THE IMPLICATIONS

OF CANNABIS LEGALIZATION

by

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OF CANNABIS LEGALIZATION

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ABSTRACT

The United States has reached a turning point with regard to its drug policy. Not only are the majority of Americans in favor of marijuana policy reform, but four states and the District of Columbia have legalized the controversial substance. Political reform and a paradigm shift in public sentiment provide unprecedented opportunities to evaluate economic estimates of legalization's impact on the cannabis markets. This study seeks to examine the fiscal, economic, and social impact of cannabis legalization by examining variables such as– tax revenue, commodity price and consumption, criminal activity, the job market, the real estate market, and the stock market.

Marijuana taxation in Colorado has been moderately successful, but has been hampered by high effective tax rates and the relative strength of the untaxed homegrown and black market segments that satisfy a significant portion of the state's marijuana demand. In contrast to previous literature, marijuana was found to be an economic substitute for beer and yet an economic complement for wine. Again, in contrast to previous literature, marijuana legalization was found to be positively correlated with criminal activity, with the exception of crimes against property. There is not yet enough data to reach a conclusion about legalization's impact on the job market, but early signals are positive. The Colorado real estate market was shown to relatively outperform other regions since legalization was passed. Finally, although marijuana legalization has been a positive catalyst for publicly-traded companies whose operations relate to the marijuana industry, many of these investments remain unsuitable for the average investor,

especially on a risk-adjusted basis. A discussion of these findings is presented below, along with considerations for future research.

INTRODUCTION

Cannabis is a genus of flowering plants that includes three different species, *Cannabis sativa*, *Cannabis indica*, and *Cannabis ruderalis* (Guy 2004). Two varieties with very different properties are common: the agricultural variety, known as hemp, and the pharmacological variety, marijuana. Cannabis was used medicinally in Ancient China, the Middle East and Africa. The plant also has religious significance in disparate parts of the world, such as India and Jamaica. In the seventeenth century, England mandated that early colonists cultivate hemp for exportation. According to Gieringer (2006), pharmacological varieties of *Cannabis indica* first became available in American pharmacies in the 1850's following its introduction to western medicine as a treatment for muscle spasms, stomach cramps or general pain by William O'Shaughnessy.

Although marijuana prohibition in the United States is commonly thought to have begun with the Marihuana Tax Act of 1937, cannabis had already been outlawed in many states before World War I during the first, Progressive Era wave of anti-narcotics legislation (Gierenger 2006). In California, cannabis was classified as a poison under The Poison Act as early as 1907. The Marihuana Tax Act of 1937 consisted of an excise tax on all sales of hemp that legally prohibited the possession or transfer of cannabis under federal law, except for medical and industrial uses. Historians maintain that prominent industrialists, such as William Randolph Hearst, facilitated the passage of the Marihuana Tax Act of 1937 by publicizing anti-marijuana campaigns in order to thwart the hemp

industry. The 1969 U.S. Supreme Court case *Leary v. United States* unanimously found the Marihuana Tax Act of 1937 unconstitutional in violation of the Fifth Amendment. However, the law was quickly repealed and superseded by the Controlled Substance Act of 1970.

In the United States, the Controlled Substances Act regulates the manufacture, importation, possession, use and distribution of certain substances at the federal level. The Drug Enforcement Administration and the Food and Drug Administration classify drugs into one of five schedules "depending upon the drug's acceptable medical use and the drug's abuse or dependency potential." Schedule I substances are defined as drugs with no currently accepted medical use and a high potential for abuse. Although several studies have concluded that cannabis exhibits significant medical benefits, cannabis is currently classified as a Schedule I substance (alongside heroin, PCP, crack, GHB, and Bath Salts).

According to an October 2013 Gallup poll, for the first time ever, more Americans approve of legalizing cannabis than not. With the passage of Amendment 64 and Initiative 502 in November 2012, Colorado and Washington state pioneered the nation's first cannabis legalization legislation. In November 2014, Alaska, Oregon, and the District of Columbia followed suit with Ballot Measure 2, Measure 91, and Initiative Measure 71, respectively. The four aforementioned states have legalized the commercial production, distribution, and possession of cannabis for nonmedical use by adults. The District of Columbia's legislation, however, is more analogous to full decriminalization. Excluding the four states and D.C. that have legalized, eighteen states have passed legislation authorizing medical marijuana and thirteen states have decriminalized the

substance. Additionally, ten states have authorized the medical application of Cannabidiol (or CBD), a non-pscyhoactive ingredient extracted from marijuana often used to treat debilitating epileptic conditions.

The legal status of cannabis in the United States is ambiguous given the disparities between federal and state legislation. However, recent statements from the U.S. Department of Justice have signaled the drug's implied approval on a federal level. In 2009, U.S. Attorney General Eric Holder issued new federal guidelines to federal prosecutors in states that have enacted medical marijuana laws, directing them to stop pursuing cases against medical cannabis patients and their caregivers. A 2013 follow-up letter from Deputy Attorney General James M. Cole stated:

> "In jurisdictions that have enacted laws legalizing marijuana in some form and that have also implemented strong and effective regulatory and enforcement systems to control the cultivation, distribution, sale, and possession of marijuana… enforcement of state law by state and local law enforcement and regulatory bodies should remain the primary means of addressing marijuana-related activity."

Legalization is expected to significantly influence cannabis price and consumption (Pacula 2010), criminal activity (TenEyck 2014), and tax revenue for state and local governments (Gettman 2007). Regarding cannabis consumption, there is disagreement over whether legalization will increase adolescent usage (Chu 2012) and recreational usage (Alford 2013) or be statistically insignificant to marijuana use (Choo 2014). Regarding criminal activity, studies have estimated legalization's impact on: enforcement costs (Caulkins 2010), drug cartel revenue (Kilmer 2010), and domestic

abuse (Smith 2014). However, there is disagreement whether cannabis legalization is positively associated (Pacula 2013) or uncorrelated (TenEyck 2014) with criminal activity.

Studying the effects of cannabis mandates on the cannabis markets has been difficult because cannabis purchase and sale are federally illegal. To date, research has mostly consisted of forward-looking estimates of legalization's impact on the cannabis. However, recent legalization efforts provide the perfect opportunity to evaluate previous economic estimates of legalization's impact on the cannabis markets. For example, previous studies could only conjecture regarding tax revenue associated with legalization, but now the state of Colorado publishes monthly tax revenue and usage data related to Amendment 64.

This study seeks to examine the fiscal, economic, and social impact of cannabis legalization by examining variables such as– tax revenue, commodity price and consumption, criminal activity, the job market, the real estate market, and the stock market.

My analysis leads to the following insights:

- The savings associated with reduced enforcement costs may do more to benefit state governments than the monetary benefits of marginal tax revenue associated with legalized marijuana.
- Marijuana legalization was negatively correlated with beer consumption and positively associated with wine consumption. This suggests that beer may be an economic substitute to marijuana while wine may be an economic complement to marijuana.

- Overall criminal activity increased following legalization in Colorado, yet income-producing crimes against property declined.
- The relative outperformance of Colorado's real estate market compared to nationwide composites for residential real estate prices may be attributable to the state's legalization of marijuana.
- Although the market capitalization of a portfolio of marijuana-related stocks grew to create nearly $5.5 billion in wealth, the majority of these stocks underperformed the S&P 500, and those that did outperform experienced significant volatility in doing so.

LITERATURE REVIEW

This study seeks to examine the fiscal, economic, and social impact of cannabis legalization by examining variables such as– tax revenue, commodity price and consumption, criminal activity, the job market, the real estate market, and the stock market. Although the commercial production, distribution, and possession of cannabis remain illegal on the federal level, four states and the District of Columbia have passed legislation legalizing cannabis. Political reform and a paradigm shift in public sentiment provide unprecedented opportunities to evaluate economic estimates of legalization's impact on the cannabis markets.

