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**INVESTIGATING THE IMPACT OF MARIJUANA LEGALIZATION ON INCOME,
EDUCATION, AND DEPRESSION**

by

Wayne W. Fu

* * * * *

Submitted in partial fulfillment
of the requirements for
Honors in the Department of Economics

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ABSTRACT

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ADVISOR: PROFESSOR YOUNGHWAN SONG

Over the past two decades, marijuana has been the most widely used illicit drug by adolescents in the US. The drug continues to soar in popularity as both a recreational and medicinal drug despite mounting scientific research that marijuana consumption may impair cognitive function including deficits in learning, memory, motivation, and attention. Marijuana use has also been linked to exacerbation of depression and anxiety symptoms. Though federal laws still classify marijuana as an illegal substance, recent state-level legislation has sparked national debate over its legal status. In fact, 23 states and the District of Columbia have legalized marijuana for medical use and four—Colorado, Washington, Alaska, and Oregon—have legalized marijuana for recreational use. This paper investigates the impact that marijuana legalization has on income, education, and depression using cross-sectional and time-series data from the 1996-2013 (not including 2002) Behavioral Risk Factor Surveillance System Survey and 1995-2013 Current Population Survey.

The regressions indicated that marijuana legalization had an effect on several of the outcome variables. Those living in states that permitted marijuana dispensaries had wage premiums and higher self-employment, but males had higher high school dropout rates and females had more depressive days. States that permitted home cultivation were also affected, with increases in depressive days and self-employment for both genders. Finally, states that legalized marijuana for recreational use showed wage penalties for females and decreases in self-employment for both genders. However, there was no evidence that marijuana legalization had an effect on unemployment.

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CHAPTER ONE

INTRODUCTION

A. Marijuana Use in the US

Over the past two decades, marijuana has been the most widely used illicit drug by Americans. During this time period, adolescent use fluctuated, with annual use peaking at 30.1% in 1997 and declining to 22% in 2006 (Johnston et al., 2014). However, the drug has since regained its popularity, with annual teen use rising to nearly 26% in 2013 (Johnston et al., 2014). Marijuana is also the most commonly used illicit drugs in adults. Of the adult illicit drug users, nearly 80% consumed marijuana (SAMSHA, 2014a). Furthermore, the average age of initiation has fallen from 19 years of age in the 1970s, to 18 years of age by 2013 (SAMSHA, 2014a). This trend towards earlier initiation is worrying, especially in light of evidence that suggests that early marijuana consumption leads to impaired educational attainment (Chatterji, 2006). Though federal laws still classify marijuana as an illegal substance, recent state-level legislation has sparked national debate over its legal status. Studies have suggested that legalizing marijuana will not only increase the number of marijuana users, but also increase the quantity of marijuana consumed among both regular and heavy users (Pacula, 2010).

B. History of Marijuana Legalization in the US

Marijuana was first categorized by the Federal Government as a Schedule I drug under the Controlled Substance Act of 1970. Schedule I drugs are classified based on their potential for abuse, lack of acceptance for medical use, or lack of safety use under medical supervision. Nevertheless, states began passing their own legislation to address the medical and recreational use of the drug. In 1996, California was the first to pass a medical marijuana law (MML), allowing patients with a valid physician recommendation to possess and cultivate marijuana for medical uses. Since then, many states have followed California's decision and passed similar

MMLs. Altogether, 24 states and the District of Columbia have passed similar laws to legalize the medical use of marijuana. However these policies may vary in the i) method of state registry and identification, ii) level of medical regulation (disease and condition limitations, physician privileges) and iii) level of access to marijuana including possession and cultivation (Pacula et al., 2002). Some states have gone even further by passing legislation for full legalization of marijuana, including for recreational use. Presently, four states—Colorado, Washington, Alaska, and Oregon—have passed marijuana legalization for recreational use. More are expected to pass a similar law in 2016 with at least five states (Arizona, California, Maine, Massachusetts, and Nevada) being targeted for similar ballot measures (Chokshi, 2014).

C. How Policies Affect Marijuana Consumption

These state-level policy changes in marijuana use will presumably have some effect on marijuana consumption. On the supply-side, it is doubtful that states under a MML will be able to ensure that all medical marijuana is consumed only by the patients they were intended for. It is more likely that a portion of the medical marijuana will be diverted to the recreational market, lowering marijuana prices in the illegal market and ultimately increasing consumption. MML states that decide to legalize marijuana for recreational use would further eliminate more of the black market risk of selling marijuana, leading to even lower prices and presumably higher consumption.

Marijuana legalization may also affect the demand of marijuana by reducing the stigma and negative perceptions associated with marijuana use. Furthermore, medical marijuana laws may encourage acceptance from a population as more users consume marijuana for its apparent medical benefits. Opponents of marijuana legalization argue that these demand-side factors may

promote marijuana use, especially in youth who may underestimate the potential negative health effects of consuming the drug (O'Connor, 2011).

D. The Consequences of Marijuana Consumption

Policy makers continue to monitor the potential consequences of marijuana legalization. Proponents of policy change point out the clear economic benefits of legalization for the government—increased tax revenue, reduced resources for law enforcement—in addition to the boost in employment for the U.S. economy. In fact, the marijuana industry generated an estimated \$3.5 million in tax revenue in Colorado after its first month of legalization, and added thousands more jobs to the 10,000 “green collar” marijuana workforce (Erb, 2014; Lopez, 2014). Altogether, the U.S marijuana industry has been estimated at \$113 billion, representing nearly \$42 billion lost in tax revenues and wasted resources on law enforcement as a result of not legalizing marijuana (Hardy, 2007).

