Weeding out the Myths: The True Cost of Recreational Marijuana

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1 Executive Summary

On both the federal and statewide levels, the debate over legalization of recreational marijuana has continued to be of focus. Recreational marijuana was first legalized in 2012 in two states: Colorado and Washington. As of 2017, the six states of Oregon, Alaska, California, Nevada, Maine, and Massachusetts have all also legalized recreational marijuana. Moreover, 29 states have either legalized the use of medical marijuana or decriminalized the possession of marijuana [1].

Yet, the federal government has yet to pass a law permitting the use and/or possession of marijuana, nor has it permitted the states to pass such laws.

As the state of Illinois begins to debate the legalization of recreational marijuana, perhaps the most pressing issue is the state debt. The revenues that would be gained from its legalization would greatly alleviate state debt. Yet, despite the much needed revenue, there are still costs, or consequences, that could arise with the legalization of recreational marijuana.

Part 1, titled "Blowing Smoke," provides a mathematical model that calculates the revenue that would be raised in the following 4 particular counties two, five, and ten years after legalization:

- Champaign, which is a college county
- Cook, which encompasses the city of Chicago
- Lake, just north of Chicago
- DuPage, just west of Chicago

Our model first estimates marijuana sales for a baseline user population of 900,000 and tax rate of 27.9% and adjusts for tax rate, time, and population to project tax revenues for the four given counties and the state of Illinois as a whole. We found that Illinois could gain \$536,781,778 in the first 2 years, \$2,602,224,707 in the first 5 years, and \$9,405,350,286 for the first 10 years after the beginning of legal sales if the tax rate was designed to maximize revenue.

Part 2, titled "Smoke Signals," analyzes the potential rewards and consequences of legalizing recreational marijuana using a Governmental, Societal, and Productivity Index. Multiple factors are taken into account, including costs and budgets to all facets of the criminal justice system, from courts to prisons ; predicted costs of homelessness as a result of legalized marijuana; and average GDPs in the various regions of the United States with cross-reference to use of marijuana and its legality in each respective region. The net profit/loss from legalizing marijuana will be determined by adding the costs and revenues from the governmental, societal, and productivity index to gross revenue. We found that while there will be an increase in cost for care of the homeless, the reduction of government expenditures and increase in productivity will ultimately create a net profit for the government of Illinois

Part 3, titled "Second Hand Smoke," provides suggestions depending on which course of action the government chooses to take. Since the legalization of weed may lead to an increase in homeless, much of the revenue generated should be used to cover the cost of services for the homeless. However, if the government decides against legalization, other strategies to generate revenue can be used to balance the budget.

2 Part 1: Blowing Smoke

2.1 Restatement of Problem

The problem asks us to do the following:

- Build a mathematical model that calculates the maximum yearly gross revenue that the State of Illinois could generate by legalizing marijuana in the following counties:
  - Cook County
  - Lake County
  - DuPage County
  - Champaign County
- Use the model to calculate the maximum revenue in the first 2, 5, and 10 years.
- Model the revenue that would be generated statewide, for the same time intervals

2.2 Assumptions

- The estimated percentage of users within each substate defined by Substance Abuse and Mental Health Services Administration is uniform[8].

  Justification: Due to a lack of data on the county level, we will assume that the estimated percentage of users in a county is the same as the percentage for the substate as a whole.

- The number of marijuana users before and after legalization will be the same [5].

  Justification: In Colorado and Washington, after recreational marijuana was legalized, usage did not measurably change.

- The price elasticity will be the same for all marijuana products.