Scholars and professionals expect cannabis legalization to influence criminal activity, consumption, taxes, and jobs. However, they debate whether legalization will increase adolescent usage (Chu 2012) and recreational usage (Alford 2013) or be statistically insignificant to marijuana use (Choo 2014). Furthermore, there is disagreement whether cannabis legalization is positively associated (Pacula 2013) or uncorrelated (TenEyck 2014) with criminal activity. To examine these issues, this paper will proceed with a literature review of articles regarding the effect of cannabis legalization on various socioeconomic factors, followed by a discussion of the implications of the research findings.

Crime

Regarding criminal activity, studies have estimated legalization's impact on: enforcement costs (Caulkins 2010), drug cartel revenue (Kilmer 2010), and domestic

abuse (Smith 2014). However, there is debate whether cannabis legalization is positively associated (Pacula 2013) or uncorrelated (TenEyck 2014) with criminal activity. Caulkins (2010) builds upon the work of Gieringer (2009) and Miron (2005), downward revising previous estimates of $1 billion in enforcement savings to an estimated $300 million, associating one-fifth of these costs with enforcement for individuals under 21 year old. According to Kilmer (2010), Mexican Drug Trafficking Organizations (DTOs) generate gross revenue of $1.5 billion, of which 15-26% is attributable to export revenue to the United States. By Kilmer's estimate, domestically exporting California-produced marijuana throughout the United States could cut Mexican DTO revenues anywhere from 65-80%. However, he concludes that legalization's impact on violence is uncertain.

According to Pacula (2003), Marijuana is positively associated with property and income-producing crimes, yet the study also determines that no casual association exists between marijuana use and violent crime. In direct contrast, TenEyck (2014) study concluded that medical marijuana laws did not increase crime and may be correlated with a reduction in homicide and assault rates (net of other covarities) by analyzing crime data published by the FBI in addition to state crime data. A recent study from the University of Buffalo found that couples that used marijuana frequently reported the least frequent Intimate Partner Violence.

Price and Consumption

Regarding price and consumption, the economic state of literature is theoretical and limited—with no evaluation of these economic estimates in domestic, post-legalization markets. Most, but not all, scholars agree that legalization is a positive

catalyst that serves to increase marijuana consumption and is expected to decrease production costs and prices of marijuana. However, the extent to which studies expect marijuana prices to decrease is a matter of contention. According to Chu (2012), medical marijuana laws increase arrests among adult males by 20%, increase treatment referrals by 10%, and affect the use of marijuana in juveniles. According to Alford (2013), the marijuana supply curve is upward-sloping, displaying relative elasticity of ~1.15. Furthermore, the study concludes that medical marijuana laws affect recreational usage and increases the supply of high-quality marijuana by 26%. According to Pacula (2010), medical marijuana laws will lead to a rise in total consumption due to new users, increase in usage of existing users, and increase in duration of marijuana consumption for average users. Kilmer (2010) estimates the pretax retail price of marijuana will decline (likely more than 80%) after legalization. The study concurs with Caulkins' 2010 estimate that annual enforcement costs for California will not exceed $300 million annually. The study acknowledges the limitation of estimating costs to end-users given the huge unknowns of taxation and federal response and criticizes previous estimates of legalization's impact on California's budget/consumption as being too affected by assumptions. According to Williams (2001), alcohol and marijuana are economic complements, rather than substitutes, finding that marijuana use rose 22% among college students between 1993 and 1999. Pacula (2013) found that components of medical marijuana laws including home cultivation and legal dispensaries are positively associated with marijuana usage. Interestingly, these same dimensions were also tied to binge drinking and fatal alcohol automobile accidents. According to Choo (2012), medical marijuana policy changes made no statistically significant difference in marijuana use among adolescents.

Taxation

According to Miron (2005), legalization would save $7.7 billion per year in government expenditure on enforcement of prohibition– $5.3 billion accruing to state/local governments and $2.4 billion accruing to the federal government. Tax revenue would yield between $2.4 billion and $6.2 billion annually depending on taxation rates. According to Gettman's 2007 case study on Hawaii, the price of high-quality marijuana decreased 12% between 1994 and 2003, indicating the failure of enforcement to meaningfully reduce supply. Gettman estimates that decriminalization would save the state ~$5 million annually and that legalization and taxation would save an additional $5 million per year and create tax revenues between $4 million and $23 million. According to Nixon (2013), which also focused on Hawaiian legalization, the state is experiencing a reversal of the long-run trend toward de facto decriminalization. He estimates that decriminalization would lead to $12 million in potential savings ($9 million for decriminalization, plus $3 million for legalization). According to Caputo (1994), estimated potential tax revenue from legalization ranges between 2.55 to 9.09 billion dollars.

Caulkins (2013) highlights the effects on various marijuana legislation components, such as government vs. private entity control of production and distribution and the tax impact on productivity and employment. The article also poses the question of whether tax rates will be set high enough to offset the anticipated sharp decline in production costs post-legalization. In a separate 2013 article, Caulkins' examines Washington state's ability to generate tax revenue. He cites insufficient I-502 market penetration and competition from the black market as potential threats to marijuana tax

revenue, but cites drug tourism, cross-state exportation, and prestige-brand edibles as potential boons for the state's revenue. According to Caulkins (2010), California should expect some degree of tax evasion, similar to cigarettes, given that $50 per ounce tax is either very high or truly unprecedented depending on the metric employed.

Other

Philander (2013) provides several important implications for legal marijuana taxation through the lens of gambling taxation. The study found fixed licensing-based taxes to be preferable to taxes on gross gaming revenue. Sin-based taxes are noted to increase economic welfare, but only when applied with a rate commensurate to harm that is external to the gambler and operator. The study also held that inter-jurisdictional competition is an important policy and enforcement consideration.

According to MacCoun (2010), despite country-wide legalization, Dutch citizens use cannabis at more modest rates than some of their neighbors. The Dutch system is ambiguous by design in ways that give officials leverage over prices and sales in ways that might be harder to achieve in a full-scale legalization regime.

According to a popular news story published by Lopez (2014), the Marijuana Industry Group estimates that there are now 10,000 people directly employed by the marijuana industry in the United States, with 1,000-2,000 new additions coming in recent months. Another popular news story published by Howland (2014) claims that a statistically significant 1% of U.S. electricity use is attributable to marijuana production.

RESEARCH QUESTION

This study seeks to examine the fiscal, economic, and social impact of cannabis legalization by examining variables such as– tax revenue, commodity price and consumption, criminal activity, the job market, the real estate market, and the stock market.