In the meantime, opponents of marijuana legalization highlight the growing body of research on the harmful health effects of marijuana consumption. There is moderate evidence that adolescents and young adults who regularly use marijuana are more likely to have impairments in academic abilities and less likely to graduate from high school, and (Fergusson, Horwood, and Beautrais, 2003; Medina et al., 2007; Lynne-Landsman, Bradshaw, and Ialongo, 2010; Hooper, Woolley, and DeBellis, 2014). Regarding depression, there was mixed evidence on whether or not adolescent and young adult users were more likely to have symptoms or diagnosis of depression in adulthood (Pahl, Brook, and Koppel, 2011; Horwood et al., 2012; Degenhardt et al., 2013; Arseneault et al., 2014).

State governments, including those who have already legalized marijuana, continue to closely monitor its potential negative consequences. For example, the Colorado Department of

Public Health and Environment recently issued a report detailing their concerns about the impact of marijuana legalization on the state's health (CDPHE, 2014). In addition to the negative health effects mentioned above, they advocate for better standardization of data and improved monitoring of use patterns and health outcomes. Moreover, they mention limitations in research (e.g. not enough focus on occasional marijuana use) that may restrict the generalization of effects of marijuana use.

E. Contributions and Organization of this Paper

The purpose of this paper is to analyze the impact of legalization of marijuana on income, education, depression, unemployment, and self-employment. Data from the 1995-2013 Behavioral Risk Factor Surveillance System (BRFSS) and 1995-2013 Current Population Survey (CPS) was used to investigate the effect of marijuana legalization on wages, high school dropout rate, and frequency of depression. This paper finds some evidence that marijuana legalization and policy dimensions have an impact on the outcome variables. For instance, those living in states that permitted marijuana dispensaries had wage premiums and higher self-employment, but higher high school dropout rates and more depressive days. States that permitted home cultivation were also affected, with increases in depressive days and self-employment. Finally, States that legalized marijuana for recreational use showed wage penalties for females and decreases in self-employment for both genders. However, there was no evidence that marijuana legalization had an effect on unemployment.

The organization of this paper is as follows. Chapter Two provides a review of the existing literature regarding marijuana legalization and effects of marijuana use on income, education, and depression. Chapter Three describes the econometric models used in this analysis. Chapter Four provides a description of the data set used to assess the impact that

legalization and specific dimensions of the policies have on the outcome variables. Chapter Five presents the results of this econometric analysis, and Chapter Six provides conclusions.

CHAPTER TWO

A REVIEW OF MARIJUANA LEGALIZATION AND EFFECTS OF MARIJUANA USE

This chapter provides a review of the existing literature concerning: i) the impact of medical marijuana legalization, ii) the impact of marijuana legalization for recreational use, iii) the benefits of legalization, and iv) the adverse effects of potential consequences of marijuana consumption.

A. Impact of Medical Marijuana Laws and Full Legalization

Opponents of marijuana legalization have suggested that medical marijuana laws in the 24 states and District of Columbia may be an important factor in the recent trend towards increasing recreational marijuana use. Findings from published studies have shown mixed results; while many studies have found that medical marijuana laws do not appear to increase use of the drug (Anderson, Hansen, and Rees, 2014; Harper et al., 2012; Lynne-Landsman, Livingston, and Wagenaar, 2013), others have found an association of higher marijuana use in states with medical marijuana laws (Wall et al., 2011; Cerdá et al., 2012; Friese and Grube, 2013). However, Sevigny, Pacula, and Heaton (2014) have found evidence that medical marijuana laws may be responsible for higher potency marijuana by influencing the marijuana strains that are sold; medical marijuana strains typically have higher potency than that of recreational marijuana sold in the black market. On average, the states that had medical marijuana laws had marijuana with higher concentrations of THC, the main psychoactive component in marijuana. This may have underestimated the amount of marijuana consumed because users consumed less of the higher potency marijuana to reach the same level of intoxication.

Furthermore, Pacula et al. (2013) has suggested that sampling limitations in previous studies may have been responsible for these inconsistent results. In particular, many studies treat medical marijuana laws as homogenous when in reality, specific policy dimensions vary from state to state. For example, Lynne-Landsman, Livingston, and Wagenaar, 2013 compared marijuana use between several states including Michigan and Colorado even though Michigan did not have a dispensary system, which may have made marijuana more accessible to the general population. Moreover, the timing of these policy changes may also influence the impact of medical marijuana laws on marijuana use. For instance, Colorado's dispensary and cultivation restrictions were only relaxed in 2009, eight years after its medical marijuana laws came into effect. In fact, while Pacula et al. (2013) found no differences in marijuana consumption when treating marijuana medical laws homogeneously, including specific components in marijuana medical laws—home cultivation and legal dispensaries—generated positive associations with marijuana use in each data set.

B. Effect of Legalization on Marijuana Prices and Consumption

Both forms of marijuana legalization, either for medical or recreational use, will at least eliminate part of the black market risk premium of supplying the marijuana market, which will inevitably lower the monetary price of marijuana (Pacula, 2010). Extensive research has been focused on how these changes in the monetary price of marijuana will affect consumption (Nisbet and Vakil, 1972; Chaloupka et al., 1999; Kosterman et al., 2000; Jacobson, 2001; DeSimone and Farrelly, 2003; Williams et al., 2006; van Ours and Williams, 2007; Pacula, 2010).

Pacula (2010) further separates the effects of marijuana price reductions depending on the type of user: initiates/light users and regular users. Initiates/light users are those who are

experimenting or consume small amounts infrequently and regular users are those who consume small to moderate amounts more frequently.

B1. Initiates and Light Users

Those contemplating experimentation with marijuana for the first time or consume marijuana infrequently are likely to be sensitive to monetary price changes (Jacobson, 2001; van Ours and Williams, 2007). Historically, marijuana initiation has peaked in the late-adolescent years (Chaloupka et al., 1999; Kosterman et al., 2000; Pacula, 2010). Estimates for initiation elasticities among youth have ranged from -0.3 (Pacula, 2001) to -0.5 (van Ours and Williams, 2007). In other words, a 10% reduction in the monetary price of marijuana would lead to a 3-5% increase in marijuana consumption. On the other hand, results from other studies (DeSimone and Farrelly, 2003) suggested that juvenile marijuana demand is not likely to be price sensitive because teenagers (aged 12-17) may rely on their parents' money to purchase the drug.