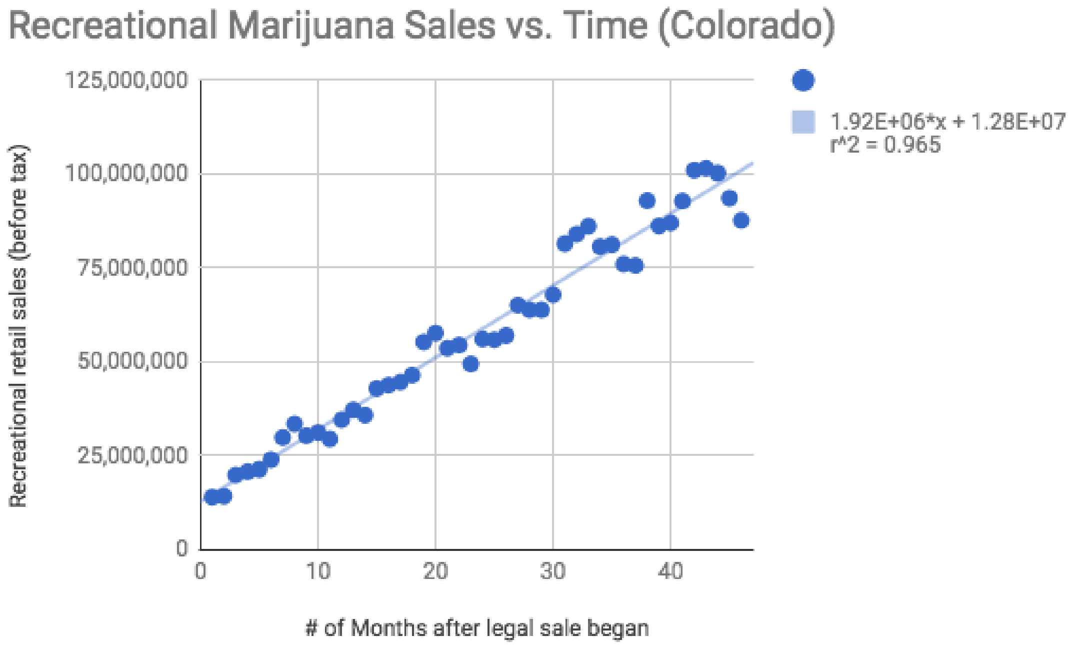
  Justification: Although the price elasticity does have variance between products, we approximate that each county or state studied have approximately the same distributions of those products, so the variance in elasticity is canceled out.

- Marijuana users in every sub region spend on average the same amount of money on marijuana.

  Justification: Although some users spend more and some less, the average consumption per person should be fairly consistent across the United States.

2.3 Developing the Model

We began by developing a model for marijuana sales. We first analyze the sales of recreational marijuana in states which have previously legalized marijuana. In doing so, we hope to project the growth of recreational sales in Illinois counties after legalization. Our investigation focuses on Washington and Colorado because they were the first to legalize marijuana, and therefore have most data showing sales growth. The following two graphs show marijuana sales vs. time in Washington and Colorado.



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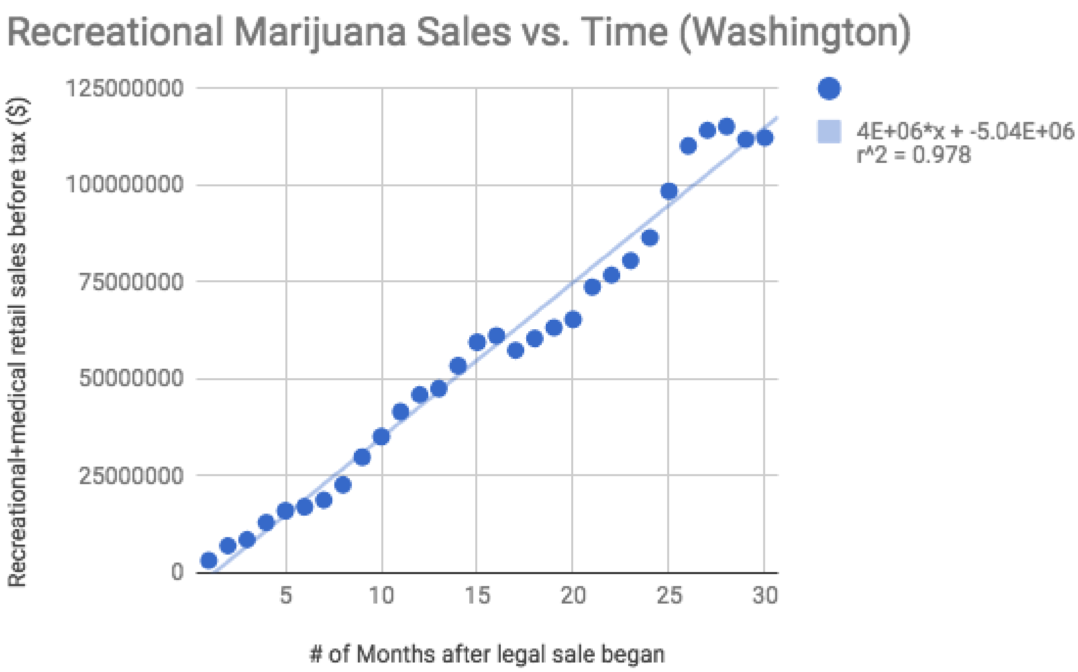