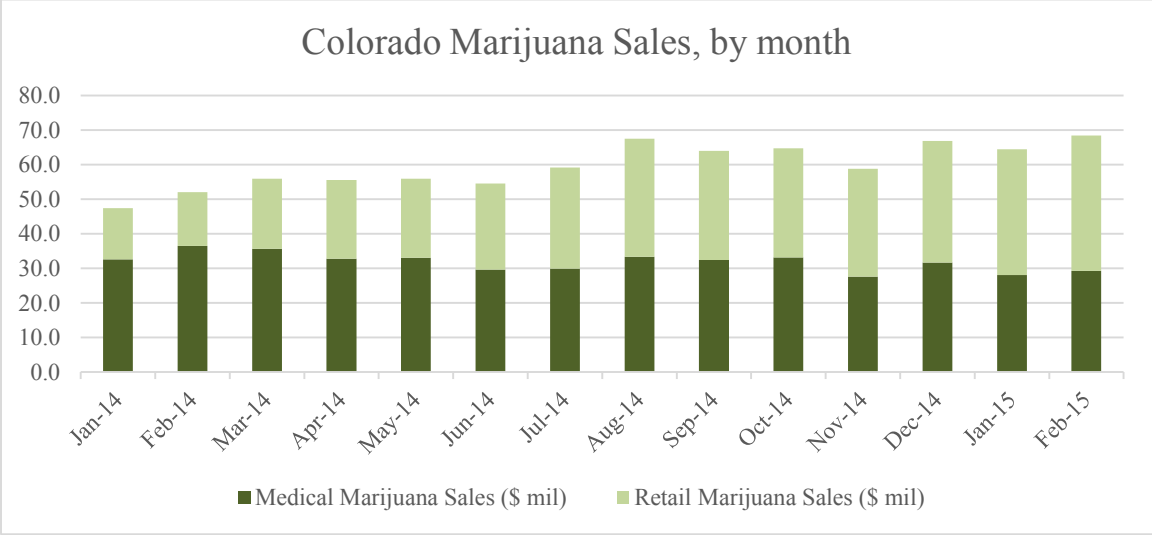
RESULTS & DISCUSSION

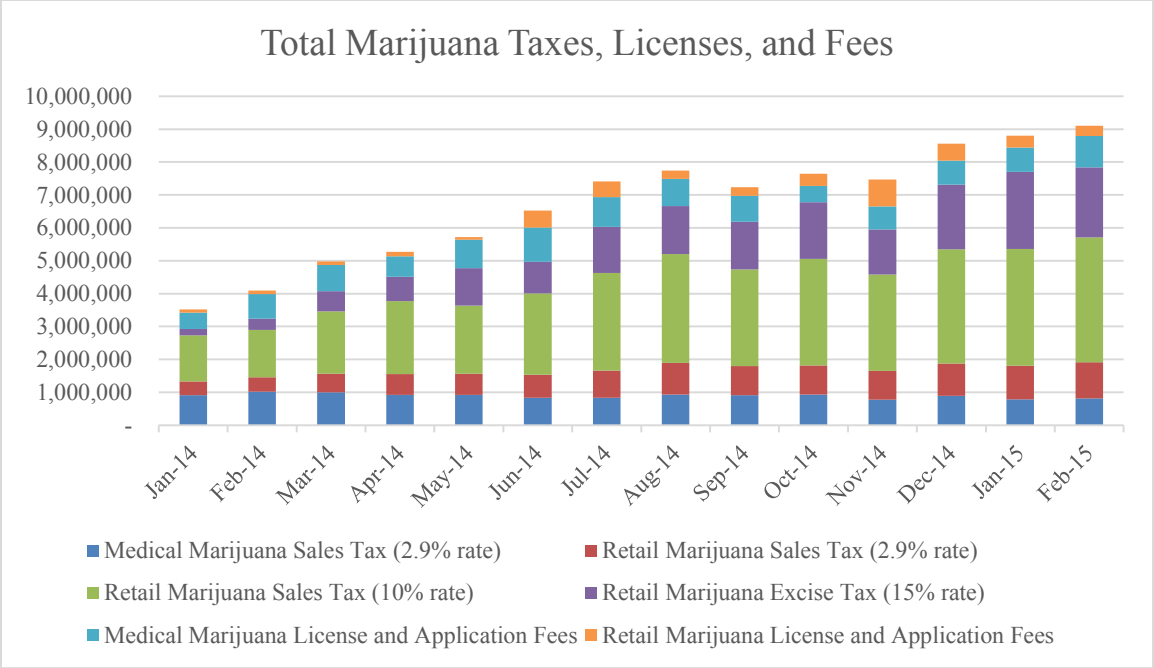
Marijuana Taxation

Methods

The Colorado Department of Revenue publishes marijuana tax reports based on actual revenue collected monthly as posted in the Colorado state accounting system. The Colorado Department of Revenue, first began publishing this data in January 2014. Total marijuana tax revenue includes: the 2.9% retail and medical marijuana sales tax, 10% retail marijuana special sales tax, 15% marijuana excise tax, and retail/medical marijuana application and license fees. The Colorado Department of Revenue does not publish retail and medical marijuana sales data. However, after some correspondence with the Colorado Department of Revenue, sales data was computed by dividing tax revenue figures by their appropriate tax rates.

Results





Discussion

In April 2015, the office of Colorado Governor John Hickenlooper downward revised its initial February 2014 estimates that legalization would bring in tax revenues of $118 million by the end of its 2015 fiscal year in June, to $69 million. According to Mullis (2014), state analysts estimated tax revenue from the Marijuana industry for the 2014-2015 fiscal year to be $30.6 million. With eight months of published tax data, marijuana-related revenues have reached $63.9 million for the current fiscal year through February 2015.

Implications

One of the criticisms levied against Colorado's taxation policy is that marijuana's high effective tax rate is keeping the black market alive. Recreational marijuana has an effective tax rate of 44% after taxes at the production, wholesale, and retail levels (Choksi 2014). Furthermore, retail marijuana sales taxes are incurred per sales dollar

rather than by weight. As market forces drive the price of marijuana down over time, sales tax revenues will be hurt as a result.

Another criticism is that much of the marijuana consumption in the state goes untaxed. Annual marijuana demand for the state of Colorado is approximately 130 metric tons (Light 2014). The taxable legal supply of marijuana is approximately 77 metric tons, while the home growing market and black market accounts for 46 metric tons and 7 metric tons, respectively. Because medical marijuana laws were passed in Colorado prior to the laws that legalized retail marijuana sales, many Colorado citizens with non-debilitating medical conditions have already been issued medical licenses, and will never be part of the retail marijuana tax base.

One of the biggest questions regarding the taxation of marijuana is simply: is it even worth it? Annual marijuana tax revenues of approximately $70 million seem like a drop in the bucket compared to Colorado's budget of $27 billion. As legalization becomes more widespread, more jurisdictions may adopt policies, similar to those of Washington D.C., that opt for full decriminalization. Under this alternative model, jurisdictions forego both the taxation and hassle associated with creating a commercial marijuana industry, instead only realizing the savings associated with reduced drug enforcement costs. These savings could amount to anywhere from $1.2 to $6.0 billion nationwide, annually (Edwards 2013).

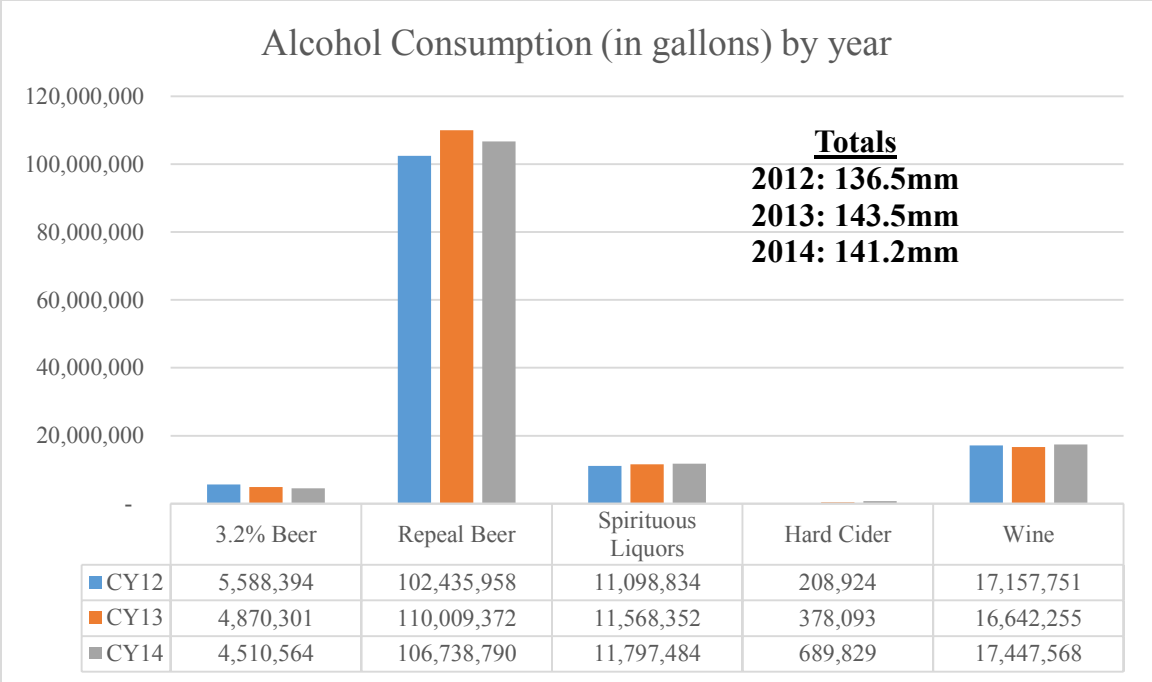
Impact on Alcohol Consumption

Methods

The Colorado Department of Revenue publishes monthly tax reports concerning the revenues generated from liquor excise taxes levied on manufacturers/wholesalers of alcoholic beverages that are sold in the state. Consumption data (in gallons) by liquor type is also published as a result of these tax reports. For this analysis, consumption and excise tax data was simply aggregated for calendar years 2010-2014.