B2. Regular Users

The economics literature characterizes regular users as those who have consumed marijuana within the past 30 days, or 12 times per year. One early study (Nisbet and Vakil, 1972) surveyed the amount of marijuana that college students were willing to purchase at different prices and estimated participation elasticities ranging from -0.7 to -1.0, suggesting that demand for marijuana in regular users was fairly sensitive to changes in price. These results were consistent with more recent studies (Williams et al., 2006), which investigated annual prevalence rates of college students. They estimated annual participation elasticities of -0.16 for students aged 18-20, and -0.26 for students aged 21-24 (Williams et al., 2006). In other words, a 10 percent decrease in marijuana prices on average would lead to a 1.6-2.6% increase in consumption among college users.

C. Effect of Marijuana Legalization on Social Norms

There has also been substantial evidence suggesting that social norms are correlates of marijuana consumption (Pacula et al., 2000; Jacobson, 2001). Bachman et al. (1998) suggested that changes in social norms (e.g. decreases in perceived risk of harmfulness and in disapproval) were important determinants of changes in marijuana consumption and may have partially explained the rise in marijuana use among youth. Pacula et al. (2000) also support this notion, with findings suggesting that a 10% decrease in the perceived harm of marijuana would generate a 28.7% increase in annual marijuana use in youth. Changes in legal penalties for marijuana use were also related to a reduction in perceived harmfulness. For instance, a one-day increase in minimum jail-time was associated with a 7-9% percentage point reduction in annual marijuana use among 10th graders (Pacula, Chiqui, and King., 2003), while higher average fines for marijuana possession were associated with lower teen marijuana use (Farrelly et al., 2001). Youth marijuana consumption was also expected to increase as peer disapproval decreased. A study (Palamar, Ompad, and Petkova, 2014) surveying non-cannabis using US high school seniors found that 10 percent of them intended to initiate use if marijuana was legal to consume and legally available. This shift in perceptions about marijuana use was also reflected in national polls where over half of respondents supported legalization and 64% felt that the federal government should not enforce federal anti-cannabis laws in Colorado and Washington (Pew Research Center, 2013).

D. Negative Consequences of Marijuana Consumption

Marijuana use has continued to rise in popularity as both a recreational and medicinal drug despite mounting scientific research that marijuana consumption may impair cognitive functions including deficits in verbal learning, memory, motivation, and attention (Hall and Degenhardt, 2009).

Findings from previous studies have supported the negative consequences that marijuana consumption has, particularly on the youth. Yamada, Kendix, and Yamada (1993) used data from the National Longitudinal Survey of Youth (NLSY) in 1982 and found that marijuana use was correlated with lower high school graduation rates. Other studies have also found the positive relationship between illicit drug use and high school dropout rates (Mensch and Kandel, 1988); early marijuana initiation doubles high school dropout rates (Bray et al., 2000); and that early marijuana initiation is associated with a reduction in the number of years of education (Chatterji, 2006).

International research has also produced similar evidence demonstrating the effect of marijuana consumption on educational attainment. An Australian study (van Ours and Williams, 2007) suggested that starting marijuana before age 15 reduces the years of education by 0.8 years in males and 1.3 years in females. Earlier marijuana initiation at age 13 further reduces the years of education an additional 0.3 years in males and 0.6 years in females. Assuming a traditional increase in wages of 7-10% for every additional year of education, early marijuana initiation can also affect earnings substantially in the future (van Ours and Williams, 2009). Similarly, Gill and Michaels (1992) examined the effect of heavy drug use on employment and found that drug users had lower employment levels than that of non-drug users. Ringel, Ellickson, and Collins (2002) investigated the impact of early marijuana use in high school students on annual earnings at age 29. After controlling for demographics, personality, and human capital variables, they found a large negative relationship between heavy marijuana use and annual earnings. Among the human capital variables, they found that educational attainment had the largest impact on the coefficient for marijuana use suggesting that marijuana use indirectly reduces earnings by hindering accumulating of job-related skills. Earlier studies (Register & Williams, 1992;

Kaestner, 1994) also found that lifetime use and 30 day use negatively affected in wages and among young male workers, long-term and on-the-job use of marijuana was related to decreases in wages by 73% and 17%, respectively.

Studies on the effects of marijuana use on frequency and likelihood of depression have had mixed results. Marijuana use has been linked to exacerbation of depression and anxiety symptoms (Grotenhermen, 2003) and evidence that they are more likely to suffer from mental health problems (van Ours and Williams, 2001, Brook et al., 2002; Fergusson et al., 2003). Green and Ritter (2000) have also shown evidence that there may be a weak and indirect effect of early marijuana use (age 16 or before) on mental health. It was proposed that much of the effect of early marijuana use on depression was mediated through decreased educational attainment or lower likelihood of employment or marriage. Other comprehensive studies (Paton, Kessler, and Kandel, 1977; Bovasso, 2001; Brook et al., 2001; Degenhardt, Hall, and Lynskey., 2003) found a consistent association between marijuana use and depressive disorders. This association may have been caused by confounding factors or bias (e.g. individuals who have psychiatric disorders are more likely to consume marijuana). Nevertheless, a systematic review of literature analyzing cannabis use and risk of mental health outcomes determined that the results from previous studies were sufficient to justify policy implications to increase awareness of the potential consequences (Moore et al., 2007). On the other hand, many studies have evidence to support that adult marijuana use is not associated with depression later in life. Green and Ritter (2000) found no significant relationship between adult marijuana use and depression in later adulthood, which is consistent with other studies (Harder et al., 2006) that found adult marijuana use does not significantly predict later development of depression.