Using simple linear models for Marijuana sales vs. time, both Colorado and Washington have $r^2 \geq .0965$ which suggests a strong linear association between marijuana sales and time. For our model we will assume that the linear sales growth will continue. Although sales growth must eventually decline, data from Colorado and Washington does not give any indication that the decline will occur in the first 10 years of legalization.

Due to the lack of published data regarding the sales for only recreational marijuana in Washington, we will model Illinois sales and growth off of Colorado.

Using a line of best fit from Colorado data [8, 9], we calculate the equation $y = 1.92 * (10^6)x + 1.28 * (10^7)$

where x=time in months after legal sale begins and y=revenue for a given month. We will redefine our equation to M(t) where t=x and M(t)=y so:

$$M(t) = 1.92 * (10^6)t + 1.28 * (10^7)$$

M(t) models the total sales before tax for a given month in Colorado. Based on our assumptions the average sales per marijuana user after marijuana is legalized is consistent among all counties and states. Therefore the sales of marijuana, assuming the same tax rate as in Colorado, in a given county can be modeled by the product of M(t) and the ratio of the number of users in the given county to the number of users in marijuana.

According to Substance Abuse and Mental Health Services Administration, Colorado had 900,000 reported users of marijuana when the drug was first legalized [8].

We define u as the number of marijuana users in a given region, state or county. Thus the ratio of users in a specified county to those in Colorado is u/900000 . Therefore our model for sales in a given state or county is $P(t, u) = u * M(t)/900000$ for Colorado's 27.9% tax rate.

To find the u value for a given county or for the state of Illinois, we multiply the population of each county by the estimated percentage of marijuana users as shown to find the total number of users in a region, as shown in the following table[8]:

Region	Estimated % of usrs	population in millions	u
Cook County	8.31	5.238	435277
DuPage County	6.08	.99378	60422
Lake County	6.08	.70390	42797
Champaign County	7.09	.208860	14808
Illinois	7.26	12.8	929280

P(t,u) only accounts for the Colorado tax rate of 27.9% however. Under this model, if we define H as the cost of 1 gram of marijuana before tax, one gram of marijuana with tax has a cost of

$$S = (1 + .279) * H = (1.279 * H)$$

per gram. In order to create a model of marijuana sales with varying tax rates, we analyzed the effect of increased cost on marijuana demand. In doing so, we hope to be able to predict the projected revenue for each tax rate and then find the rate which will maximize profit. According to a study by Adam J. Davis of ADM Energy, Karl R. Geisler of the Department of Economics, Applied Statistics, and International Business at New Mexico State University, and Mark W. Nichols of the Department of Economics at University of Nevada, the price elasticity of marijuana was found to be between -.67 and -.79 [18]. For the purpose of our model we will use the mean projection of -.73 to minimize uncertainty error. Using a price elasticity value of -.73, every 1% increase in price from our base model translates to a -.73% decrease in sales. Applying the price elasticity to our model for 27.9% tax rate, we arrive at the equation

$$(1 - .73g)P(t, u)$$

where g is the % difference from the standard cost of $1.279(H)$ per gram. For example if g=.01, a one percent increase from the cost under the P(t,u) model. Then our adjusted sales estimate is

$$(1 - .73(.01))P(t, u) = (1 - .0073)P(t, u)$$

which is a .73% sales decrease as desired.