Results

	Beer	Spirits	Wine	Totals
CY10	0.3%	4.7%	2.4%	2.2%
CY11	0.0%	3.5%	4.6%	3.3%
CY12	-2.1%	5.2%	9.0%	4.0%
CY13	6.3%	4.2%	-1.5%	3.9%
CY14	-3.2%	2.0%	4.6%	1.2%



	3.2% Beer	Repeal Beer	Spirituous Liquors	Hard Cider	Wine
CY12	5,588,394	102,435,958	11,098,834	208,924	17,157,751
CY13	4,870,301	110,009,372	11,568,352	378,093	16,642,255
CY14	4,510,564	106,738,790	11,797,484	689,829	17,447,568

Discussion and Implications

Since 2010, liquor excise tax revenues have grown year-over-year at an average of 2.9%. Until recently, liquor excise tax revenues were growing year-over-year at an increasing rate. However, this growth rate fell precipitously from 2013 to 2014. This decrease coincides with Colorado's legalization of retail marijuana sales, which became effective on January 1st, 2014. The implication here is, of course, that marijuana legalization cut into liquor excise taxes. This notion is further supported by the Colorado Department of Revenue's consumption data. Total alcohol consumption fell 1.6%, or approximately 2.3 million gallons, from 2013 to 2014. Interestingly, beer consumption fell 3.2% in 2014 while wine reversed a negative growth trend, with consumption increasing 4.8%. These findings are partially contradictory to Williams' 2001 study that concluded marijuana and alcohol were economic complements. Based on these results, it would be more accurate to conclude that wine serves as an economic complement for

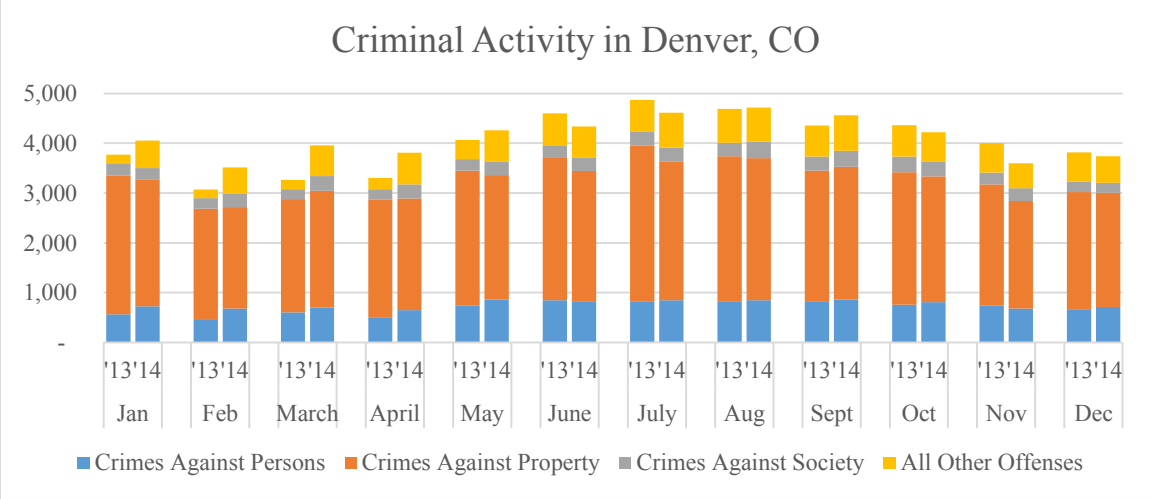
alcohol, while beer serves as an economic substitute. Going forward, as new marijuana legislation is enacted, states desiring consistent liquor tax revenue should consider levying additional taxes on alcohol to counteract the impact of decreased consumption.

Impact on Criminal Activity

Methods

According to the Denver Police Department, Uniform Crime Reporting (UCR) is the primary data standard used by the FBI to record crime for law enforcement agencies across the United States. The UCR tracks crimes against persons, crimes against property, crimes against society, and other offenses. Because data is published on a citywide basis, this analysis used criminal activity for the city and county of Denver as a proxy for criminal activity throughout the state of Colorado.

Results



	Crimes Against Persons	Crimes Against Property	Crimes Against Society	All Other Offenses	Total
2013	8,367	31,345	2,899	5,542	48,153
2014	9,205	29,573	3,293	7,294	49,365
Change %	*10.0%*	*-5.7%*	*13.6%*	*31.6%*	*2.5%*

Discussion and Implications

Total criminal activity increased from 2013 to 2014, mostly driven by a 31.6% increase in the catchall category "all other offenses". Interestingly, the results of this case study diverged from previous literature regarding legalization's impact on criminal activity. Pacula (2003) concluded that marijuana is positively associated with property and income-producing crimes. However, according to the findings from the UCR, crimes against property was the only category of criminal activity that decreased year-over-year. TenEyck (2014) concluded that medical marijuana laws did not increase crime and that medical marijuana laws may be correlated with a reduction in homicide and assault rates. In contrast, my findings demonstrated an increase in overall criminal activity and a 10% increase in crimes against persons, the category in which homicide and assault are the primary constituents.

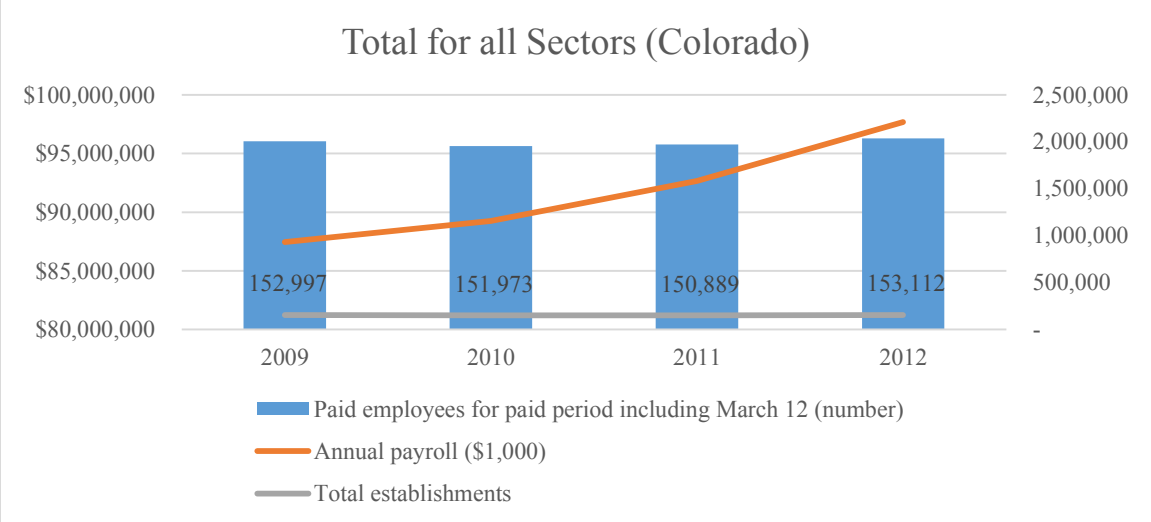
One limitation of these findings is that Denver may not be a very good proxy for every Colorado city. For example, I would surmise that legalization has had a negligible criminal impact in more rural Colorado towns, especially considering that Denver is the state's most populous city as well as the epicenter of marijuana tourism. Regardless, these findings may have important implications for governments in states considering legalization. Most notably, cost savings associated with a reduction in drug enforcement policies should be partially reallocated to combat potential increases in violent crime.