E. Contribution of this Paper

Since legalization of marijuana for recreational use has only occurred in recent years and states have been constantly updating their legalization policies, this paper examines the effects of these policy changes on the outcome variables using the most recent data on marijuana use.

Moreover, this paper uses a wider period of data (1995-2014) to investigate the effects of both medical marijuana laws and legalization for recreational use over the past two decades. It also considers different policy dimensions (e.g. home cultivation, dispensaries) instead of treating marijuana laws homogenously.

CHAPTER THREE

ESTIMATING THE EFFECT OF MARIJUANA LEGALIZATION ON THE OUTCOME VARIABLES

This chapter describes the econometric model used in this analysis. In addition to discussing each of the dependent and independent variables, the chapter outlines the statistical methodology used in this study.

A. Econometric Model to Estimate the Effects of Marijuana Legalization

Marijuana Outcomes

$$\begin{aligned} &= \beta_0 + \beta_1 \text{LEGALIZED} + \beta_2 \text{MEDICAL} + \beta_4 \text{DISPENSARY} + \beta_5 \text{HOME} \\ &+ \beta_6 \text{BLACK} + \beta_7 \text{HISPANIC} + \beta_8 \text{OTHER} + \beta_9 \text{AGE} + \beta_{10} \text{AGE} + \beta_{11} \text{STATE} \\ &+ \beta_{12} \text{HSGRAD} + \beta_{13} \text{SOME_COLLEGE} + \beta_{14} \text{COLLEGE_GRAD} \\ &+ \beta_{15} \text{EMPLOYED} + \beta_{16} \text{UNEMPLOYED} + \beta_{17} \text{PARTIME} + \beta_{18} \text{MARRIED} \\ &+ \beta_{19} \text{FEMALE} + \beta_{20} \text{YEAR} + \varepsilon \end{aligned}$$

where ε is a stochastic disturbance term.

Dependent Variables for Marijuana Outcomes

<i>INCOME</i>	The natural log of the hourly wage rate of the respondent
<i>DROPOUT</i>	Dummy variable that indicates if the respondent dropped out of high school or not.
<i>DEPRESSION</i>	Days during the past 30 days when respondent had some form of depression
<i>UNEMPLOY</i>	Dummy variable that indicates if the respondent was unemployed or not
<i>SELF-EMPLOY</i>	Dummy variable that indicates if the respondent was self-employed or not

Note: Responses from the CPS surveys will be used for the INCOME, DROPOUT (only respondents aged 16-18 years), UNEMPLOY, and SELF-EMPLOY variables, and responses from the BRFSS survey will be used for the DEPRESSION variable.

Key Independent Variables

<i>LEGALIZED</i>	1 if the individual's state has legalized marijuana for recreational use; 0 otherwise
<i>MEDICAL</i>	1 if the individual's state has legalized medical marijuana; 0 otherwise
<i>DISPENSARY</i>	1 if the individual's state permits medical marijuana dispensaries; 0 otherwise

HOME 1 if the individual's state permits home cultivation; 0 otherwise

Other Independent Variables

Race/ethnicity of respondent (reference group: non-Hispanic White)

BLACK 1 if the respondent is non-Hispanic Black; 0 otherwise

HISPANIC 1 if the respondent is Hispanic; 0 otherwise

OTHER 1 if the respondent is a race other than White, Black, or Hispanic; 0 otherwise

AGE Age of the respondent in years

AGE-SQ The square of the age of the respondent

STATE Dummy variable that indicates the individual's state of residence

Educational Level of Respondent (reference group: did not graduate high school)

HSGRAD 1 if the respondent is a high school graduate; 0 otherwise

SOME_COLLEGE 1 if the respondent has attended college but has not earned a Bachelor's degree; 0 otherwise

COLLEGE_GRAD 1 if the respondent has earned a Bachelor's degree or higher; 0 otherwise

Employment Status (reference group: not in the labor force)

EMPLOYED 1 if the respondent is employed either full-time or part-time; 0 otherwise

UNEMPLOYED 1 if the respondent is unemployed; 0 otherwise

PARTIME 1 if the respondent is employed part-time; 0 otherwise

Marital Status (reference group: never married)

MARRIED 1 if the respondent is married; 0 otherwise

Sex of the Respondent (reference group is male)

FEMALE 1 if the respondent is female; 0 otherwise

YEAR Dummy variable that indicates the year the survey was administered

Note: PARTIME is only used for the INCOME regression

B. Estimation Methods

This paper estimates the econometric model using ordinary least squares (OLS) and probit model regressions. Probit analysis is used for the DROPOUT, UNEMPLOY, and SELF-EMPLOY variables because they can only take on binary values (e.g. either high school dropouts or not high school dropouts).

The model uses several dependent variables. The first, INCOME, is the natural log of respondents' hourly wages. The second, DROPOUT, is a dummy variable that indicates whether high school students (aged 16-18) dropped out of high school or not. Third is DEPRESSION, which indicates the number of days that respondents suffered from depressive symptoms in the past 30 days. The fourth, UNEMPLOY, is a dummy variable that indicates whether the respondent was unemployed (looking for work or laid off). The final dependent variable, SELF-EMPLOY, is a dummy variable that indicates whether the respondent was self-employed (incorporated or not-incorporated).

