

Summary

Valuation, Risk, and Damages in an Emerging Legal Marijuana Products Industry: Early Evidence and Sober Projections

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The United States has prohibited the sale of marijuana for decades, despite significant and widespread use among a fairly diverse section of its population. Since the turn of the century, a modest but growing number of states have adopted laws allowing for the legal sale of medical marijuana, and at least four have effectively legalized limited trade in modest amounts for recreational use. Meanwhile, several states are likely to face further relaxation of longstanding prohibitions, and a nascent legalized industry appears to be forming.

The potential size of the market for legal cannabis products is a question for which strong evidence is available for the first time in 75 years. Policymakers, taxpayers, as well as potential consumers and distributors of such products all have an interest in understanding the likely scale of this market, the regulatory structures that could reduce the dangers it poses, and the potential sources of conflict and tax revenue.

Using a set of methods used in forensic economics, public policy studies, industrial economics and mathematical economics, and data from the first two years of legal operation in multiple states, we provide a new analysis on this important topic.

This new analysis takes the form of methodological findings, as well as a 50-state review of the potential market for legal cannabis products, with differentiated market assessments for each. The following are our methodological and empirical findings, with references to portions of the extended market study that are included with this presentation:

1. The Industry Faces a Patchwork of Laws

We expect that the emergence of the legal cannabis products market in the United States will be marked for some time by a patchwork of state laws. As we enter 2016, the United States include jurisdictions that retain complete prohibition; those that allow limited medical use; those that allow wide latitude for medical and quasi-medical uses; and those that allow personal and recreational use.

We observe that, contrary to the most optimistic forecasts of advocates for legalization, there has been no rush of states following the 2012 breakthrough year for state legalization measures, when Colorado and Washington (now joined by Alaska and Oregon) voted to allow recreational uses.

See: Attachment, Executive Summary, Figure 2 (2015 legal status by state).

2. We Observe Durable Consumer and Voter Reluctance

Contrary to the impression created by the legalization votes beginning in 2012 in Colorado, Washington, Oregon and Alaska, the country is displaying considerable reluctance toward embracing legal cannabis. Clear indications of this include the decisive rejection of the Ohio legalization measure in 2015; the narrow rejection of a

much milder Florida measure in 2014; and the failure of initiatives in many states (including California and Michigan) to reach the ballot in 2015.

This voter reluctance also signals that a majority of consumers are likely to remain reluctant to embrace these products.

See: Attachment, Executive Summary, Figure 3 (anticipated legal status, 2017).

3. **Serious Conflicts in Laws Exist**

As we enter 2016, much of the United States operates under at least two sets of conflicts between state and federal laws:

- a. The conflicting legal status of federal prohibition of both possession and commercial distribution, and state laws that may allow possession and sale for limited medical or for recreational use; and
- b. The conflicting taxation schemes of regular business taxation (under both federal and state business tax schemes), and the confiscatory section 280E of the Internal Revenue Code.

Moreover, even licensed operators in legalized states have difficulty receiving normal financial services from federally-regulated institutions. These conflicts in laws make it difficult for business managers, investors, and customers to operate in a normal fashion.

4. **Market Size Depends on Consumer Fundamentals**

Demonstrated consumer demand data did not exist for legal cannabis products in the United States, at least until 2014 when legal sales began in Colorado. This leaves an enormous empirical and conceptual gap. To fill this gap, we rely on a combination of methods, including standard business economics analysis of consumer demand for substitute products. In particular, we use our intuition and observe well-demonstrated consumer demand for a specific set of substitute products that provide recreational and social means of acquiring a modest sense of intoxication. Our intuition suggests, and a tentative and limited data set corroborate, that this relationship suggests a basis for estimating consumer demand for cannabis products.

Using this intuition, these data, and a small amount of information from recently-legalized states, we estimate the potential size of the consumer market, and related estimates of potential state excise taxes using a standardized scheme, for all 50 states.

*See: Attachments: Executive Summary, Figure 1 (Relative State Market Sizes)
Market Estimates for State of Michigan
Figure 4: Alcoholic Beverages Expenditures and
Marijuana Prevalence Among the States*

5. **Contrary Assertions About Market Size Abound**

Our estimates imply smaller (and often much smaller) demand than that frequently discussed by advocates for legalization. For example, our estimate for the State of Michigan (which is approximate \$592 million) is approximately half the over \$1 billion that advocates for legalization in the State have described. Our estimate for the State of Ohio is much less than half of what was asserted as a likely market during the

recent campaign for legalization in that state.

However, our estimates are still higher than many published estimates based on law enforcement and substance abuse data.

The variance among these estimates is not just due to differing enthusiasm. It also derives from fundamental methodological differences. In particular, our consumer-demand approach is fundamentally different from all the following:

- a. Extrapolation of early results from Colorado (often bases for optimistic estimates);
- b. Inference from seizures of criminal shipments (often bases for pessimistic estimates); and
- c. National import and export data (the basis for many international organization estimates).

6. **Consequences of Consumer Adoption Include Cannibalization of Alcoholic Beverages Sales, and Possible Tobacco Sales**

Consumer adoption of these products, even if limited, has consequences. Among these are cannibalization of other product categories, including alcoholic beverages and tobacco products. In particular, we expect that consumer adoption of cannabis products will inevitably lead to losses in market share for other consumer products, as well as the tax revenue that arises from these products. It appears these consequences have been largely ignored by advocates (and public policy analysts) in the often heady discussions of the emerging industry.

See: Attachment, Figure 4 (Alcohol Beverage Consumption and Marijuana Prevalence)

7. **Asymmetric Risks and Business Value**

The conflicts in laws and related risks, along with uncertainties related to the consumer demand and lack of product standards, produce the highly uncertain environment in which entrepreneurs are now confronted. However, we find that legal businesses in this arena still have value. In particular, we find the value varies with the prospects for normalization as well as with the size of the market.

To estimate indicative values for such firms, we use the recursive model of business valuation, which natively accounts for asymmetric risks and real options. Using such a method across 50 states, and taking into account the potential for complete losses in businesses as well as the potential dramatic improvements in prospects should voters adopt legalization schemes in the future, produces an interesting pattern of indicative values for legal and quasi-legal entities.