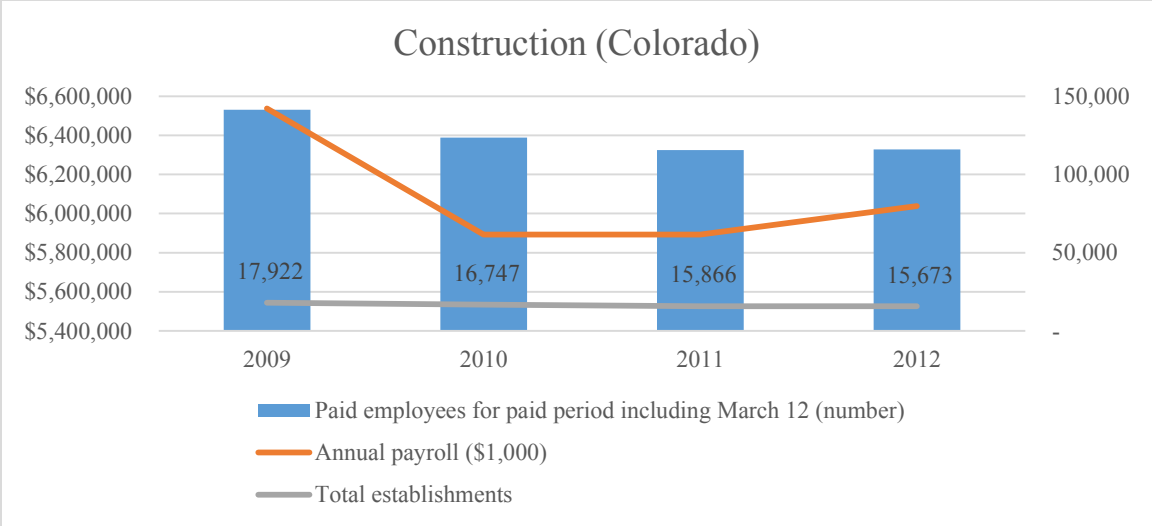
Impact on the Job Market

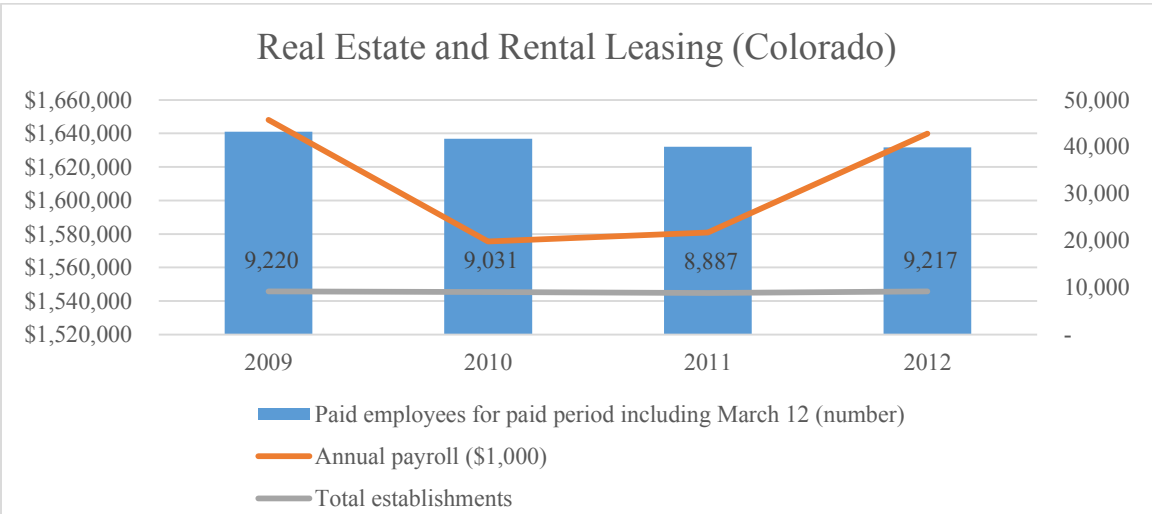
Methods

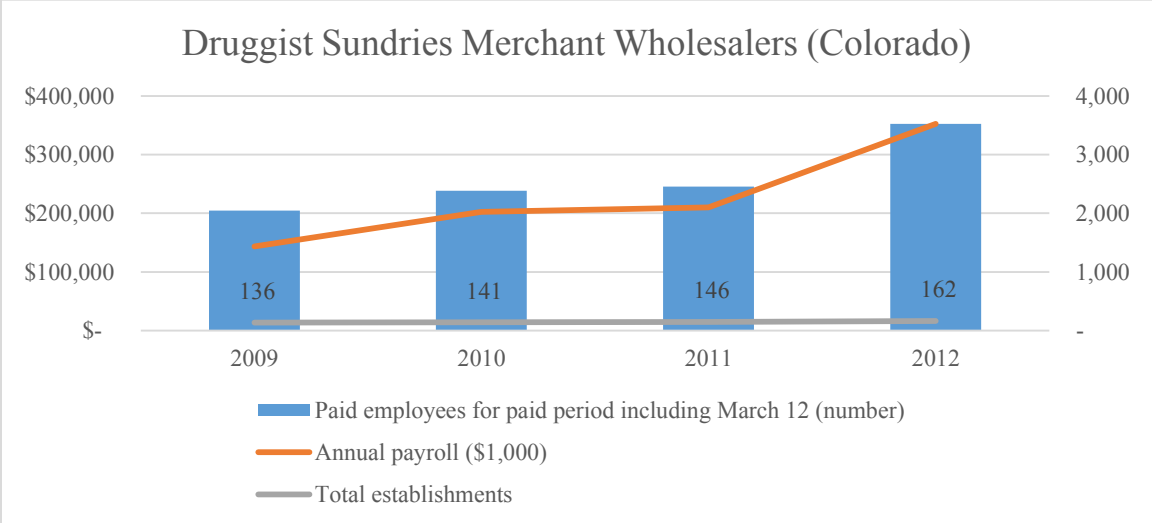
For this study, County Business Patterns (CBP), published by the United States Census Bureau, were used to analyze the effects of legalization on the Colorado job market. CBP provides data such as the number establishments, number of employees, and payroll amounts associated with various NAICS codes, which are used to classified business establishments by activity and industry for statistical analysis. Although published on a county-by-county basis, the CBP data can be aggregated at the statewide level. County Business Patterns are published two years in arrears, meaning data through December 2012 was only just made publicly available at the time of this study.