There are four key independent variables, LEGALIZED, MEDICAL, DISPENSARY, and HOME, which were generated to investigate the impact of the two major forms of marijuana legalization (either for recreational or medical use), and specific dimensions of these policies (permitting dispensaries or home cultivation). Both forms of marijuana legalization are expected to increase marijuana consumption. Studies have found that states with medical marijuana laws typically have more marijuana consumption than those that do not (RMHIDTA, 2014). Moreover, although states have only recently begun legalizing marijuana for recreational use, states like Colorado have already seen increases in annual marijuana use for several high-risk age groups (SAMSHA, 2014). In turn, marijuana use has been associated with lower wages, decreased educational attainment, and increased likelihood of depressive symptoms, which

researchers believe are mediated by cognitive deficits (e.g. verbal learning, memory, attention) and negative neurodevelopmental effects, especially in the youth (Hall and Degenhardt, 2009; McQueeney et al., 2011). Thus, I predict that states that are legalized for recreational or medical use, and permit dispensaries and home marijuana cultivation will have lower incomes, higher dropout rates and, higher depression rates. Despite these potential negative effects, marijuana use has not been found to affect occupational attainment (MacDonald and Pudney, 2000). Thus, I predict that these states will have no change in unemployment rates. Furthermore, since there is some evidence that drug dealers are more likely to choose legitimate self-employment than non-drug dealers, I also predict that these states will have higher self-employment rates.

Aside from the key independent variables, a number of variables are included to control for demographic characteristics and other determinants of the outcome variables. They include: marital status (married, never married); education level (high school dropouts, high school graduate, some college, and college graduate); race (Non-Hispanic White, Non-Hispanic Black, Hispanic, and other); employment status (employed, unemployed), age, age-squared, and dummy variables for part-time employment (only for INCOME regression), gender, year and state of residence. These variables should significantly affect the outcome variables. Married individuals are generally happier due to companionship and support, receive higher wages due to greater financial responsibilities, and have higher educational level than those who are unmarried (Hill, 1979; Coombs, 1991). Also, part-time employees are generally paid less per hour of work than full-time employees. As one's education level increases, they are also typically happier, have higher wages, and more likely to employed. Similarly, age and age-squared are included assuming that as age increases, wages will increase as a result of increased experience and skills. Consequently, older individuals who have more work experience will be more likely to be

employed. Regarding depression rates, research shows that depression falls in early adulthood, but rises in later adulthood to reflect the gains and losses of marriage, employment, and economic well-being (Mirowsky and Ross, 1992).

CHAPTER FOUR

DESCRIPTION OF DATA

This study uses cross-sectional and time-series data from the 1996-2013 (not including 2002) Behavioral Risk Factor Surveillance System (BRFSS) Survey and 1995-2014 Current Population Survey (CPS) to explore the effect of marijuana legalization on income, education, depression, unemployment, and self-employment¹.

A. Overview of the 1996-2013 Behavioral Risk Factor Surveillance System (BRFSS)

The BRFSS Survey is conducted by the Centers for Disease Control and Prevention (CDC). This survey is the primary source of information concerning health-related risk behaviors and events, chronic health services, and the use of preventative services. The BRFSS is the largest continuously conducted health survey system in the world, reaching over 400,000 Americans annually in all 50 states in addition to the District of Columbia and three U.S. territories. The CDC provides technical assistance to state health departments, which use in-house interviewers, telephone call centers, or universities to administer the survey continuously throughout the year. The survey is conducted using the Random Digit Dialing technique and is administered to respondents over 18 years old. The BRFSS collects state data concerning health-related risk behaviors and events. In particular, it asks the respondents to list the number of days that they have been feeling depressed. These responses are used for the DEPRESSION variable.

B. Overview of the 1995-2014 Current Population (CPS) Survey

I also collected data from the Current Population Survey. The CPS is conducted monthly by the Bureau of the Census for the Bureau of Labor Statistics and provides primary information

¹ The 2002 BRFSS responses were excluded because it was missing a substantial portion of responses regarding depression

on the labor force characteristics of the US population. It reaches about 60,000 households that are representative of the civilian noninstitutional US population.

The CPS surveys households four consecutive months, leaves the sample for eight months, and returns for another four months of surveying. Surveys for the first and fifth months are conducted in-person, while the remaining months are conducted over the telephone. I used data from the March CPS for the wages, high school dropouts (aged 16-18 only), unemployment, and self-employment of respondents.

C. Selection of the Sample and Descriptive Statistics

The full sample used in this paper contains 2,212,076 respondents from the Current Population Survey data (used for INCOME, DROPOUT, UNEMPLOY, and SELF-EMPLOY) and 4,548,731 from the Behavioral Risk Factor Surveillance Survey (used for DEPRESSION). States were also controlled for different policy dimensions (dispensaries and home cultivation) and the timing of them. Table 1 shows the evolution of these dimensions across different states through the end of 2014.

For the first dependent variable, INCOME, the wages of workers between the ages of 25-64 were selected from the outgoing rotation groups (those in their fourth and eight months of the CPS survey). Only employed individuals working in private, federal government, state, and local governments were included because this particular variable focuses on the effects of marijuana legalization on those who are active in the labor force. Table 1 shows the descriptive statistics for the 223,841 respondents that met the criteria for the INCOME variable. The average log of hourly wages is 2.98. The average age of the respondents was slightly above 42 years, which is about halfway in the 25-64 year old age range. Non-Hispanic Whites comprised the largest proportion of observations at nearly 75%, followed by Blacks (9.9%), Hispanic (9.6%), and

Other (6.6%). The respondents had about equal proportions of education levels for high school graduates (30%), some college degree (29%), and college degree or higher (34%), but only 7.7% for less than high school. About 64% of the respondents were married compared to the 36% that were single. Given the age range, it seems reasonable that most of the respondents would be married and have at least completed high school.

The second dependent variable, DROPOUT, only included respondents who were between the ages of 16 and 18 and have not yet finished high school since this variable only considers high school dropouts. Table 2 shows the descriptive statistics for the 149,507 respondents that meet this criterion. The dependent variable measured the proportion of these respondents that were not in high school. Only a small proportion of 16-18 year olds (7.2%) were not in high school at the time of their survey. This is reasonable since most individuals in that age range are high school students. Most of the respondents were non-Hispanic Whites (63%) followed by Hispanics (18%), Blacks (11%), and Other (7.2%). As expected, the majority of 16-18 year olds were not married (99.48%) compared to those that were married (0.52%).