See: Attachment, Business Valuation Model; Extended Results for Colorado and Michigan

8. **Forensic and Business Economics Tasks**

We identify the following forensic and business economics tasks that are likely to emerge from such an industry:

- a. Estimating market size in various states, for use by investors, lenders, producers, and retailers.
- b. Estimating potential tax revenue from the taxation of retail sales.
- c. Estimating the cannibalization of market demand from other products.
- d. Estimating the losses from breaches of contract among legal suppliers, retailers, and distributors.
- e. Estimating the value of businesses involved in the nascent industry, particularly when breaches of contract or other causes cause business failure.

These tasks will take place, for at least the immediate future, in an environment in which patchwork and conflict of laws, as well as asymmetric risks and lack of extended data, are likely to prevail.

This presentation is an expansion and revision of an analysis first presented at the NAFE International Conference in Amsterdam in May 2015, and incorporates new data, results from subsequent elections, and additional analyses.

We also include the Executive Summary, along with excerpts, of a recently published 50-state report edited by the author of this working paper. The full 50-state report, which runs over 250 pages and includes 4 pages of market information for each state, is available from <http://www.andersoneconomicgroup.com>.

The Market for Legal Cannabis Products in the 50 United States

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Anderson, Value and Damages,
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Preface

American attitudes about marijuana and other products of the *cannabis* plant are clearly changing. From the late 1990s until now, an entire swath of the country has enacted laws—often initiated by citizens—that have relaxed the prohibition on the drug that has persisted for decades.

Advocates for cannabis—and critics of the War on Drugs—have been recommending the decriminalization or legalization of cannabis products for at least two decades. Recently, a handful of states have agreed to legalize (at least under their state's law) the medical and recreational uses of marijuana. Other states have rejected similar proposals, and the federal prohibition (and near confiscatory federal tax policy) remains in place.

A national debate on this topic rages across the states and in national politics. Who could have guessed one election cycle ago that multiple candidates in a Republican presidential debate—including one son of a former president—would voluntarily admit to using marijuana? It wasn't that long ago that a Democratic candidate was pressured into uttering one of the most memorable instances of political double-speak on exactly the same issue. This turnaround in popular and political culture suggests that other surprises lie ahead.

Addressing Glaring Unknowns. One glaring unknown in this national debate has been the inconsistent predictions about usage and demand for the product. Without such information, citizens and policymakers are at the mercy of dramatically conflicting claims about usage, effects, tax revenue, and costs. As has been demonstrated by the fledgeling state-legal marijuana dispensaries in some states, as well as the first-year experience in taxing and regulating state-legal sellers of recreational marijuana in Colorado and Washington, state governments and private companies were often poorly prepared to function properly once state laws were relaxed.

This report provides the most comprehensive assessment of likely demand, tax revenue, and related business activity yet available for all 50 states. It does so using an innovative approach and data that was not available until recently. Thus, it is a much-needed resource for citizens, policymakers, public health and criminal justice authorities, as well as business leaders and potential investors.

Information Assembled in This Report. For the first time, we present here a systematic review of the underlying indicators of consumer demand for cannabis products in each of the 50 United States. The report includes this demand analysis, along with projections about political momentum towards legalization in each state, an indication of the investment value of distribution businesses, and estimates of likely state sales and excise tax revenue that would accrue to the states if cannabis products were legalized for sale. In addition, we have estimated the cannibalization of other consumer product sales—in particular, alcohol beverages—that would likely result from legal sales of cannabis products.

These estimates have been prepared using a systematic methodology, which is consistent across all states. Thus, the reader of this report will have both more knowledge and a more consistent picture across the country than previously was possible.

A Sober Assessment by Business Economics Professionals. There are plenty of articulate advocates for the legalization of cannabis products, and also many defenders of the current national criminalization. In this report, we neither urge voters to adopt, nor reject, any of the numerous proposals to decriminalize or legalize cannabis products. Furthermore, our market assessments are sober, carefully presented, and more conservative than the majority of assertions about consumer demand for cannabis products.

We are not advocates for cannabis legalization or criminalization. We are professionals in market analysis and business economics, and have worked hard to make the estimates presented here the best available. They are not the most pessimistic, nor the most enthusiastic; they are certainly one of the best-supported and most consistent across states.

Cannabis from a Consumer Demand Perspective. Much of what is known about the marijuana industry and demand for its products arises from one source: the criminal justice system. Of course, this is to be expected for a product that has been outlawed for decades across the United States. Many other estimates of marijuana usage are based on data from this system—from surveying those arrested for criminal violations or treated for addiction. Most of the data arises from states where the industry was illegal and possession of even small amounts was a criminal offense.

While these data may have been the best available in the past, we did not project future demand on the basis of past criminal activity. Instead, we have followed the approach of estimating demand for cannabis products from fundamental indicators of consumer demand.

Useful for Decision-makers and Voters. We hope this report will be useful to both policymakers and voters in states debating policy changes, as well as those in related industries, such as alcohol beverages, that are directly or indirectly competing against the cannabis industry.

As political and legal conditions change in the states, and new information on demand and tax revenue becomes periodically available, you can expect this report to be updated. The field is changing rapidly, and we hope to keep our subscribers alerted to those changes in the future.

*Patrick L. Anderson
East Lansing, Michigan
November 2015*

I. Executive Summary

With dramatic changes in both public opinion and the legal landscape regarding marijuana, it is clear that future consumption of marijuana in the U.S. will be under a much different legal regime than in the past. While we do not yet know what this will imply for both state and federal laws, we believe a serious effort to review the available data with numerous indicators could provide us with much better information than what was available in the past. We have undertaken the most thorough effort yet attempted to estimate market demand for cannabis products from fundamental drivers of consumer behavior.

We hope this analysis will find a ready audience among those who are investing in this emerging industry; attempting to estimate or design tax and regulatory regimes for it; selling potentially competing products, such as alcohol beverages, tobacco, and other medical therapies; and with interests in public health and law enforcement.

PURPOSE OF REPORT

The primary purpose of this report is to estimate the market demand for legal cannabis products including recreational marijuana and marijuana-related products in the United States. These market demand estimates are conditional on changes in the legal status of these products on a state-by-state basis.