For a given tax rate T the cost of 1 gram of marijuana is

$$H + T * H = (1 + T)H.$$

In order to find the percent increase of our new cost N from our standard we use the formula percent difference formula $g = (N - S)/S$.

g= $(N - S)/N$= $((1 + T) * H - (1.279 * H))/(1.279 * H)$= $(1 + T - 1.279)/(1.279)$= $(T - .279)/1.279$

Now our model for the total of marijuana becomes:

$$F(T, t, u)$$

$$= (1 - .73) * P(t, u)$$

$$= (1 - .73(T - .279)/1.279)) * P(t, u)$$

$$= (1482.68 - 730T)/1279 * P(t, u)$$

$$= (1.15924 - .570758T) * P(t, u)$$

F(T,t,u) models the total monthly sales before tax of marijuana after a given number of months (t), a given tax rate (T), and a population of users (u). In order to find the total tax revenue from sales of marijuana we must take the product of the tax rate (T) and the total sales F(T,t,u). We define R(T,t,u) as the total tax revenue from marijuana sales in a given month which is found by multiplying the tax rate by the total sales as shown below:

$R(T, t, u)$
$= T * F(T, t, u)$
$= T * (1.15924 - .570758T) * P(t, u)$

$$= (1.15924T - .570758T^2) * P(t, u)$$

In order to find the maximum revenue, we must first find the tax rate which maximizes revenue under our model. To do so we set the derivative of revenue with respect to tax equal to zero:

$\frac{d(R(T,t,u))}{d(T)}$
$= \frac{d((1.15924T - .570758T^2) * P(t,u))}{d(T)}$
$= ((1.15924 - 1.141516T) * P(t, u)) = 0$
$T = \frac{1.15924}{1.141516} = 1.0155267 = 101.55267\%$

Because marijuana sales or excise tax rates are usually to the nearest .1% we will round the optimal tax rate to 101.6%. We also recognize that 101.6% is far greater than any existing marijuana tax in the United States, so we will also use Washington's 35% rate as a reference for a more likely tax that would be passed in Illinois [14]. We would also note that our model is less accurate for higher tax rates because 0f error due to people using illegal methods of obtaining marijuana to avoid high tax prices.

Using
$R(T, t, u)$
$= (1.15924T - .570758T^2) * P(t, u)$
$= (1.15924T - .570758T^2) * u * M(t)/900000$
$= (1.15924T - .570758T^2) * u * (1.92 * (10^6)t + 1.28 * (10^7))/900000$
$= ((1.9210^6 t + 1.2810^7)(1.15924T - 0.570758T^2)u)/900000$

we can find the revenue for a given month. To find the total revenue for a length of time by taking the summation of the revenues for each individual month. Using this process the total revenue for the first two years becomes:

$$\sum_{n=1}^{12*2} R(T,t,u)$$

Similarly the revenue for the first five years is:

$$\sum_{n=1}^{12*5} R(T,t,u)$$

and the revenue for the first ten years is:

$$\sum_{n=1}^{12*10} R(T,t,u).$$

At the tax rate of 35%

Time	Cook County	DuPage County	Lake County	Champaign
2 years	\$150,603,242	\$18,688,972	\$14,105,624	\$4,859,838
5 years	\$730,098,328	\$90,600,889	\$68,381,616	\$23,559,650
10 years	\$2,638,830,730	\$327,463,303	\$24,715,5080.4	\$85,152,815

At a tax rate of 101.6%

Time	Cook County	DuPage County	Lake County	Champaign
2 years	\$263,977,781	\$32,792,740	\$24,724,378	\$8,518,338
5 years	\$1,279,718,374	\$158,973,505	\$119,859,487	\$41,295,419
10 years	\$4,625,349,820	\$574,585,853	\$433,214,110	\$149,256,091

Finally using the u value calculated earlier for all of Illinois we can project the total tax revenues for the first 2, 5 , and 10 years.