The third dependent variable, DEPRESSION, was based on 4,548,731 observations. This number did not include respondents who responded with “don’t know/not sure”, or refused to answer. No age groups were excluded from this analysis. However, the BRFSS only surveys respondents aged 18 years or older. Table 3 displays the descriptive statistics. The BRFSS survey question asked respondents “During the past 30 days, for about how many days have you felt sad, blue, or depressed?” The average number of depressive days in the past 30 days was just over three days. The average age of the respondents was about 49 years old. The racial distributions were slightly different than those in the CPS data sets with Non-Hispanic Whites claiming a much larger share (80%) compared to Blacks (8%), Hispanics (7.4%), and Other

(4.4%). However, the relative proportions for education level were about the same with 9.2% less than high school, 30% graduating high school, 27% in some college, and 34% with some college degree or higher. Approximately 55% were married and 45% were single.

The last two dependent variables, UNEMPLOY and SELF-EMPLOY, was based on 1,838,728 observations. This number only included respondents aged 25-64. Table 4 shows the descriptive statistics. Respondents had an average of 5.1 % unemployment and 9% self-employment, and an average age of about 43 years. The racial distributions were similar as well with 67% Non-Hispanic Whites, 10% Black, 15% Hispanic, and 7.5% Other. The proportion of respondents who graduated high school, had some college degree, or had a college degree was about the same at 30% each. The remaining 12% of respondents had less than a high school education level. For marital status, 65% were married and 35% were single.

CHAPTER FIVE

ESTIMATION RESULTS: QUANTIFYING THE EFFECT OF MARIJUANA LEGALIZATION ON THE OUTCOME VARIABLES

This chapter presents the results of the regression analysis. It is divided into five subsections. These subsections discuss the effect of marijuana legalization on: i) income, ii) education, iii) depression, iv) unemployment and v) self-employment. Although this paper focused primarily on the first three outcome variables, regressions for unemployment and self-employment are included to further explore the impact of marijuana legalization on the labor force. Key independent variables of interest for all models are based on each state's legal policy on marijuana use. States can: i) be legalized for recreational, ii) be legalized for medical use, iii) permit dispensaries, and iv) permit home cultivation. All of the models are split by gender to reflect the difference of marijuana effects on adolescent neurodevelopment between males and females (Medina et al., 2009; McQueeney et al., 2011).

A. The Effect of Marijuana Legalization on Income

The first model uses an OLS regression with the log of hourly wage as the dependent variable. Other independent variables include relevant demographic characteristics including age, race, education, marital status, education, and dummy variables for part-time employment, year, and state. Table 6 presents these results with both genders in the first column, males in the second column, and females in the third column.

Controlling for other independent variables, both genders, males, and females in states that permit marijuana dispensaries show a significant wage premium of 2.3 percent (at the 0.01 level), 1.9 percent (at the 0.10 level), and 2.8 percent (at the 0.05 level), respectively. Although dispensaries are usually associated with selling medical marijuana, states that have legalized recreational marijuana may also permit recreational (as opposed to medical) dispensaries. In

these states, the dispensaries are popular destinations for locals and tourists alike and can represent a lucrative opportunity for those involved in the marijuana retail business. For instance, recreational dispensaries in Colorado sold a record-breaking \$22 million in retail marijuana, with some selling as much as \$100,000 a month (Git, 2014; Ferner, 2014).

Females in states that legalized marijuana for recreational use show a wage penalty significant at the 0.05 level of -9.8 percent, *ceteris paribus*². Although there has been no research to date that can explain the female wage penalty in states that have legalized recreational marijuana use, studies have shown a significant negative relationship between early marijuana use and earnings later in life (Ringel, Ellickson, and Collins; 2006). The researchers suggested that this may be due to the cumulative effect of marijuana use on cognitive and academic abilities. The independent control variables show the expected results. Age, age-squared, increasing years of education, and marriage all had significant positive coefficients. Hispanics, Blacks, and other races all showed significant negative coefficients.

B. The Effect of Marijuana Legalization on Education

The second model uses a probit regression to estimate the effects of marijuana legalization on high school dropout rates. The probit analysis is used because the outcome variable, high school dropouts, can only take on two values: respondents who dropped out and those who did not dropout. The probit model estimates the probability that an observation will fall into one of these categories. Other independent variables include relevant demographic characteristics including age, race, and marital status. This estimation is restricted to only respondents aged 16 and 18. Table 7 presents estimates of the marginal effects split into three columns based on gender.

² Dummy variables in log-linear regressions are calculated using the equation $(\exp(\beta)-1) \times 100\%$ where β is the coefficient

Controlling for other independent variables, males in states that permitted marijuana dispensaries showed a significantly higher dropout rate at the 0.05 level. On average, states that permitted marijuana dispensaries increased the dropout rate for males by 1.2 percentage points, *ceteris paribus*. While this contrasts evidence found in the literature that suggests that marijuana use is more likely to cause dropouts in females (Flisher and Chalton, 1995), the paucity of recent research focused specifically on marijuana legalization leaves much uncertainty regarding the impact of legalization changes on high school dropout rates.

C. The Effect of Marijuana Legalization on Depression

The third model also uses an OLS regression with the number of days with depression in the past 30 days as the dependent variable. Other independent variables include relevant demographic characteristics including age, race, education, marital status, and education. Table 8 presents these results based on gender.

