Fee-setting requires guesses by government about what the market will bear; an auction method lets the market speak for itself. An auction of quotas, like a tax, could capture some of the economic rents of legalized marijuana commerce. An auction could sell the right to grow (1) on a number of square feet,

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[40] In Washington, for example, early in the process of issuing licenses by lottery, 127 applicants who were denied chances in the lottery had appealed the denials (Johnson, 2014).

[41] See, e.g., FCC (2008): "Renewal will be subject to the licensee's success in meeting . . . license conditions."

[42] The legislature might be concerned that trying out a novel approach on a novel industry creates a significant risk of unintended, harmful consequences.

(2) an amount by weight (or eventually THC content), or, more simply, the right to operate a store.

Auctions ordinarily favor well-capitalized bidders (e.g., existing businesses), which can pay in all events, without depending on results. This favors favor bidders with wealth—with risk capital. So auctions are regressive in their allocation of a state-owned intangible asset, but they tend to eliminate underfinanced bidders.

Auction design, though, presents difficult theoretical and practical issues and provides traps for the unwary (Klemperer, 1999). Collusion among buyers is a constant concern. The possibility of collusion, though it can be addressed by auction design, cannot be eliminated (see, e.g., "Competition Hammered," 2014).

Auctions could yield permanent or temporary quotas. Auctions of permanent privileges—or privileges revocable only for cause—could provide winning bidders either (1) a fixed quota or (2) a fixed fraction of a total market amount to be set periodically by the state. Bidding for permanent licenses is likely, from the state's perspective, to leave money on the table. As the nascent marijuana industry struggles to outperform the black market, entrants are unlikely to amass and risk the capital necessary to pay for the present value of future rents from a permanent marijuana license. That is, given uncertainty, firms would deeply discount the prospective profits from the out-years. Taxation can make up for that shortcoming by taking up economic rents as they materialize. But proceeds of a one-time auction for permanent rights would bring in a disproportionate amount of revenue up front and could help pay for the cost of setting up legalization.

Instead of permanent licenses, annual licenses could be auctioned. (Auctions could sell off licenses for any number of years; we consider one year as an example.) A series of annual auctions might, like nimble taxes, yield increasing revenue over time. As the cost of producing marijuana drops, the privilege of selling it legally in a restricted market increases in value. With annual auctions, the state might take at least some of the increasing value of that privilege. If so, winners' payments to the state would increase their costs of production, which might help prevent an unfortunate price collapse.

The state could set a year's quantity target for quotas based on prior volume (or, for the first year, on an estimate of likely first-year consumer demand). Several types of auctions are available (Klemperer, 1999). If the state seeks to avoid market concentration, it could limit producers to a certain percentage of the total quota. Related-party rules would be needed to enforce that kind of limitation. This gets back to the issues surrounding supply architectures in Chapter Four.

The winner of an annual auction has no guarantee of renewal. That uncertainty might keep bids low and might keep potential entrants out of the market. Indoor marijuana production, in particular, would seem to be benefit from long-term investment. Typical investments in real property and in plant and equipment with a useful life beyond one year would be thrown into turmoil by the prospect of nonrenewal. Outdoor growers, whose operations are less capital-intensive, might be less daunted by the risk of nonrenewal. Annual licenses, perhaps more than any other allocation mechanism, could work against incumbent marijuana businesses. That would be a positive feature if government wants to disfavor entrenched incumbency in the marijuana industry. As Caulkins, Hawken, Kilmer, and Kleiman (2012) noted, "[O]nce business interests get entrenched in an industry, toughening the laws related to that industry becomes more difficult. . . . Private interests prioritize profit, not public health or public safety" (p. 245).

To be sure, annual licenses would entrench incumbents less than permanent licenses. But annual licenses would not eliminate entrenchment. Incumbents might tend to benefit from asymmetrical information (Yasuda, 2008), such as knowledge of production processes and of the market learned while operating with a license. In addition, investments in tangible assets might allow an incumbent to outbid new entrants. Indeed, annual auctions could *eventually* concentrate production in the most-successful and capital-rich enterprises, eventually leading to only a few major players with a high probability of regulatory capture. One way to weaken the advantages of incumbency would be to issue only nonrenewable licenses. Or perhaps the law could favor new entrants by requiring incumbents to outbid them. Either practice would disrupt the industry and invite disguised ownership arrangements in which incumbents try to pass themselves off as outsiders.