Tax rate	35%	101.6%
2 years	\$306,241,972	\$536,781,778
5 years	\$1,484,607,822	\$2,602,224,707
10 years	\$5,365,891,950	\$9,405,350,286

We chose to include the total revenue over each time period rather than the average yearly (which can be found by dividing revenue by the length of time), because of the significant sales growth present from year to year shown in our model.

2.4 Overview of model created

The final model we created was $= R(T, t, u) = (1.9210^6 t + 1.2810^7)(1.15924 - 0.570758T)(T)(u/900000)$

The first factor was

$$M(t) = (1.9210^6 t + 1.2810^7)$$

which modeled the growth of marijuana sales over time. $M(t)$ was based off of Colorado, so it apples for a 27.9% tax rate as seen in Colorado and a marijuana user population of 900,000.

Next in order to account for the effect of different tax rate on price we multiplied by $(1.15924 - 0.570758T)$ to account for the $-.73$ price electricity of marijuana.

Then we multiplied by the tax rate T to calculate the tax revenue rather than total sales before tax.

Finally we multiplied by $u/900000$ to adjust for differing populations of marijuana users.

Note:Medical Marijuana was not included in our model. Medical marijuana is already legal in Illinois.

3 Part 2: Smoke Signals

3.1 Restatement of Problem

Since it is unrealistic to assume that the economic profit results entirely from the sales of marijuana, we are tasked with the following:

- Build a new mathematical model that calculates the true cost/benefit of marijuana use in Illinois
- Calculate an time varying impact index to advise Illinois lawmakers in both the short and long term with regards to legalizing marijuana.

3.2 Assumptions

- The cost of homelessness will stay constant in Il in the near future

  Justification: Due to the fact that the cost of homelessness in Il has had insignificant changes in the past couple of years, and for simplicity, it is necessary that we assume that the cost per person is constant.

- The growth of homelessness follows a linear trajectory

  Justification: Due to the apparent linear growth of the past years as well as for the sake of simplicity, we assumed that the growth of cost of homelessness would be linear.

- Percentage health insurance premium will not be affected by the legalization of marijuana.

  Justification: Most life insurance companies evaluate marijuana usage on an individual basis, so premiums cannot be generalized [3]

- Percentage crime rate increase by state is not included in the model.

  Justification: The data indicates that there is no relationship between crime rate and the legalization of marijuana.

- The banning of recreational marijuana sales in certain cities and counties within will not affect the overall gross revenue.

  Justification: We assume that the percentage amount of cities in a state that ban marijuana sales is constant across all states, therefore all data and calculations should already take these cities into account.

- Human Migration is not included in the model.

  Justification: Human Migration has a strong positive correlation with homelessness due to the large amount of people seeking job opportunities in states that have legalized weed, and eventually not being able to find a job. Thus, by analyzing the percent changes in homelessness, migration is analyzed in our model as well.

- Car crash fatality rates will not be included in the model.

  Justification: The data we found has both positive and negative effects and most is inconclusive, therefore, we did not include it in the model [4].

3.3 Developing the Model

Our model consists of three indexes: Governmental (GI), Societal (SI), and Productivity (PI). Governmental index refers to money saved by state governments with the legalization of marijuana, while societal index refers to the money gained/lost from social factors by the legalization of marijuana, and productivity index refers to the money gained/lost in relation to the creation/loss of jobs and workforce outputs as a result of the legalization of marijuana. The societal and governmental indices are represented monetarily while the productivity index is represented by a ambiguous value. Then, we utilized a formula to properly add each index along with the monetary value from part one wherein the sum of each index allows us to come up with our final impact value (IV).