Controlling for other independent variables, both genders and females in states that permitted marijuana home cultivation showed a significant difference in days of depression in the past thirty days at the 0.05 level. On average, females in states that permitted home marijuana cultivation had 0.297 more days of depression in the past thirty days compared to those in states that did not permit home marijuana cultivation, *ceteris paribus*. Likewise, on average, both genders in states that permitted home marijuana cultivation had 0.205 more days of depression in the past thirty days compared to those in states that did not permit home marijuana cultivation, *ceteris paribus*. These results are supported by previous literature indicating that females may be more prone to the negative health effects of marijuana including a higher risk of mental disorders. McQueeney et al. (2011) suggests that earlier neurodevelopment in females makes

them less likely to counteract the negative effects of consuming marijuana, leaving them more vulnerable to depression and anxiety.

On the other hand, females in states that permitted dispensaries had a significantly lower depression rate, holding other independent variables constant. On average, females in states that permitted marijuana dispensaries suffered 0.482 fewer days of depression, *ceteris paribus*. This contrasts evidence (as mentioned above) that suggests that females may be more vulnerable to depressive symptoms due to earlier neurodevelopmental processes in females. However, a lack of high-quality research, particularly on marijuana dispensaries, creates some uncertainty over their effect on marijuana users' depression rates.

D. The Effect of Marijuana Legalization on Unemployment

The fourth model uses a probit regression to estimate the effects of marijuana legalization on unemployment. This estimation's dependent variables indicate if the respondent is unemployed or not unemployed. Other independent variables include relevant demographic characteristics including age, race, and marital status. Table 9 presents estimates of the marginal effects split into three columns based on gender. The first column includes both genders, the second includes only males, and the third includes only females. There appears to be a negligible impact of marijuana legalization on unemployment—none of the key independent variables were significant at a 0.05 level. In the literature, though there has not been much research on the effect of marijuana legalization on unemployment, other studies investigating the effect of marijuana consumption have indicated that increasing levels of marijuana use is associated with higher unemployment levels (Buchmueller and Zuvekas, 1998; DeSimone, 2002; Fergusson and Boden, 2007). It is possible that time lags on marijuana legalization changes mask the effect of

unemployment levels in each state. For instance, three of the four states that have legalized marijuana for recreational use have only done so in the past year.

E. The Effect of Marijuana Legalization on Self-Employment

The fifth and final model uses a probit regression to estimate the effects of marijuana legalization on self-employment. This estimation's dependent variables indicate if the respondent is self-employed or not self-employed. Other independent variables include relevant demographic characteristics including age, race, and marital status. Table 10 presents estimates for the marginal effects split into three columns based on gender.

The results indicate that states that legalized marijuana for recreational use showed significant decreases in self-employment at the 0.01 level. Again, it is possible that time lags on marijuana legalization changes have impacted the self-employment figures. Repeating this study a few years later may show more meaningful results. Moreover, banks have been reportedly been rejecting business from marijuana dispensaries to avoid any federal legal problems (Git, 2014). As the marijuana industry matures and gains acceptance, it is possible that it can generate more self-employed businesses, especially in states that have legalized marijuana and allow dispensaries.

Both genders and females in states that permitted home cultivation showed a significant increase in self-employment (0.4% and 0.9% respectively). Although there has not been substantial research on the impact of home cultivation on self-employment, anecdotal evidence suggests that current regulation laws are more beneficial for black market street dealers than for those working in licensed dispensaries. For instance, licensed marijuana dispensaries are expected to follow strict constantly updated laws and regulations, zoning regulations (at least 1,000 feet from schools, churches, and other dispensaries), and rigid tax codes, while black

market street dealers avoid these expensive regulations and fees (Townes, 2015). In fact, despite lower marijuana prices in legalized states (due to a reduction in the black market premium), illegal street dealers in the underground market can sell marijuana for even lower prices than in legal marijuana dispensaries (Associated Press, 2015; Swanson, 2015). As a result, depending on how strictly each state regulates the legal marijuana market, home cultivation may be a boon for self-employed black market street dealers.

Controlling for other independent variables, both genders, males, and females show a significant increase in self-employment (1%, 1.4%, and 0.6%, respectively) for states that permit marijuana dispensaries. Although the literature does not indicate whether or not marijuana legalization has an effect on self-employment, it is consistent with reports of the profitability of selling marijuana. For instance, the nearly 40 marijuana dispensaries open in Colorado when marijuana generated over \$1 million dollars in sales on the first day of legalization for recreational use.

CHAPTER SIX

CONCLUSIONS

A. Summary of the Findings and Commentary

Using cross-sectional and time-series data from the 1995-2014 CPS survey and 1996-2013 (not including 2002) BRFSS survey, this paper investigated the impact of marijuana legalization on income, education, depression, unemployment, and self-employment. To summarize, both genders, males, and females in states that permit marijuana dispensaries show a significant wage premium, while females that legalized marijuana for recreational use show a significant wage penalty. Regarding education, males in states that permitted marijuana dispensaries had a significantly higher high school dropout rate. The depression regression produced mixed results with both genders, males, and females in states permitting home cultivation showing significant increases in depressive days, but females in states permitting dispensaries showing a significant decrease in depression days. For unemployment, there were no significant correlations with any of the key independent variables. Finally, the probit regression involving self-employment indicated significant increases in states that permitted dispensaries and home cultivation, but significant decreases in states that had legalized for recreational use.

B. Policy Implications

The findings of this study have potentially important implications for policymakers considering marijuana legalization, either for medical or recreational use. Firstly, since states that permitted marijuana dispensaries showed a significant wage premium for males, it suggests that dispensaries may be a profitable business. State governments that are proposing legalization, or have legalized but not yet permitted dispensaries, can use this information to increase tax rates and generate more tax revenue. Some states like Colorado already have a 29% tax rate in place,

and generating nearly \$3.5 million in its first month of legalization for recreational use (Tax Foundation; Erb, 2014).

Regarding education, governmental agencies should be aware of the significantly higher high school dropout rates for males in states that permitted marijuana dispensaries. This may be a warning for states that permit dispensaries to impose stricter guidelines for dispensaries in relation to schools, playgrounds, and public housing to limit its negative influence on the youth population. For instance, they can increase the distance of dispensaries from these locations or limit the number of dispensaries in areas that have higher youth populations.