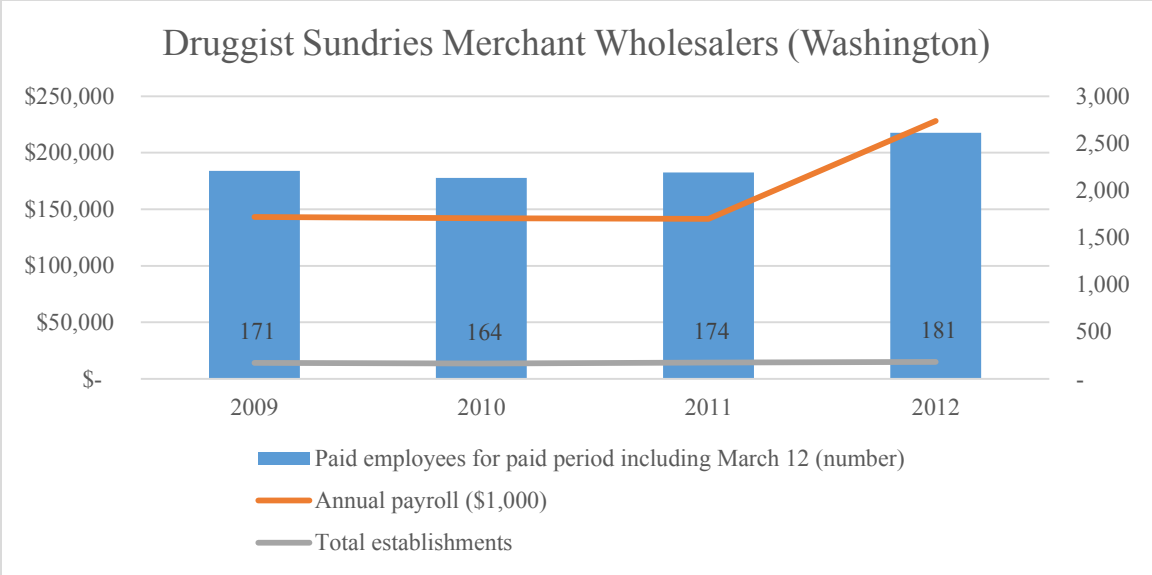
Results




Construction (Colorado)
$6,600,000
$6,400,000
$6,200,000
$6,000,000
$5,800,000
$5,600,000
$5,400,000
150,000
100,000
50,000
-
17,922
16,747
15,866
15,673
2009
2010
2011
2012
Paid employees for paid period including March 12 (number)
Annual payroll ($1,000)
Total establishments


Real Estate and Rental Leasing (Colorado)
$1,660,000
$1,640,000
$1,620,000
$1,600,000
$1,580,000
$1,560,000
$1,540,000
$1,520,000
50,000
40,000
30,000
20,000
10,000
-
9,220
9,031
8,887
9,217
2009
2010
2011
2012
Paid employees for paid period including March 12 (number)
Annual payroll ($1,000)
Total establishments


Druggist Sundries Merchant Wholesalers (Colorado)
$400,000
$300,000
$200,000
$100,000
$-
4,000
3,000
2,000
1,000
-
136
141
146
162
2009
2010
2011
2012
Paid employees for paid period including March 12 (number)
Annual payroll ($1,000)
Total establishments



Discussion

Job data for Colorado in 2012 was largely positive. Annual payroll and total establishments grew for the construction, real estate, and "all sector" industries, with paid employees remaining relatively flat or showing modest growth. However, these categories were too broad to draw any conclusions about the impact of legalization on the job market. However, there was one sub-industry, Druggist Sundries Merchant Wholesalers, that was likely to be specifically impacted by marijuana legalization. In Colorado, 16 new business were established and more than 1,000 jobs were created in the industry during 2012. During that same timeframe, 7 new businesses were established and just under 500 jobs were added to the Washington state job market.

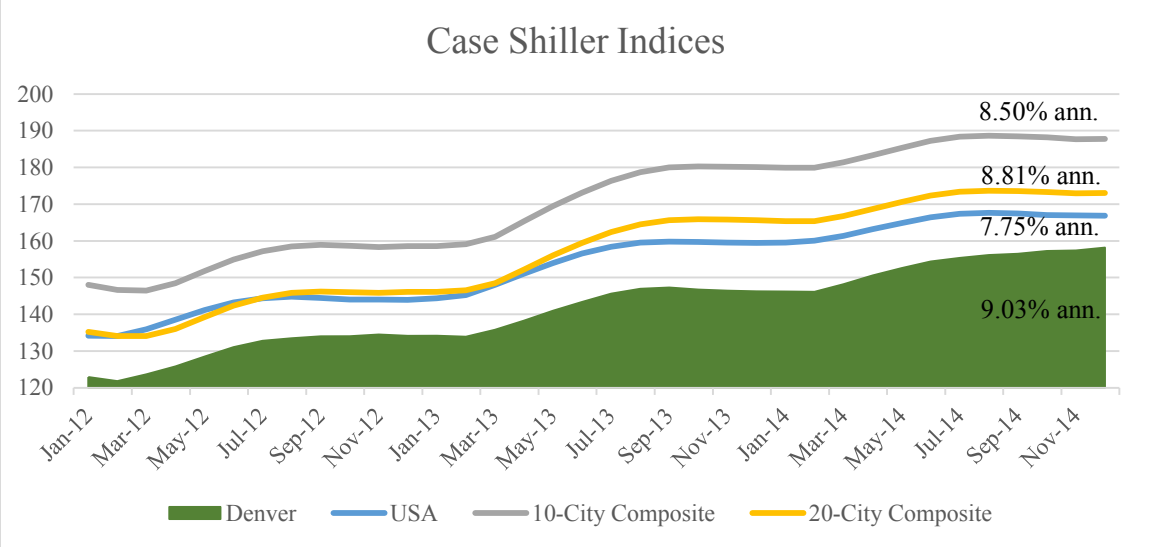
The effectiveness of this analysis is limited by the fact that marijuana was only legal for two months out of the four years that this time series covers. However, as more data becomes available, and as NAICS codes for marijuana-related sub-industries are developed, the impact of marijuana legalization on the job market will more easily determinable.

Impact on the Real Estate Market

Methods

For this study, Case-Shiller indices were analyzed to determine how the Colorado real estate market was impacted as a result of marijuana legalization. According to Standard & Poor's which maintains these indices, Case-Shiller Home Price Indices are the leading measures of U.S. residential real estate prices, tracking the changes in the value of residential real estate both nationally, as well as in 20 metropolitan regions.

Results



Discussion

From 2012 to 2014, the Case-Shiller index for the Denver metropolitan area relatively outperformed the National index as well as the 10- and 20-city composite indices, with a 9.03% annualized growth rate. The 20 cities comprising the larger composite index include: Atlanta, Boston, Charlotte, Chicago, Cleveland, Dallas, Denver,

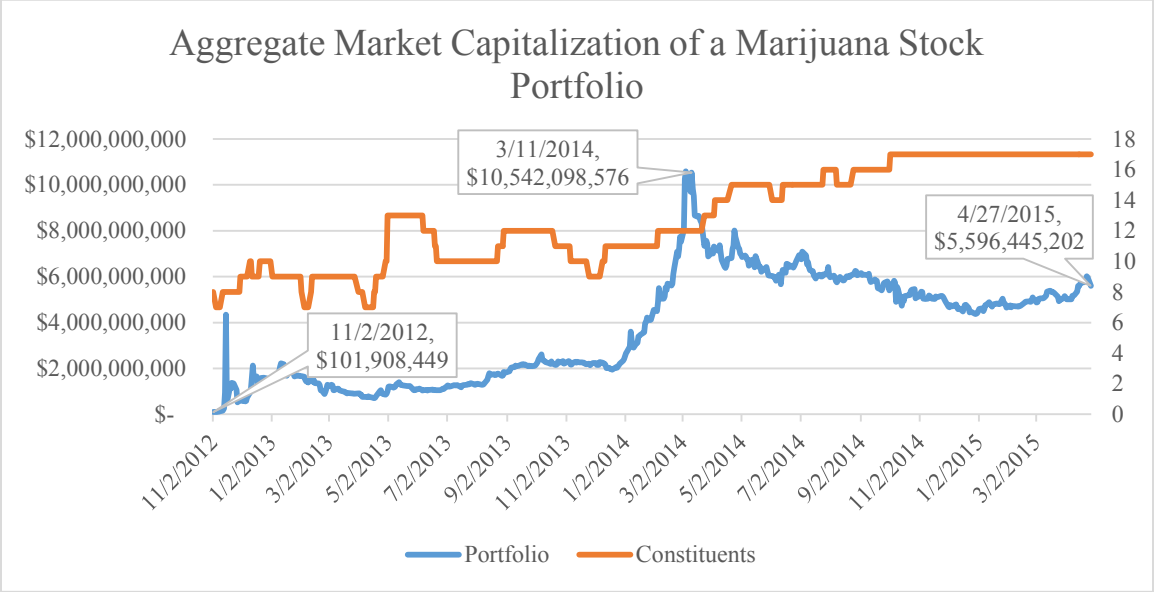
Detroit, Las Vegas, Los Angeles, Miami, Minneapolis, New York, Phoenix, Portland, San Diego, San Francisco, Seattle, Tampa and Washington, D.C. One limitation of this analysis is that it fails to measure the impact that legalization may have on commercial real estate.