We first established a relationship between the governmental index (GI) and the total state expenditures saved from the legalization of marijuana, denoted as E_{state}. To calculate the total state expenditures, we considered three factors: the reduction in police resources, the reduction in prosecution and judicial resources and the reduction in penal resources. We may represent this as

$$E_{state} = P_{arrests} * Bu_{police} + P_{convictions} * Bu_{judges} + P_{incarcerations} * Bu_{prisons}$$

where $P_{arrests}$ represents the percentage of state arrests for drug violations, Bu_{police} represents the state budget for police, $P_{convictions}$ represents the percentage of state convictions for drug violations, Bu_{judges} represents state budget for prosecutors and judges, $P_{incarcerations}$ represents the percentage of state incarcerations for drug violations, and $Bu_{prisons}$ represents the state budget for prisons. (Data was gathered thanks to Jeffrey Miron and the dpt. of Economics at Harvard University). The expenditures saved for each state are as follows:

State	Expenditures Saved (In 1000s)
Alaska	34,443
California	1,867,180
Colorado	145,243
D.C.	22,800
Illinois	235,025
Maine	28,988
Massachusetts	197,228
Nevada	103,775
New Hampshire	31,701
Oregon	126,294
Washington	198,843

Thus, the total governmental expenditures saved by Illinois will be $235,025,000.

Next, we establish the model for the societal index (SI). We aggregated data points from the Annual Homeless Assessment Report to evaluate the effects of legalizing marijuana on the the growth of the homeless population, and to determine the costs of services for the homeless. From the AHA Reports, we created the chart below holding the percent increase of homeless people from 2014-2017 in Oregon, Washington, and

Colorado.

State	Homeless per 10,000 in 2014	Homeless per 10,000 in 2017	Percent change
Colorado	19	20	5
Washington	26.5	29	9.4
Oregon	31	34	9.67

We average the percent changes in Colorado, Washington, and Oregon to obtain the general percent change, $\bar{m} = 8.02$, for Illinois. Then, we determine the number of homeless T years from 2017 using $(1 + \bar{m}) * 11590 * T/4$, where the population of homeless in 2017 is 11590 and the homeless population is measured every four years. Finally, we multiply the population of homeless by the average cost of $18,500$, [12], per person to model the yearly monetary loss due to caring for the homeless in Illinois.

$$SI = -18500[11590(1 + \bar{m})]^{\frac{T}{4}}$$

Finally, to model our productivity index (PI) we accounted for the factors of an increase in number of jobs due to the new marijuana industry (J) and the percent increase in per capita GDP of industry in each state as a reflection of the average productivity per person as delineated by the United States Department of Labor (GP). We created a GDP model comparing various states in each geographical region of the United States with legalized marijuana with their neighboring non-legalized marijuana states, in terms of GDP per capita increase between 2014-2016. In particular, we looked at the states of Washington, Colorado and Oregon due to them being the earliest adapters of legalized recreational marijuana. This resulted in the chart below.

State	2014	2016	Percent Increase
Utah	43069	44204	2.63531 percent
Kansas	46003	46890	1.92814 percent
New Mexico	40842	41348	1.23892 percent
Colorado	52019	52795	1.49176 percent
Washington	55001	56831	3.32721 percent
Oregon	48342	50582	4.63365 percent
Idaho	35099	35466	1.04561 percent
Montana	39214	39356	0.36212 percent

From this table, we averaged the average GDP per capita increase of the states near Colorado and took the difference of that and the average GDP increase of Colorado.

$$Difference_{Colorado} = 1.49 - (2.635 + 1.928 + 1.238)/3$$

Resulting in a difference of -.44

Then we averaged the average GDP per capita increase of the states near Oregon and Washington, and found the difference between the average and each of Washington and Oregon respectively.

$$Difference_{Washington} = 3.327 - (1.045 + 0.362)/2$$

$$Difference_{Oregon} = 4.633 - (1.045 + 0.362)/2$$

Resulting in differences of 2.635 and 3.929 respectively.

Then by averaging all 3, we came up with a GP of 2.0413

$$GP = (3.929 + 2.635 + -.44)/3$$

We estimated the increase in the number of jobs due to the marijuana industry by finding the ratio R of cannabis jobs per person [some source] in the states of Alaska, Colorado, Oregon and Washington which have already legalized marijuana and averaging them to create the constant k [7].