Secondary purposes of this report include the estimation of state-level tax revenue on the business of producing, distributing, and selling such products, and the implications for consumer spending on other categories of goods should they shift spending toward cannabis products.

A tertiary purpose, albeit one with significant benefit, is to consider how the emergence of legal products in limited geographic areas is likely to affect the underground market that currently supplies cannabis products illegally across the U.S.

Note on Terms. There is a noticeable ambiguity in the common uses of the terms “cannabis” and “marijuana.” At the technical level, “cannabis” refers to plants of genus *Cannabis* and “marijuana” includes the flower and leaves of the *Cannabis sativa* plant. Please see “Cannabis Products” on page 12 for a more detailed description of the terms. Throughout this report, we have used the terms interchangeably, except where a specific definition is noted. When discussing state laws, we have used the terms as found in the statutes, which vary among the states.

OVERVIEW OF APPROACH

Fundamental Approach. We have estimated market demand for legal cannabis products from fundamental drivers of consumer behavior. The premise for this approach is that the emerging legal cannabis products industry will quickly

begin to function as other legal industries, and consumer behavior will also resemble consumer behavior in other industries.

A number of characteristics of the cannabis products industry strongly affect our ability to estimate demand, including a distinct lack of market data, the impact of the illegality of the products, and changing consumer preferences. To overcome these difficulties, we use a combination of sophisticated technical methods, as well as professional judgement regarding the likely evolution of legal regimes and consumer tastes.

Critical Factors Underlying Consumer Demand. We present a model for estimating consumer demand for cannabis under current law, and for the emerging scenario where some states have a decriminalized, or partially legalized, industry.

This model is based on estimating consumer expenditures using fundamental indicators of consumer demand for cannabis products. For this category of products, we have identified the following set of indicators that, for each state, provide some explanatory power in our demand estimation equations:

1. Number of households with adults. We take this as the primary indicator of the size of the available consuming market in each state.
2. Alcohol beverage expenditures. We use a sophisticated estimate of these expenditures, taking into account under-reporting of expenditures for this category of goods in the standard consumer expenditure data prepared by the U.S. government.
3. Prevalence of use under current law. This varies among age groups; region of the country; exposure to the illegal marijuana trade; and cultural and local attitudes.
4. Political momentum towards legalization in various states. This is manifested in citizen initiatives (among those states where the constitution provides for the right of initiative); adoption of state laws; and other indicators.

Informed by these indicators, we use a combination of methods for this analysis, including:

1. A consumer expenditure model for estimating the size of the market, based on analogies with other products and aggressive use of available data from the indicator categories listed above, which generates different market demand estimates for different states based on multiple characteristics of that state's population, expenditures, preferences, and legal regimes. This model also generates estimates of the cannibalization of other products.
2. Tax policy models for estimating related tax collections, taking into account the likely tax regimes and the experience of collections in those small number of states where taxes are collected.
3. A recursive model for the valuation of distribution businesses, recognizing the serious and asymmetric business risks inherent in such a business.

4. Professional judgement about the course of change of public policies in various states, coupled with the U.S. election cycle.

We provide detail on these methodological aspects in the following sections of the full report: Chapter III, “Methodology for Predicting Market Demand,” on page 21, “Appendix A: Methodology” on page A-1, and “Appendix B: Business Valuation Model” on page B-1.

SUMMARY OF ESTIMATES

The full report, available by subscription, contains market demand; tax revenue; cannibalization; and indicative business value forecasts for each of the 50 U.S. states.

This executive summary provides summary data based on the state-level forecasts as of the time of this edition’s publication.

Market Demand. For each state, we estimate total, pre-tax demand for legalized recreational cannabis products using the consumer demand approach outlined above. The results include an estimate of approximately \$14.8 billion across the U.S. if every state were to legalize recreational cannabis use. See Figure 1, “Relative State Market Sizes,” on page 6 for a relative comparison of each state’s estimated demand.

Cannibalization of Alcohol Sales. We also estimate the amount of money that consumers in each state will divert from purchases of alcohol beverages to fund the purchases of cannabis products, which we refer to as cannibalization of alcohol sales. Across the U.S., we estimate alcohol sales could decline by as much as \$221.4 million as a result of consumers’ ability to legally purchase cannabis products.

Indicative Business Value. In addition to the values above, we also estimate the indicative value of the marijuana distribution industry in each state under their current laws. This is meant to serve as a barometer of sorts, providing for the comparison of investment opportunities across the different states (note that we are not valuing any specific business, but the industry as a whole). Our business value model considers many different scenarios and accounts for likely policy changes to produce robust estimates tailored to each state. Our estimates range from \$1 million to \$64 million across the U.S.

Tax Revenue Estimates. Finally, we estimate general sales and marijuana specific excise tax revenues likely to be collected by the governments of each state. Extending the excise tax scheme adopted in Colorado to the rest of the states, we estimate total excise tax revenues to be approximately \$3.1 billion. We reserve the reporting of sales tax revenues to the individual state reports included in the full report.

For each state we also provide notes on existing laws governing marijuana use and possession, as well as notes on likely changes in the legal status of cannabis products in the next two years. Figure 2 on page 7 shows the current legal status and Figure 3 on page 8 summarizes our estimates of the likely legal status in the next two years for each state.

Comparing Market Estimates. Other published estimates of national market demand for cannabis products range from roughly \$13.5 billion to \$60 billion, with one as high as \$113 billion (see “Previous Approaches to Estimating Demand” on page 22). Our estimate for national market demand, conditional on state legalization, of \$14.8 billion falls near the low end of this range. This is due to at least three reasons: First, our approach carefully considers only state-legal sales of recreational marijuana, which does not include medical marijuana or illegally-sold marijuana. Many other studies attempt to estimate total legal and illegal sales, naturally leading to higher numbers. Second, our approach involves the aggregation of estimates for each of the individual states. This allows us to account for variation in consumer behavior among the states, rather than relying on the assumption that all markets will behave in a manner similar to those in the early-adopting states. Third, we adopt a conservative approach, carefully separating out state-legal taxable sales from tax revenues and accounting for the fact that new expenditures on cannabis products will mean consumers are spending less on other goods.

We are business valuation professionals, not advocates for or against the legalization of marijuana in any state. Ours are sober estimates intended to provide valuable information to the readers of this report.