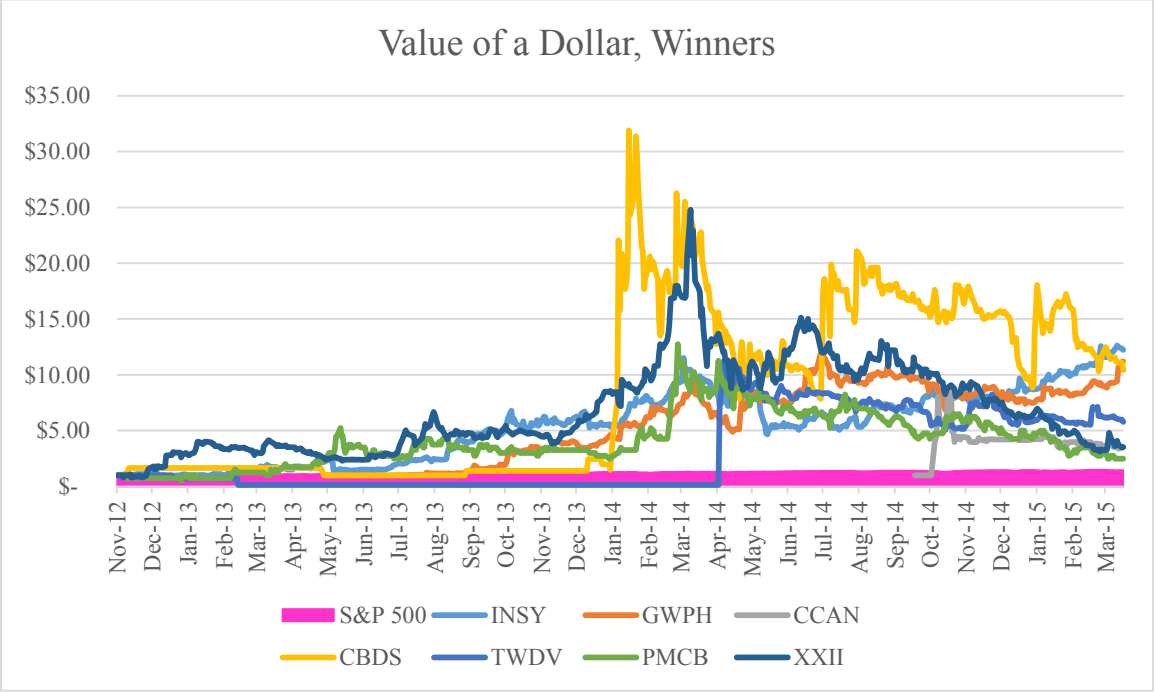
Impact on the Stock Market

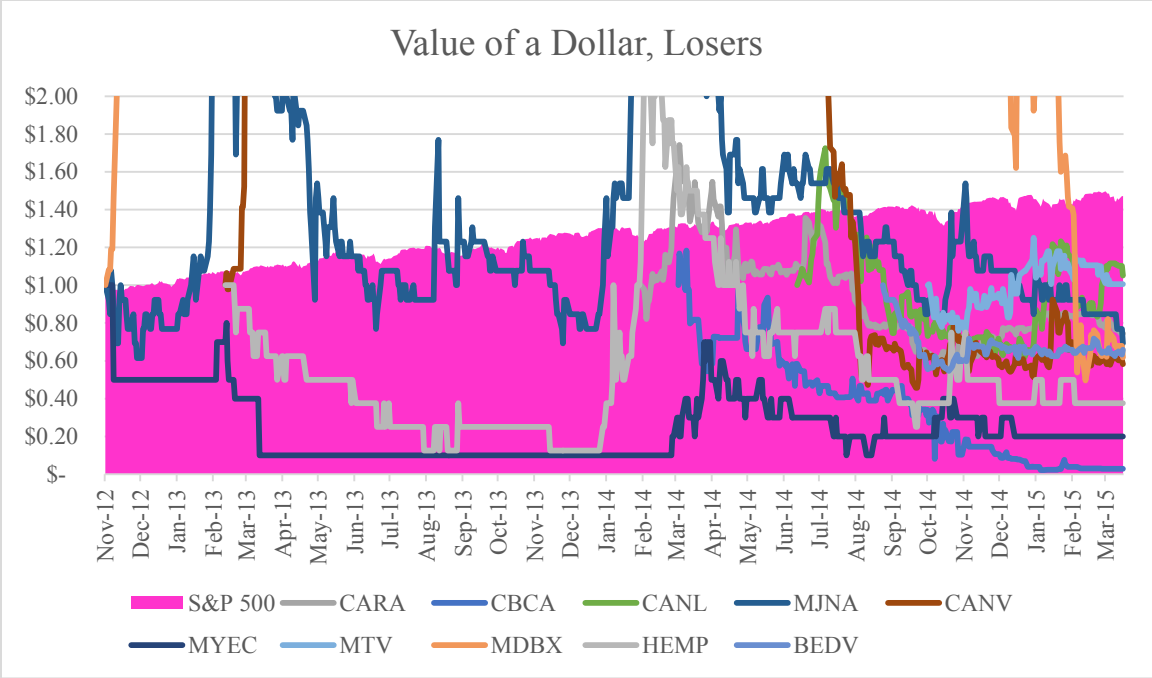
Methods

To determine the impact of marijuana legalization on the stock market, the performance of a portfolio of 17 marijuana-related, publicly-traded stocks was evaluated. Only stocks with market capitalizations in excess of $50 million were included in the analysis. The market capitalization of the combined portfolio was analyzed to determine the wealth creation attributable to these stocks. Additionally, these stocks were analyzed individually in comparison to the S&P 500 (a widely used proxy for the United States stock market) by charting the value of a dollar invested on November 2nd, 2012– the day Colorado and Washington state passed their legalization initiatives– or on the data of the stock's initial public offering (IPO) where applicable.

Results


Aggregate Market Capitalization of a Marijuana Stock Portfolio
$12,000,000,000
$10,000,000,000
$8,000,000,000
$6,000,000,000
$4,000,000,000
$2,000,000,000
$-
18
16
14
12
10
8
6
4
2
0
3/11/2014, $10,542,098,576
4/27/2015, $5,596,445,202
11/2/2012, $101,908,449
11/2/2012
1/2/2013
3/2/2013
5/2/2013
7/2/2013
9/2/2013
11/2/2013
1/2/2014
3/2/2014
5/2/2014
7/2/2014
9/2/2014
11/2/2014
1/2/2015
3/2/2015
Portfolio
Constituents


Value of a Dollar, Winners
$35.00
$30.00
$25.00
$20.00
$15.00
$10.00
$5.00
$-
Nov-12
Dec-12
Jan-13
Feb-13
Mar-13
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
May-14
Jun-14
Jul-14
Aug-14
Sep-14
Oct-14
Nov-14
Dec-14
Jan-15
Feb-15
Mar-15
S&P 500
INSY
GWPH
CCAN
CBDS
TWDV
PMCB
XXII



Discussion

From November 2012 to April 2015, these marijuana stocks created nearly $5.5 billion in wealth, peaking at an aggregate market capitalization of nearly $10.5 billion in March 2014. During that time, 8 stocks in the portfolio made their initial public offerings. On an individual basis, only 7 marijuana stocks outperformed the S&P 500.

Implications

Investors should be wary of investing in marijuana-related public stocks. Not only did several of these stocks underperform the S&P 500, but those that did outperform experienced significant volatility in doing so. On a risk-adjusted basis, none of these stocks would be suitable for any investor when compared to the safety of passive investment in the S&P 500. In fact, in May 2014, FINRA, the Financial Industry Regulatory Authority, issued an alert and suspended trading for several companies with operations relating to the marijuana industry.