State	Jobs	Population	R
Colorado	23,407	5,268,367	0.004442933
Washington	22952	6,971,406	0.003292306
Oregon	11295	3,930,065	0.002873998
Alaska	154	735,132	0.0002094862

$$k = (R_{colorado} + R_{washington} + R_{oregon} + R_{alaska})/4.$$

Thus, we obtain $J_{Illinois}$ with the equation

$$J_{Illinois} = k * 12830632$$

where 12830632 is the population of Illinois and $J_{Illinois}$ represents the amount of new jobs created in the state of Illinois following a legalization of marijuana.

Finally, we assigned values of 12830632 for A and 182143 for B to weight the categories of GP and J to determine the productivity index. A is 12830632 because the GP is per capita and we want a monetary number per population of Illinois while B is 182143, as that is the average annual salary of a worker in IL.

$$PI = A * GP + B * J$$

$$PI = 12,830,632 * 2.0413 + 182,143 * 34,514 = 6312747542.87$$

3.4 Putting It All Together

To calculate IV (the net profit/loss), we added together the monetary value from revenue for the entire state from part 1 to the governmental index of Il, the societal index of Il, and the scaled productivity index PI multiplying and summed each accordingly to find the total monetary value over a time period rather than as a yearly rate.

$$IV(T) = Value_{Part1} + GI + SI + PI$$

$$IV(T) = Model_{Part1} + 235,025,000 * T + \sum_{T=1}^{T} -18500(11590(1.0802)^{\frac{T}{4}}) + 6,312,747,542.87 * T$$

Below is the data for the next 2 years, 5 years and 10 years increments for Illinois:

Time	IV
2 years	\$13165431778
5 years	\$34201349707
10 years	\$72497900286

3.5 Justification and Discussion

Firstly, this model heavily relies on averages from the small sample size of states that have legalized marijuana which may affect the overall accuracy of the monetary result of IV over time.

Moreover, it seems quite obvious from our predictions that legalizing marijuana would be overall, more beneficial than harmful to society since in the coming 2 years, 5 years and 10 years, the model predicts an extremely large positive number.

However, testing this model for accuracy is incredibly difficult as the net monetary gains including outside factors cannot be determined until marijuana is legalized.

Additionally, the variability and seemingly no correlation of many factors which one would assume would be in the argument against legalizing marijuana might have some correlation with the small data set due to the recentness of this issue. Given more years of data, there might be some correlation between legalizing marijuana and issues such as health care, car crash rates, and violent crime rates.

4 Part 3: Second Hand Smoke

4.1 Restatement of Problem

The problem asks us to do the following:

Suppose that recreational marijuana is legalized in Illinois. Provide strategies on how revenues from part 1 can be spent to offset long-term negative externalities found in part 2? Alternatively, suppose that marijuana is not legalized. What revenue streams might you suggest to offset the perceived loss in revenue found from part 1 that would help to balance the budget?

4.2 Assumptions

- The police force will not experience a significant increase or reduction of numbers.

  Justification: Officers that would be searching for illegal possession of marijuana would instead be enforcing state regulations of the production and sale of legalized marijuana.

- Regarding highway tolls, an average amount per person can represent a population of toll users, even if some pay more tolls than others.

  Justification: Tolls are generally not terribly expensive, plus they are lower in Illinois than most other states. Hence, it can be assumed that even if some users of tolls pay more than others, the average usage balances out in the population without repercussions [15].

- The number of toll users will not decrease.

  Justification: The population of Illinois is staying relatively steady, and usage of tollways is increasing because the toll system is expanding. Hence, it's highly unlikely that the number of toll users will decrease.