**OBTAINING A
SUBSCRIPTION;
PERIODIC UPDATES**

Subscribers to the Anderson Economic Group cannabis market service receive access to periodic updates of market demand estimates and detailed state-level estimates on many more indicators, including changes in legal and political climates. These updates will be made available to subscribers online at the Anderson Economic Group website:

www.andersoneconomicgroup.com/cannabisreport.

If you wish to suggest an update, please send an e-mail to us at:

info@AndersonEconomicGroup.com.

ABOUT THE AUTHORS

Patrick L. Anderson, Executive Editor. Mr. Anderson is the Principal & CEO of Anderson Economic Group and one of the leading business economists in the U.S. His most recent book is *Economics of Business Valuation* (Stanford University Press, 2012). He has been honored three different times for outstanding writing in business economics by the National Association for Business Economics.

Contributors. Contributors to this report include Jeff Johnson and Neal Anderson from Supported Intelligence, and Calla Ketchens and Antonette Patino from Anderson Economic Group. Jeff and Neal developed the data analytics and business valuation models relied upon in this report. Calla prepared the state law and political momentum discussions. Antonette prepared the description of cannabis products and catalogued the large number of sources used in this report.

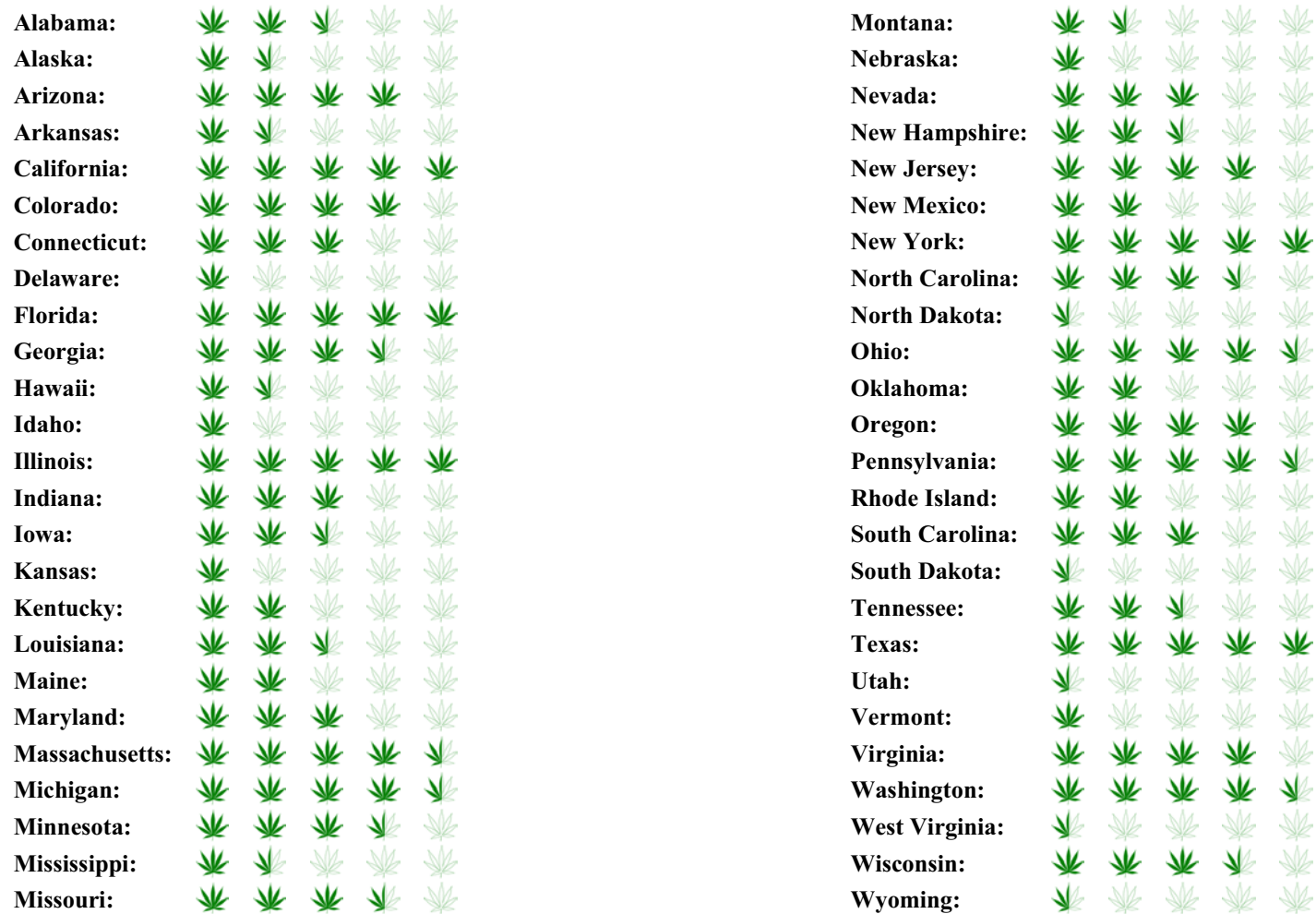
Acknowledgements. We also wish to acknowledge the assistance of Alex Rosaen, Traci Taylor, Ashley Perrotin, and Rebecca Ryan, all from Anderson Economic Group.

More information about the authors and editor of this report is contained in “Appendix C: Authors” on page C-1.

About Anderson Economic Group. Anderson Economic Group is a boutique consulting firm, with particular expertise in both the economics of consumer-facing industries and in tax and fiscal policy. Anderson Economic Group consultants have completed numerous analyses for businesses in the automotive retail, alcohol beverages, hotel, rental car, and restaurant industry in the U.S. For these industries, we have developed sophisticated approaches to estimating market demand within certain consumer segments and specific geographic areas. We apply the same fundamental approach in this study of the demand for cannabis products.

Anderson Economic Group consultants also have extensive experience in the economics of state and local taxation. Members of this project team have also worked on multiple editions of Anderson Economic Group’s *State Business Tax Burden Rankings*, the foremost reference of its type.