ADDITIONAL RESEARCH

Currently, Colorado is the only state that has implemented a taxation model and begun publishing marijuana tax data. With time, more states will publish their own revenue data, allowing for a wider array of analyses. Additional research in this area should look to expand on the effectiveness of commercialization and taxation models (such as the one enacted by Colorado) versus full decriminalization models (such as the one enacted by Washington D.C.) Another interesting topic of discussion is the duality of marijuana legal status on the state and federal level. For example, many national financial institutions won't hold marijuana businesses as clients for fear of drug laundering charges. Additional research might seek to quantify the inefficiencies resulting from this dynamic.

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CONCLUSION

The findings of this study diverged from previous literature with regard to marijuana legalization's impact on both alcohol consumption and criminal activity. Beer was found to be an economic substitute for marijuana, while wine was found to be an economic complement. When Colorado legalized the recreational use of marijuana in 2014, overall alcohol consumption decreased as a result, which suggests that legalization policies may pose a minor threat to liquor excise tax revenue. In contrast to previous literature, Colorado observed an uptick in overall criminal activity, yet a decrease in income-producing crimes against property.

This analysis found that the relative outperformance of Colorado's real estate market compared to nationwide composites for residential real estate prices may be attributable to the state's legalization of marijuana. Additionally, a portfolio of seventeen micro- and small-cap publicly-traded stocks whose operations relate to the marijuana industry were analyzed to determine marijuana legalization's impact on the stock market. Although the aggregate market capitalization of the portfolio grew to create nearly $5.5 billion in wealth, the majority of these stocks underperformed the S&P 500, and those that did outperform experienced significant volatility in doing so. The implication being that in this stage of the marijuana industry's life cycle, these firms would not be suitable investments for the average investor.

This study suggests that additional research will be necessary to determine the efficacy of different legalization models. Time will tell if the simplicity of Washington D.C.'s full decriminalization model, and the enforcement cost savings therein, outweigh

the benefits of marginal tax revenue associated with Colorado's marijuana commercialization model. Additionally, data availability was prohibitive to finding any meaningful conclusions regarding impact of marijuana legalization on the job market, and will need to be revisited in the future.

REFERENCES

Alford, C. (2013). Medical Marijuana Laws and Marijuana Markets. Retrieved from http://people.virginia.edu/~cea9e/website_files/alford_mmlandmarkets.pdf

Caputo, M., Ostrom, B. (1994). Potential Tax Revenue from a Regulated Marijuana Market: A Meaningful Revenue Source. Retrieved from http://www.jstor.org/stable/3487191

Caulkins, J. (2010). Cost of Marijuana Prohibition on the California Criminal Justice System. Retrieved from http://www.rand.org/

Caulkins, J., Andrzejewski, S., Dahlkemper, L. (2013). How much revenue could the cannabis tax generate, under different scenarios?. Retrieved from http://liq.wa.gov/publications/Marijuana/BOTEC%20reports/8b_Tax_revenue_under_different_scenarios-%20Final.pdf

Caulkins, J., Hawken, A., Kilmer, B., Kleiman, M. Pfrommer, K., Pruess, J., Shaw, T. High Tax States: Options for Gleaning Revenue from Legal Cannabis. Retrieved from http://law.uoregon.edu/org/olr/volumes/91/2/documents/Caulkins.pdf

Caulkins, J., Morris, E., Ratnatunga, R. (2010). Smuggling and Excise Tax Evasion for Legalized Marijuana: Lessons from Other Excise Taxes. Retrieved from http://www.rand.org

Choksi, N. (2014). Moody's: Washington might not see the marijuana tax windfall previously projected. Retrieved May 3, 2015, from http://www.washingtonpost.com/blogs/govbeat/wp/2014/07/22/moodys washington-might-not-see-the-marijuana-tax-windfall-previously-projected/

Choo E., Benz M., Zaller N., Warren O., Rising K., McConnell K. The impact of state medical marijuana legislation on adolescent marijuana use. J Adolesc Health 2014; doi:0.1016/j.jadohealth.2014.02.018.

Chu, Y. (2012). Medical Marijuana Laws and Illegal Marijuana Use. Retrieved from http://econ.msu.edu/seminars/docs/draft100112.pdf

Edwards, E. (2013, July 1). The War on Marijuana in Black and White. Retrieved April 4, 2015, from https://www.aclu.org/feature/war-marijuana-black-and-white

Gettman, J. (2007). Lost Taxes and Other Costs of Marijuana Laws. Retrieved from http://norml.drugsense.org/downloads/Gettman_Lost_Taxes.pdf

Guy, G. (2004). The Medicinal Uses of Cannabis and Cannabinoids (p. 74). London: Pharmaceutical Press.

Howland, E. (2014, February 27). This is the grid. This is the grid on legalized marijuana. Any questions? Retrieved September 22, 2014.

Ingram, C. (2014, August 26). Study: Couples who smoke marijuana are less likely to engage in domestic violence. Retrieved September 22, 2014, from http://www.washingtonpost.com/

Kilmer, B., Caulkins, J., Bond, B., Reuter, P. (2010). Reducing Drug Trafficking Revenues and Violence in Mexico: Would Legalizing Marijuana in California Help?. Retrieved from http://www.rand.org/

Kilmer, B., Caulkins, J., Pacula, R., MacCoun, R., Reuter, P. (2010). Altered State? Assessing How Marijuana Legalization in California Could Influence Marijuana Consumption and Public Budgets. Retrieved from http://www.rand.org/

Light, M. (2014). Market Size and Demand for Marijuana in Colorado. Retrieved May 3, 2015.

Lopez, G. (2014, May 20). Legal marijuana created thousands of jobs in Colorado. Retrieved September 22, 2014, from http://www.vox.com/2014/5/20/5734394/legal-marijuana-created-thousands-of jobs-in-colorado

MacCoun, R. (2010). What Can We Learn from the Dutch Cannabis Coffeeshop Experience?. Retrieved from http://www.rand.org

Miron, J. (2005). The Budgetary Implications of Marijuana Prohibition. Retrieved from www.prohibitioncosts.org/mironreport

Mullis, N. (2014). Focus Colorado: Economic and Revenue Forecast. Retreived from http://www.leg.state.co.us/lcs/econforecast.nsf/vwFile/1406/$File/14JuneForecas .pdf#page=29

Nixon, D. (2013). Update to: The Budgetary Implications of Marijuana Decriminalization and Legalization for Hawai`i. Retrieved from http://acluhawaii.files.wordpress.com/2013/01/econreptmarijuana1_2013.pdf

Pacula, R. (2010). Examining the Impact of Marijuana Legalization on Marijuana Consumption: Insights from the Economics Literature. Retrieved from http://www.rand.org/

Pacula, R., Kilmer, B. (2003). Marijuana And Crime: Is There A Connection Beyond Prohibition?. Retrieved from http://www.nber.org/papers/w10046

Pacula, R., Powerll, D., Heaton, P., Sevigny, E. (2013). Assessing the Effects of Medical Marijuana Laws on Marijuana and Alcohol Use: The Devil is in the Details. Retrieved from http://www.nber.org/papers/w19302

Philander, K. (2013). Normative Analysis of Gambling Tax Policy. Retrieved from http://digitalscholarship.unlv.edu/grrj/vol17/iss2/2/

Reuter, P. (2010). Marijuana Legalization: What Can Be Learned from Other Countries?. Retrieved from http://www.rand.org

TenEyck, M., Barnes, J., Kovandzic, T. (2014). The Effect of Medical Marijuana Laws on Crime: Evidence from State Panel Data, 1990-2006. Retrieved from http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.009286

Williams, J., Pacula, R., Chaloupka, F., Wechsler, H. (2001). Alcohol and Marijuana Use Among College Students: Economic Complements or Substitutes?. Retrieved from http://www.nber.org/papers/w8401