An auction process produces revenue in the short run that does not depend on the fortunes of private enterprise or the vagaries of the market. That is, an auction requires businesses to pay a set amount of revenue, possibly collected up front, whether the industry has a good year or a bad year, so it removes some uncertainty from the state's budgetary process, though only for one year. An auction shifts the risk from the state's budget to the private bidders, who could reflect that risk by bidding less than their best guess about the most likely value of the license.

Winners of auctions for the privilege to produce might have to pay up before the supply chain is in operation. If so, the capital available would be only that raised by the producers themselves, in contrast to a tax imposed on *sales* by a producer, in which case the purchaser would come in with cash. That kind of capital requirement might hold down bids—or favor vertical integration. If, instead, payment of bid amounts were delayed until after harvest, collection might fail.

As the industry evolved, producers could well receive a small share of total dollars spent on marijuana.[43] If auctions were the only revenue source from marijuana commerce, the level of government revenue necessary to set prices at tolerable levels could mean that minimum auction bids would dwarf all the other expenses of producers combined. That extraordinary cost structure would put pressure on anticollusion mechanisms.

Like any licensing plan, any quota system transfers scarcity rents from the state to quota owners (Donohue, 1998, p. 5). An auction process would need to be carefully designed, and bidders would need to be competitive, to bring an appropriate amount of those rents back to the state that is responsible for allowing them.

Consumer Fees

Vermont could charge consumers for the privilege of buying marijuana (Kleiman, 1992). Residents could pay less than nonresidents, or residents might even be exempt. Vermont charges fees for hunting, fishing, and trapping licenses and charges nonresidents more than residents—sometimes an order of magnitude more (Vermont Fish and Wildlife Department, undated). And nonresidents of Vermont pay $50.00 for a license to hunt small game, while residents pay nothing. States routinely charge nonresidents more for such licenses. Colorado limits purchased quantities of recreational marijuana more severely for nonresidents than for residents, and most medical-marijuana states do not allow purchases by nonresidents at all.

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[43] With taxes making up very roughly half of the retail price of U.S. cigarettes, and markups by resellers getting most of the rest, growers of raw tobacco get a tiny fraction of the final price.

A fee structure disfavoring nonresident marijuana buyers could limit both interstate leakage and harm from marijuana tourism. Game licenses that discriminate in favor of residents are constitutional, and federal illegality makes a claim of constitutional discrimination even more difficult for marijuana consumers.[44] But any after-fee price advantage for residents can extend only so far as the market will bear. If it is too large, out-of-state purchasers will find straw Vermont residents to do their marijuana shopping for them—for cash.

Determining the amount the market would bear for a consumer license would be a matter of speculation. If the state allows local option for any decision about marijuana legalization, it might let localities experiment with amounts of license fees and with price advantages for Vermont residents. To be sure, high local fees or taxes could result in de facto prohibition, so, if the state seeks uniformity, it could ban or limit local license fees or limit Vermont residents' price advantage. Or it could share in the revenue that border jurisdictions collect from nonresidents.

The ability of localities to impose a minimal fee on purchases might allow for further experimentation. For instance, as a pilot project, a locality, if not the state, might choose to impose a small fee on all purchasers but waive it for who set their own monthly purchase limits. Such limits might

> keep consumers mindful of how much they're actually using, compared to how much they intend to use . . . Since using more, or more often, than intended is among the defining characteristics of substance abuse, helping users enforce on themselves their own chosen consumption patterns would address the problem at its root. (Kleiman, 2014a)

To be sure, users could adjust their own limits periodically and might seek to get around the inconvenience by traveling or by hiring straw purchasers. Even so, the limits would tend to enlighten users about their own use and maybe to nudge them toward their own goals.

Other Revenue Considerations

This section mentions briefly some other potential revenue streams to the State of Vermont. It is not exhaustive; for example, given the uncertainty about how legalization will influence alcohol consumption and alcohol tax revenue (Chapter Three), the revenue impact that legalization could have on alcohol revenues is not discussed in this chapter. Note that insights about public-health consequences and costs associated with regulation are discussed in Chapters Three and Seven, respectively.