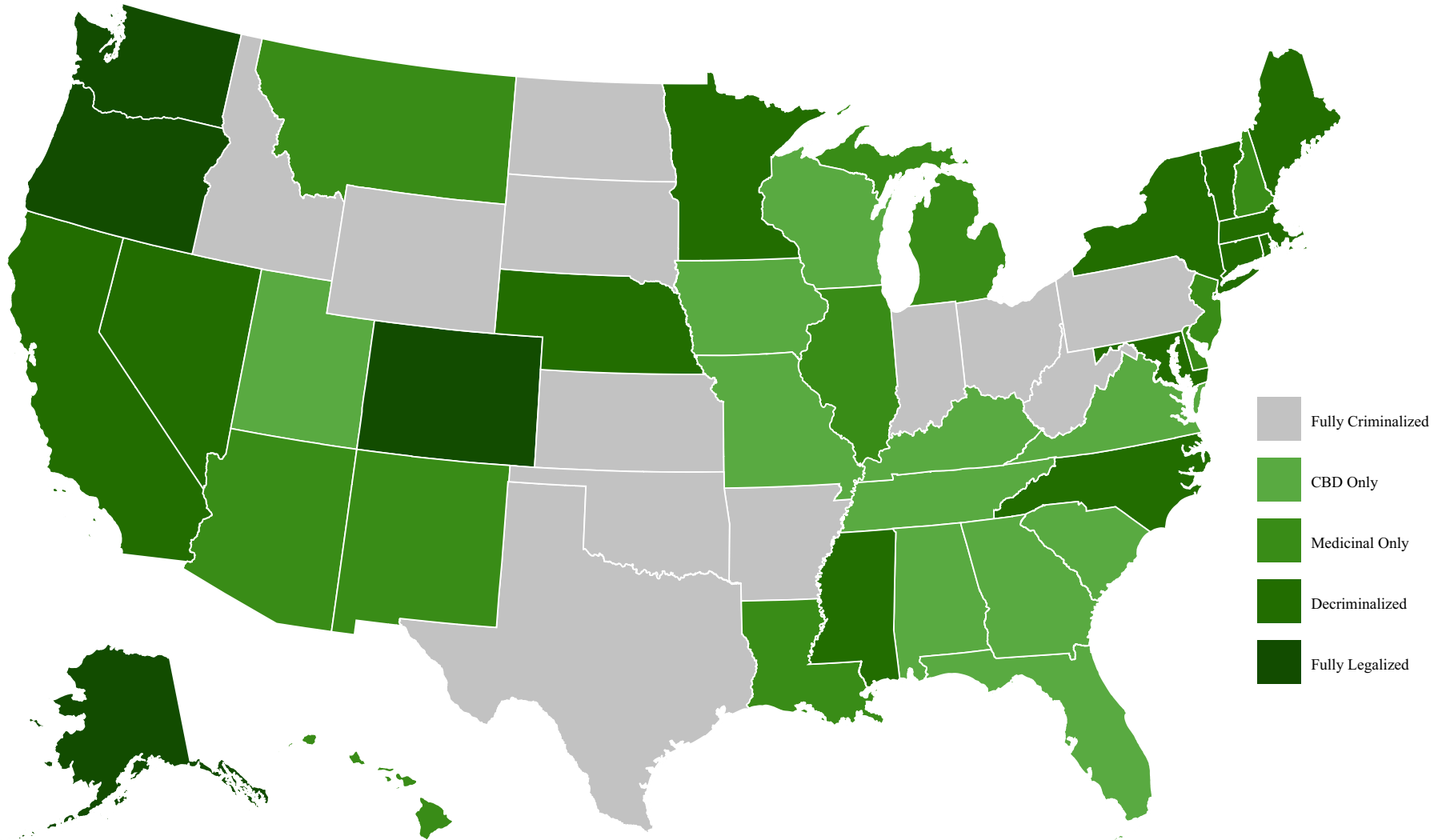
FIGURE 1. Relative State Market Sizes



Source: Anderson Economic Group Cannabis Market Report, November 2015

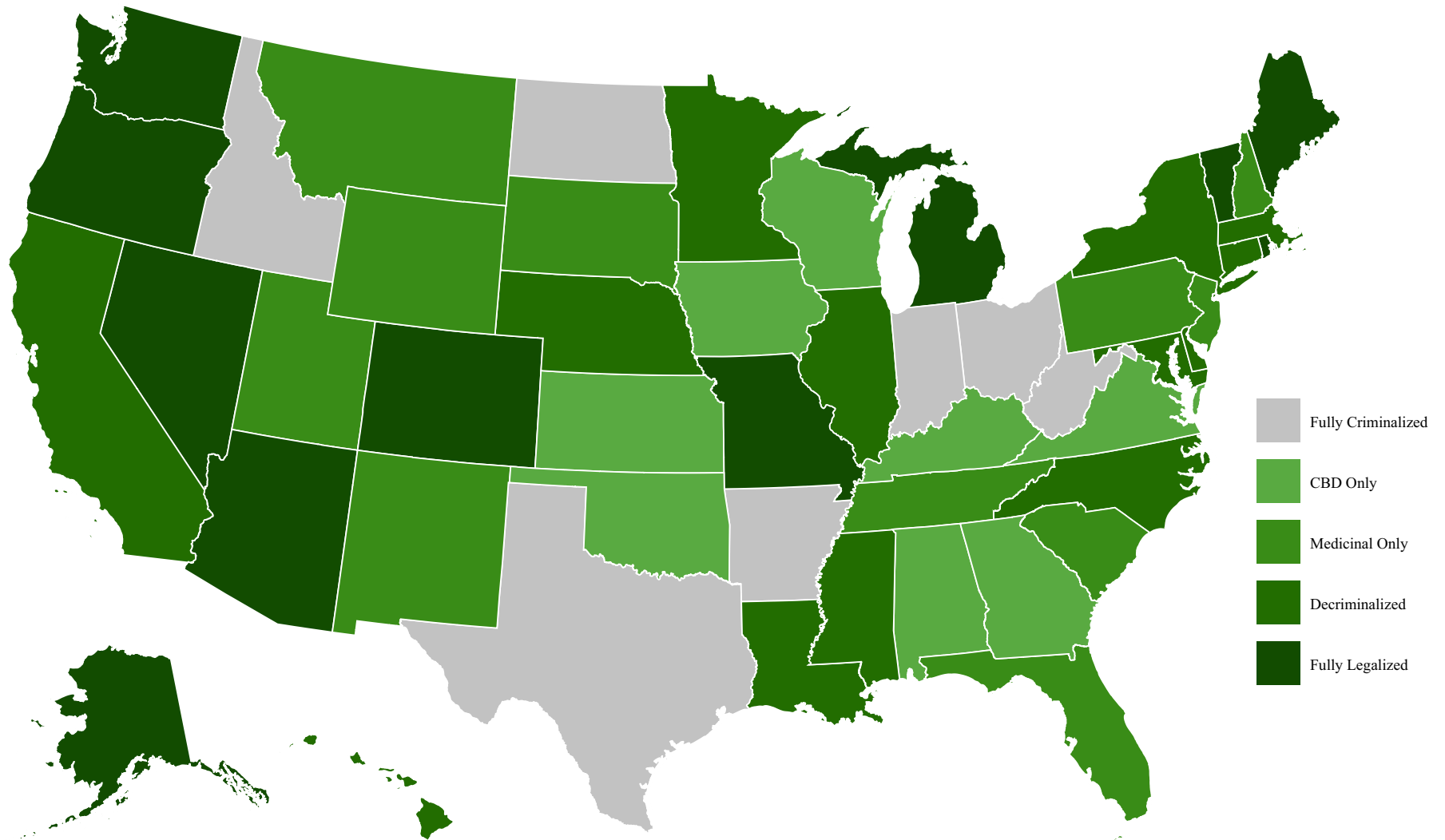
Note: This chart shows relative rankings of the markets for cannabis products in each of the U.S. states. States are ranked from one-half to five leaves, with five leaves representing the largest markets. Individual markets are described in detail in Chapter IV, “Market Demand Estimates,” on page 33.