4.3 If Recreational Marijuana IS Legalized

Evidently, an increase of homelessness from drug abuse and migrations will be the greatest long term negative externality. To offset an increase in homelessness, some potential revenue from legalization could be allocated to fund the effort to provide housing and other assistance. We can use the SI model from Part 2: Smoke Signals to determine the cost of homeless services

$$SI = -18500[11590(1+\bar{m})]^{\frac{T}{4}}$$

4.4 If Recreational Marijuana is NOT Legalized

If marijuana is not legalized, then the state would still be in debt which would need to be alleviated. Recently, marijuana possession has been decriminalized in Illinois. Possession of marijuana results in a fine, not jail time. Since marijuana would be decriminalized but we'd still be advocating for lesser enforcement, less money would need to go in to the prison/corrections system. Since fewer people will be arrested for marijuana, prisons will not be overcrowded.

A logarithmic regression is the best approach to budgeting prisons because it allows the percentage of budget to "level out," instead of hitting zero; a portion of the state's budget always must be incorporated into the prison system. Using past Illinois budgets from 2012, 2013, and 2014, [2, 6, 13] the following exponential regression can model the percent of the Illinois budget used for corrections:

$P = 4.891879054 * (0.7522189398)^t$, where P represents the percentage of budget for corrections, and t represents the number of years since 2018.

Note that after about five and a half years, the percentage of budget into corrections would still reach one percent and continue to decrease. However, the budget would never reach zero, and due to inflation (as noted in the assumptions), the amount of money being used in prisons won't dramatically fall. Hence, the model above can be used for an extensive period of time.

Besides money invested into the prison system, revenue can be obtained from highway tolls in place of marijuana taxes. Illinois has one of the lowest toll rates (only two states have lower toll rates). Currently, the toll system makes about $800,000 per day, from 1,200,000 users [15], totaling about $292000000 per year. By this logic, each user pays $800,000/1,200,000$ dollars per day, equating to 2/3 of a dollar. In a full year, then, a normal user of the tollways pays $243.

If the government imposed a tax, however, on tolls as well, then the state could receive a portion of the toll's revenue. Assuming that the amount paid per person, per day, remains the same at 2/3 of a dollar, then the state would obtain $(2/3) * tax$ from each purchase.

If each tollway user uses the tollway each day, on average, then the government would obtain $(2/3) * tax * 365$ dollars per customer per year. As stated above, there are an average of 1,200,000 customers per day using the tolls, so the total amount of revenue netted by the state, per year, would be $(2/3) * tax * 365 * 1,200,000$, or $292,000,000 * tax$.

To demonstrate sample results from taxes, a tax of 10 percent would lead to an average toll cost of a bit over 73 cents per toll (6 cent difference), yet the government would net $29,200,000 in revenue. A tax of 1 percent would lead to an average toll cost of 67 and a third cents, but the government would still gain a revenue of 2,920,000 dollars. Small taxes implemented into the toll system could offset the loss in revenue from lack of marijuana legalization.

5 Conclusion

5.1 Strengths

- Our models utilize information that has already been gathered for similar situations. Illinois is not the first state to consider legalizing recreational marijuana. Colorado, Oregon, and Washington have had it legalized for an extensive period of time, so we had sufficient data that could be easily accessed.
- Our revenue models can adjust to various tax rates, allowing governments to predict what will optimize revenue.
- Our indexes and models utilize various factors to make relatively accurate calculations. Some of these factors that could be influenced following legislation include: government funding, growth of jobs, probability of car crashes, homeless rates, and business revenue.
- The inclusion of a table adds strength to our argument. The table summarizes expenditures saved, so readers can see where the most and the least expenditures are saved.
- With sufficient population and marijuana usage data, our models can be applied to other states as well.

5.2 Weaknesses

- Our model on budget used for the prison system could be faulty because the linear and quadratic regressions more accurately fit the data presented. However, a exponential regression was used because linear and quadratic regressions demonstrated that, eventually, no money would be budgeted into the incarceration system.
- The model of the budget for the prison system is that some of the data is outdated. The model was constructed based on data between 2012 and 2014. Budgeting between 2014 and 2018 was not taken into account. However, the timing isn't a large issue because it still shows a decrease in the percent budget for prisons.
- Since three different indexes were used to calculate true costs and revenues of marijuana legalization, it was sometimes difficult to identify which index a factor should be incorporated with.

6 References

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