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[44] Although we do not undertake a full constitutional analysis, we quote Justice Harry Blackmun about one argument: "Whatever rights or activities may be 'fundamental' under the Privileges and Immunities Clause, we are persuaded, and hold, that elk hunting by nonresidents in Montana is not one of them" *Baldwin v. Fish & Game Comm'n of Montana*, 436 U.S. 371, 391 (1978). To paraphrase, during federal illegality, whatever rights or activities might be fundamental under the privileges and immunities clause (U.S. Constitution, Article IV, § 2, Clause 1), marijuana consumption by nonresidents in Vermont is not one of them. And an equal-protection challenge would fail if a legitimate state purpose exists. The U.S. Supreme Court allowed Montana to charge nonresidents more than residents for hunting licenses, accepting that "nonresident [elk] hunters create greater enforcement problems" than Montanans and holding that higher fees did not offend the equal-protection clause (*Baldwin*, 436 U.S. at 388). In light of attempts in the Netherlands to deter drug tourism, it is plausible to think that drug tourists would create more problems than marijuana-using residents. And restricting drug tourism is likely to reduce the danger of leakage to other states, an existential threat to legalization in light of federal warnings.

If Vermont legalized marijuana, a host of non–marijuana-specific taxes would kick in. These are important for two reasons. One is their contribution to Vermont revenue. Whatever its marijuana-specific taxes, Vermont will also benefit from the extra effect of nonspecific taxes, which is often ignored in the policy debate about marijuana legalization (this is further addressed in Chapter Seven). The second is these taxes' effect on total operating cost in a business that will be fighting for survival against the black market. In connection with that second reason, federal taxes, such as FICA and income taxes on employees, are large and important.

Vermont's general sales tax was considered briefly, along with price-based excises, in "Bases for Taxing Marijuana." Vermont's individual income tax, with a top rate of 8.95 percent, and its corporate income tax, with a top rate of 8.5 percent, will apply to income owners and employees earn from marijuana businesses. (In Appendix B, we discuss an obscure income-tax issue—Section 280E—Vermont's version of which denies some deductions to marijuana businesses.) Medical-marijuana businesses are already subject to all income taxes; so are illegal producers of marijuana, although the collection rate might be low. (Remember that prohibition-era racketeer Al Capone went to prison for tax fraud because illegal income is not tax exempt.) To the extent that the marijuana industry hires employees who were either not earning income in Vermont (this category includes workers moving into the state and chronically unemployed Vermont residents) or evading taxes before, Vermont's income-tax receipts will rise. So will unemployment taxes.[45]

Whether or not black-market workers charge a prohibition premium for their labor, legal workers (leaving aside federal illegality) will not. For workers shifting from illegal to legal work, wages per worker could decline, but compliance with tax law should increase.

A key point is that these non–marijuana-specific tax bases could expand. A host of multiplier effects can be anticipated. Construction and employment will result from new business activity. Businesses will hire professional help. Tourists will come and spend. Legalization could free up cash in consumers' hands, leaving them more to spend on other items. That is, a consumer with fixed income and a static level of marijuana use will have extra cash to spend or save—*if* the price per intoxicated hour goes down.

When marijuana businesses buy or rent real estate, income for owners of that real estate benefits. Property values might go up,[46] benefiting local property-tax collections, while perhaps burdening property-owning taxpayers. Vermont residents not involved in marijuana commerce might see some increase in the general price level, to the benefit of sales-tax collections.

In summary, a host of collateral effects can be imagined. But predicting how a legal marijuana industry will affect the economy overall is speculative.

Concluding Thoughts

Revenue is not the only goal, and maybe not even the primary goal, of a tax scheme. In the case of marijuana, an upsurge of problem use and underage use in the wake of legalization could create social, educational, and health damage that would outweigh all the revenue collected

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[45] We note the argument that increased marijuana use could decrease ambition and increase nonproductive idleness to the point that economic activity suffers.

[46] Prices for warehouse space in Denver are said to have soared in the early days of legalization (Raabe, 2014). Whether those price increases are sustainable or are the result of temporary supply shortages is not clear.

from even the most ambitious tax plan. The dangers of such an upsurge ought to dominate decisions about the level and form of taxation.

A licit marijuana market has some advantages over the illicit market. For producers, legal production can be much cheaper than illegal production, with no need to hide, sneak, or pay outlaw wages and the capacity to invest in long-lived assets. If marijuana were a fully legal product, produced the way tea is produced, a joint would cost just about what a teabag costs: pennies rather than dollars (Gieringer, 1994; Caulkins, Hawken, Kilmer, and Kleiman, 2012). For consumers, legal product will be easier and safer to buy and will have been tested both for potency and for the presence of adulterants and contaminants. So at some point, as the market matures, it can sustain fairly hefty taxation without generating much illicit activity. But finding the optimal level of taxation is a challenging and ongoing problem.