FIGURE 2. Current Legal Status of Cannabis Products by State



Source: Anderson Economic Group Cannabis Market Report, November 2015

FIGURE 3. Likely Legal Status in 2017 by State



Source: Anderson Economic Group Cannabis Market Report, November 2015

The Market for Legal Cannabis Products in the 50 United States

For the first time, we present a systematic review of the underlying indicators of consumer demand for cannabis products in each of the 50 United States. The report includes this demand analysis, along with projections about political momentum towards legalization in each state, an indication of the investment value of distribution businesses, and estimates of likely state sales and excise tax revenue that would accrue to the states if cannabis products were legalized. In addition, we have estimated the cannibalization of other consumer product sales—in particular, alcohol beverages—that would likely result from legal sales of cannabis products.

This report does not advocate for cannabis legalization or criminalization. It was written by a team of market analysis and business economics professionals who worked hard to make the estimates presented here the best available.

The full report, which contains individual assessments of state markets, more analysis of the legal cannabis industry, and a detailed explanation of our methodology, can be purchased at AndersonEconomicGroup.com/CannabisReport.



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INTELLIGENCE

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Calla Ketchens, and Antonette Patino*

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State Market Demand: Michigan

SNAPSHOT

\$592.0M

Potential State Market Demand for Legal Recreational Use in 2016



Market Size Rank: 6th of 50
(Assuming legalization in all states)



\$127.1M

Potential State Sales and
Excise Tax Revenue



\$8.9M

Likely Cannibalization of
Retail Alcoholic Beverage
Sales



\$855.7M

Indicative Value for
Businesses in Distribution
Industry

Legal Status current legal status in 2015

Fully Criminalized	CBD-specific	Medical Only	Decriminalized	Fully Legalized (State-level)
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Political Momentum likely legal status in 2017

Fully Criminalized	CBD-specific	Medical only	Decriminalized	Fully Legalized (State-level)
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Table S-22: Relevant State Attributes for Michigan

Households with Adults Age 21+	3,869,010
Past Year Marijuana Usage Among Adults	15.12%
Alcoholic Beverage Expenditures per Household	\$452
General State Sales Tax Rate	6%

Data sources and methods are listed in the Appendix.

KEY FACTORS

Anderson Economic Group considered a number of key factors when estimating the demand for legalized cannabis products in Michigan. These include the number of households with adults, the share of adults reporting use of marijuana during 2011-2012, Michigan average expenditures per household, Michigan's general sales tax rate, trend growth in household alcoholic beverage expenditures in the U.S., and the political momentum of legalization efforts in Michigan. We report the values of these key factors for Michigan in Table S-22 on the previous page.

See Chapter III. "Methodology for Predicting Future Market Demand" for a discussion of both the key factors and methodology involved in calculating our demand, tax revenue, cannibalization, and distribution business value estimates.

DEMAND ESTIMATE

We estimate the demand for state-sanctioned cannabis products in Michigan, conditional on the adoption of state laws legalizing personal recreational use, commercial sales, and possession in small quantities to be **\$592.0M** in 2016. Future estimates will be different.

TAX REVENUE ESTIMATE

We estimate state tax revenue assuming that Michigan will adopt a similar regulatory and tax structure to that of Colorado. We assume that recreational cannabis sales would be subject to a general sales tax, as well as a cannabis-specific excise tax.

General Sales Tax Revenue. To calculate expected sales tax revenue in the event that recreational use of cannabis products is legalized, we multiply the dollar amount of cannabis products sold by the general sales tax rate for Michigan. By applying this method, we estimate potential sales tax revenues from state-sanctioned sales of cannabis products to range from \$28.4M to \$42.6M. Our best estimate is **\$35.5M**.

Excise Tax Revenue. We also estimate excise tax revenue under the assumption of a change to the laws of Michigan to allow legal sales of cannabis products for recreational use and the taxing of these sales in a manner similar to that implemented in Colorado. Following this approach, we estimate that Michigan could collect between \$73.2M and \$109.8M in cannabis-specific excise taxes. Our best estimate of excise tax revenue is **\$91.5M**.

Note on Fiscal Impact. We expect that customers will choose to divert money from other taxable purchases to purchase state-sanctioned cannabis products. Therefore, the net fiscal impact to the state will be lower than the new tax revenue collected from sales of state-sanctioned cannabis products.

CANNIBALIZATION ESTIMATE

As noted above, we expect consumers to shift some expenditures toward cannabis products if they are legalized. Alcoholic beverages are likely to be a major substitute for cannabis products.

To estimate potential cannibalization of alcoholic beverage sales, we apply a cannibalization factor to the difference between the market size for illegal and legal cannabis products. Following the method described above, we estimate the potential cannibalization of alcoholic beverage sales in Michigan will fall between \$7.1M and \$10.7M under full legalization at the state level.

DISTRIBUTION BUSINESS VALUE

Finally, we estimate an indicative value of businesses in Michigan's distribution industry. We do so using a recursive valuation model constructed by Supported Intelligence, LLC. This model takes into account the significant risks associated with the industry, as well as the potential for future legal sales.

This model estimates the indicative value of businesses in the distribution industry serving about half of Michigan's market to be between \$684.6M and \$1,026.9M under full state-level legalization. Our best estimate of the indicative value of these businesses is **\$855.7M**.

NOTES ON MICHIGAN LAW

We summarize Michigan's laws on recreational and medical cannabis products below. Of course, this is only a summary of laws that are subject to change. Federal laws are not included in this summary.

Recreational. Marijuana is a Schedule I controlled, hallucinogenic substance except when it is manufactured, obtained, stored, dispensed, possessed, grown in compliance with this act, then it is a Schedule II (including pharmaceutical-grade cannabis) under Michigan law. Schedule I substances were found to have a high potential for abuse and no accepted medical use. However, Michigan has rescheduled marijuana to Schedule II because, although there is still a high potential for abuse and that abuse may lead to severe dependence, there is a currently accepted medical use for marijuana. A person who possesses marijuana is guilty of a misdemeanor and subject to fines up to \$2000, imprisonment up to one year, or both.

Medical. A person cannot use marijuana unless it has been obtained from a valid prescription, otherwise he or she is guilty of a misdemeanor which is punishable by a fine up to \$100, imprisonment up to 90 days, or both. A qualifying patient who, at the time of arrest, presents both a valid registration card and government photo ID and who possesses not more than 2.5 oz of marijuana is immune to prosecution or penalty, including civil penalty, for possession of marijuana for medical purposes. A qualifying patient is one who has been diagnosed by a licensed physician with a debilitating medical

condition including, but not limited to, cancer, glaucoma, epilepsy, or severe and persistent muscle spasms.

Source: Mich. Comp. Laws Serv. §§ 333.7211-.7213, 333.7403-.7404, 333.26423-.26424. (LexisNexis 2015)

NOTES ON POLITICAL MOMENTUM

Current Political Activity. We reviewed state-level efforts to legalize the sale of cannabis products for recreational and medical use around the country, and predicted the potential changes in laws in those states where momentum seems strongest. Of course, these are subjective observations as of the year 2015, and actual changes (or lack thereof) in the future will likely be somewhat different.

Michigan has legalized medical marijuana. There are currently two petitions being circulated by two groups to get their initiatives for recreational marijuana legalization on the 2016 ballot. One of the groups has collected 45,000 signatures out of its goal of 370,000 as of July 28, 2015. The groups have 180 days to collect enough signatures. At least two localities, East Lansing and Ann Arbor, have decriminalized possession of recreational marijuana. Furthermore, we observed that marijuana is a topic of conversation statewide. It is likely that Michigan will fully legalize marijuana by 2017 if at least one of these initiatives is on the 2016 ballot.

Selected References:

<http://www.micannabis.vote>, accessed August 13, 2015

<http://www.milegalize.com>, accessed August 13, 2015

Jonathan Oosting, June 15, 2015, http://www.mlive.com/lansing-news/index.ssf/2015/06/michigan_marijuana_legalization_3.html, accessed August 13, 2015

Jonathan Oosting, June 25, 2015, http://www.mlive.com/lansing-news/index.ssf/2015/06/marijuana_legalization_activis.html, accessed August 13, 2015

July 28, 2015, http://www.mlive.com/lansing-news/index.ssf/2015/07/michigan_marijuana_legalization_4.html, accessed August 13, 2015

**GENERAL CAUTIONS
AND DISCLAIMER**

All economic and business information should be considered as “forward-looking statements.” Notes on Michigan law and political momentum contain subjective judgement and are not intended as comprehensive summaries of all state laws or new legislation. Readers are responsible for obtaining their own legal and investment advice.

UPDATES

State laws and market conditions change over time. Subscribers can access updated state reports released periodically at:
www.AndersonEconomicGroup.com/CannabisReport.

If you would like to alert our editorial team to a pending change in state law or an item you believe is in error, please contact us via email at:
info@AndersonEconomicGroup.com.

Figure 4: Alcoholic Beverages Expenditures and Marijuana Prevalence Among States



Sources: National Survey on Drug Use and Health; Anderson Economic Group estimates

Appendix B: Business Valuation Model

In addition to a thorough, conservative estimate of market demand in each state, this report also provides an indicative business value for a group of marijuana distribution businesses operating in each state. To provide this estimate, we use a powerful new approach to valuing businesses facing significant risk and growth potential. This appendix briefly describes this new approach and outlines our application of it for the purposes of this report. Finally, we present extended valuation results for businesses operating in Colorado and Michigan under various legal and business conditions.

NOVEL APPROACH: A VALUE FUNCTIONAL MODEL

For the difficult task of estimating indicative business values for marijuana distributors across the United States, we sought a model that captures the actual risks faced by the business manager and that includes a mechanism for a rational response to those risks. One such model is the recently proposed value functional model of the firm.¹ In this model, the manager makes a series of decisions regarding the operation of the firm, each of which impacts the state of affairs for the next decision. The manager is assumed to maximize the *value* of the firm, which accounts for both current and potential future profits.

In an analysis of business hiring decisions under uncertainty, Anderson notes that the value functional approach:

is different from neoclassical profit-maximization in at least [two] respects.

Value Maximization. The manager is primarily concerned about value, rather than profits. The value given the current state is defined recursively as maximization (over the set of actions available to the manager) of the sum of the current period's net profit and the discounted expectation of next period's value. A value maximizer will act differently than a profit maximizer, and the path of decision over time for a profit maximizing firm (even one that takes into account expectations about future prices) will be different than for the one that maximizes value.