In addition to finding the right tax level, policymakers need to determine how and at what stage of production the tax will be collected and determine the base of the tax. An ad valorem tax is administratively simple but has the disadvantage that it will fall as market prices fall; if the goal is to keep the after-tax price at some target level, ad valorem taxation is not the way to go. A tax on gross weight produced or sold is also relatively simple, but it creates an incentive for producers to pack as much intoxicating power as possible into as little plant material as possible and thus gives a market advantage to the highly potent forms of marijuana that have become increasingly popular; insofar as those forms are more dangerous than milder forms, that counts as a disadvantage of taxation on gross weight. Taxation per unit of THC has many attractive features but depends on accurate and honest testing procedures. In any case, a decision has to be made about how to tax concentrates and edibles, as opposed to herbal marijuana; those product forms have been growing in market share in states with open medical or commercial sales.

Higher taxes will have only modest effects on casual use or the number of users; even at today's illicit-market prices, being stoned costs an occasional user without a developed tolerance to THC less than $1 per hour. But taxes matter to heavy users because marijuana makes up a significant fraction of their personal budgets and because they use more often and use more per day of use than others. Someone averaging 1.5 g per day over the year—which would put that person in the top 10 percent of monthly marijuana users—and paying today's illicit prices spends more than $5,000 per year on marijuana: about what a pack-and-a-half-a-day cigarette smoker paying Vermont retail prices spends on tobacco.

In addition, keeping Vermont marijuana prices higher than illicit-market prices in New Hampshire, Massachusetts, and New York will discourage both consumers and dealers from buying in Vermont to use or resell in neighboring states; effective control of out-of-state sales is part of the requirement for federal toleration of state legalization efforts.

That makes marijuana taxation a potentially important public-health measure and a means of avoiding a federal crackdown. But high taxes also have disadvantages:

- The higher the tax, the greater the incentive for evasion via diversion, illicit production, or import from out of state and the greater the need for enforcement. (A sufficiently high tax would be tantamount to prohibition.)
- Although high taxes help protect some users from slipping into substance-use disorder, other users will do so even in the face of high taxes. Those people will wind up not only chronically intoxicated but also poorer than they would have been had the price of marijuana been lower.

- If—and this is a big if because the causal relationships remain unclear—marijuana tends to substitute for alcohol (especially for heavy problem drinking or for alcohol use in combination with opiate use) or for other illicit or prescription drugs, higher prices for marijuana due to higher taxes could lead to more abuse of those other substances. Insofar as they are more dangerous than marijuana, the result could be to increase total harm rather than decreasing it.

We conclude this chapter by highlighting three threats to collecting tax revenue from state-level legalization regimes. In addition to taxes being so high that they sabotage legal sales and perpetuate the black market, taxes could also be too low. Although eliminating the black market, the revenue per unit sold could be so low that tax collections are meager or even so low that the public turns against legalization, which would wipe the revenue stream out. And the state would need to set shrewd tax rates on all products: Purchasers could flock to any particular product categories that are undertaxed.

Second, the public could eventually condone marijuana tax evasion. This threat might not materialize: If citizens embrace the new law and want tax collected, cheating will be a fool's errand, and the bulk of marijuana commerce will flow through legitimate channels that bring cash to the state. But two non–revenue-producing alternatives to legitimate channels could wreak havoc: One is tax-free medical products being, in fact, available to healthy users without means testing.[47] The other is the public viewing evasion of marijuana taxes as casually as it now views adult marijuana use. In that case, law enforcers and prosecutors might go easy on tax evaders, or jury nullification could set them free, or complicity among citizens could make detection close to impossible. Either way, meaningful revenue collection could be at risk.

Third, a tightening of federal law or policy, perhaps upon a change in administrations in 2017, could stop state taxation and licensing (not to mention state sales in a monopoly model). That could happen overnight under current law—after a court order or a simple modification of prosecutorial discretion. That would leave the state without marijuana revenue and the law in chaos.

This chapter presents only a first look at marijuana revenue. We offer no answers, just options—and warnings. It is unlikely that any plan will get marijuana revenue right at first, and the market is likely to evolve and prove tumultuous beyond anyone's ability to predict. So, as Vermont considers legalization, input from stakeholders, from the executive branch, from analysts, and from the ongoing experience in other states will allow more-informed steps toward or away from any particular revenue plan—indeed, toward or away from legalization itself.

[47] Tax and means-testing options for medical sales are discussed in Oglesby (2015).