Tension between investments for the future and current-period rewards. The firm's optimization involves decisions in one period that can affect the state in the following period. This gives rise to an explicit trade-off, between current expenditures designed to improve the state of affairs in the future, and current-period rewards.²

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1. Patrick Anderson, *Economics of Business Valuation*, Stanford University Press, 2012.
 2. Patrick Anderson, "Persistent Unemployment and Policy Uncertainty," *Business Economics*, January 2014.

ELEMENTS OF OUR VALUE FUNCTIONAL MODEL

Our model of the value of marijuana distribution businesses includes the following elements:

1. State of Affairs

The state of affairs presented to the company consists of the current legal status of cannabis products in their state, and the share of the statewide market the business is able to capture. Our model contains seventeen states, which capture all combinations of “Fully Criminalized”, “CBD-specific”, “Medicinal Only”, “Decriminalized”, and “Fully Legalized” legal statuses and “Low,” “Medium,” “High,” and “Full” market shares, plus an additional state to capture the case where the business has been forcibly closed for legal reasons.

2. Actions Available to the Business Manager

The subject company has three elements in its action set: reinvesting a small, medium, or large amount of earnings into the company. All of these impact the likelihood of the business maintaining or increasing its current market share and the likelihood of the business being closed for legal reasons.

3. Rewards

Current-period rewards in our model capture the profits of the firm while operating in each possible combination of state and action. We estimate these rewards by first calculating net profit to the firm for each state and action combination. To calculate this, we combine the state market size (see “Methodology for Predicting Market Demand” on page 21) and firm market share to determine the firm’s revenue. We then subtract operating expenses to determine profit before action costs.³ Finally, we subtract the amount reinvested in the business (given by the action). We model investments between 15% and 30% of the firms annual revenue.

4. Transitions Between States

Our model accounts for how the state changes over time, including the effect of decisions (actions) made by the firm’s manager, and elements outside of the firm’s control, including changes in the legal status in the state. We use professional judgement to estimate the likelihood of specific transitions.

We assume that the larger the investment, the more likely it is that the business maintains or grows its market share, and the less likely they are to face legal challenges. For example, a business operating in a state where cannabis products are fully criminalized is assumed to have an 18-35% chance of being shut-down, depending on their level of investment. This decreases until such products are decriminalized, where the chance of being shutdown by the government disappears for a business making the largest allowed reinvestment.

The legal status is unaffected by the firm’s reinvestment decision. We model a slow but likely move towards full legalization in all states, adjusted up or down to account for our view of the political momentum in that state.

5. Discounting Future Rewards

3. We estimate operating costs as a share of revenue, using information on these ratios for operating distributors in the alcohol beverage industry, as reported in Leo Troy, *Almanac of American Business Ratios*, CCH Press, 2008.

We use a discount rate of 20% to account for both secular risk and the significant risk of operating in the fledgling legalized marijuana industry. We also adopt a growth rate of 6%, which is higher than most markets but in line with growth in the alcohol beverage industry.

6. Optimization Problem

The manager optimizes a series of decisions affecting the value of the firm. In this model, value is defined as current period profits plus discounted expected future profits, thus the manager must evaluate potential tradeoffs between immediate and future rewards.

We use the Rapid Recursive® Toolbox for MATLAB® to compose, validate, error-check, solve, and report the results of our value functional model.⁴

EXTENDED RESULTS FROM SAMPLE STATES

The solution to our business valuation model includes both the value and the value-maximizing action for each state in the model. For the purposes of this report, we have chosen to include only the value for a business with medium market share under the current legal status in each U.S. state in the main text. To provide readers with a better understanding of the full results and flexibility of our value functional model, we show extended results for Colorado and Michigan in Table 1 on page B-4. Extended results for specific states are available upon request to subscribers to Anderson Economic Group's cannabis market service.⁵

4. The Rapid Recursive® Toolbox is a product of Supported Intelligence, LLC (www.SupportedIntelligence.com), and is patent-pending. MATLAB® is a product of The MathWorks, Inc. (www.MathWorks.com).

5. Please submit requests for these results to: info@andersoneconomicgroup.com. Please include your subscription information along with the request.

TABLE 1. Extended Results from Colorado and Michigan

Legal Status	Market Share	Colorado		Michigan	
		Indicative Business Value	Action	Indicative Business Value	Action
Fully Criminalized	Low Market Share	\$217.3 M	Invest Big	\$279.4 M	Invest Big
Fully Criminalized	Medium Market Share	\$240.5 M	Invest Big	\$309.1 M	Invest Big
Fully Criminalized	High Market Share	\$258.8 M	Invest Big	\$332.7 M	Invest Big
Fully Criminalized	Full Market Share	\$267.3 M	Invest Medium	\$343.6 M	Invest Medium
Medicinal Only	Low Market Share	\$263.4 M	Invest Big	\$338.5 M	Invest Big
Medicinal Only	Medium Market Share	\$287.9 M	Invest Big	\$370.0 M	Invest Big
Medicinal Only	High Market Share	\$307.3 M	Invest Big	\$395.0 M	Invest Big
Medicinal Only	Full Market Share	\$326.2 M	Invest Medium	\$419.3 M	Invest Medium
Decriminalized	Low Market Share	\$279.3 M	Invest Big	\$359.0 M	Invest Big
Decriminalized	Medium Market Share	\$310.2 M	Invest Big	\$398.8 M	Invest Big
Decriminalized	High Market Share	\$335.8 M	Invest Big	\$431.7 M	Invest Big
Decriminalized	Full Market Share	\$356.7 M	Invest Medium	\$458.5 M	Invest Medium
Fully Legal	Low Market Share	\$281.3 M	Invest Big	\$361.6 M	Invest Big
Fully Legal	Medium Market Share	\$314.2 M	Invest Big	\$403.9 M	Invest Big
Fully Legal	High Market Share	\$348.0 M	Invest Medium	\$447.4 M	Invest Medium
Fully Legal	Full Market Share	\$382.5 M	Invest Medium	\$491.7 M	Invest Medium

Analysis: Supported Intelligence LLC

DISCLAIMER

The business values presented here and in the body of this report are intended to be used as indicators of relative values across U.S. states. These valuations reflect representative groups of businesses, and do not address any specific businesses, operating or otherwise. We encourage readers to seek their own professional legal and financial advice before making investment decisions.