Governments should also continue to monitor scientific research on the effect of youth marijuana use on depression in later life. Although there is currently mixed evidence as to whether or not marijuana users are more likely to develop symptoms of depression, future research may elucidate some of the uncertainty.

Finally, states that permitted dispensaries and home cultivation also showed a significant increase in self-employment. This information may be useful for states that are currently debating whether or not to permit dispensaries and home cultivation. These policy dimensions may give states a boost in employment and benefit the labor force. On the other hand, governments should be consider the possible negative effects of legalization for recreational use on the labor force since it was found to significantly decrease self-employment.

C. Suggestions for Further Research

Since many states are in the process of legalizing marijuana, either for medical or recreational use, an updated study involving the outcome variables would be appropriate for more meaningful results. This is especially true for the relatively small number of states—only

four— that legalized marijuana for recreational use. Experts are predicting that up to a dozen states, including Arizona, California, Vermont, and Rhode Island, will follow suit by the end of 2016 (Sullum 2015). It might also be useful to control for more minor variations between different marijuana legalization policies to reflect the heterogeneity effects of these laws. For instance, this paper considers whether states permit home cultivation and dispensaries, but future studies can also include whether states require patient registry systems or whether states allow marijuana use only for pain rather than general medical conditions (only applicable in medical marijuana laws).

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Tables

Table 1 Legalization Dates for medical marijuana and recreational use in U.S. States

State	Medical Marijuana Legal Date	Recreational Marijuana Legal Date	Permit Dispensaries (Date)	Permit Home Cultivation (Date)
Alaska	1998	2015	No	Yes (1998)
Arizona	2010		Yes (2010)	Yes (2010)
California	1996		Yes (2003)	Yes (1996)
Colorado	2000	2012	Yes (2012)	Yes (2000)
Connecticut	2012		Yes (2000)	No
Delaware	2011		Yes (2011)	No
DC	2010		Yes (2010)	No
Hawaii	2000		No	Yes (2000)
Illinois	2013		Yes (2014)	No
Maine	1999		Yes (2009)	Yes (1999)
Maryland	2003		No	No
Massachusetts	2012		Yes (2012)	Yes (2012)
Michigan	2008		No	Yes (2008)
Minnesota	2014		Yes (2014)	No
Montana	2004		No	Yes (2004)
Nevada	2001		No	Yes (2001)
New Hampshire	2013		Yes (2013)	No
New Jersey	2010		Yes (2009)	No
New Mexico	2007		Yes (2007)	Yes (2007)
New York	2014		Yes (2014)	No
Oregon	1998	2014	No	Yes (1998)
Rhode Island	2006		Yes (2009)	Yes (2007)
Vermont	2004		Yes (2011)	Yes (2004)
Washington	1998	2012	No	Yes (2011)

Source: Pacula et al., (2013) and Marijuana Policy Project (2014).

Table 2: Descriptive statistics for INCOME with average log of hourly wages as the dependent variable.

Variables	Wages
Dependent Variable	
Average Log of Hourly Wages in 2014 dollars	2.98 (0.61)
Key Independent Variables	
Legalized for Recreational Use	0.0035 (0.38)
Legalized for Medical Use	0.21 (0.41)
Permit Dispensaries	0.087 (0.28)
Permit Home Cultivation	0.18 (0.38)
Independent Variable	
Age	42.42 (10.28)
Age squared	1905.24 (892.19)
Race	
White	0.74 (0.44)
Black	0.099 (0.30)
Hispanic	0.96 (0.29)
Other	0.066 (0.25)
Education Level	
Less than high school	0.077 (0.27)
High school graduate	0.30 (0.46)
Some college	0.29 (0.45)
College or higher	0.34 (0.47)
Part time	0.14 (0.34)
Marital Status	
Single	0.36
Married	0.64 (0.48)
Number of Observations	
	223,841

Note: The reported values are the means. The standard deviations are in parentheses. The means are weighted according to the final annual weights provided by the 1995-2014 Current Population Survey.

Table 3: Descriptive statistics for DROPOUT with high school dropout as the dependent variable.

Variables	High School Dropout
Dependent Variable	
Proportion of 16-18 year olds not in high school	0.072 (0.26)
Key Independent Variables	
Legalized for Recreational Use	0.72 (0.26)
Legalized for Medical Use	0.24 (0.43)
Permit Dispensaries	0.11 (0.31)
Permit Home Cultivation	0.20 (0.40)
Independent Variable	
Age	16.83 (0.77)
Race	
White	0.63 (0.48)
Black	0.11 (0.32)
Hispanic	0.18 (0.39)
Other	0.072 (0.26)
Marital Status	
Single	0.9948
Married	0.0052 (0.072)
Number of Observations	149,507

Note: The reported values are the means. The standard deviations are in parentheses. The means are weighted according to the final annual weights provided by the 1995-2014 Current Population Survey.

Table 4: Descriptive statistics for DEPRESSION, with number of depressive days in the past 30 days as the dependent variable.

Variables	Depression
Dependent Variable	
Number of depressive days in past 30 days	3.42 (7.67)
Key Independent Variables	
Legalized for Recreational Use	0.0047
Legalized for Medical Use	0.24
Permit Dispensaries	0.085
Permit Home Cultivation	0.16
Independent Variable	
Age	48.97 (18.35)
Race	
White	0.80 (0.41)
Black	0.080 (0.272)
Hispanic	0.074 (0.26)
Other	0.044 (0.23)
Education Level	
Less than high school	0.092 (0.29)
High school graduate	0.30 (0.46)
Some college	0.27 (0.45)
College or higher	0.34 (0.47)
Marital Status	
Single	0.45 (0.34)
Married	0.55 (0.50)
Number of Observations	4,548,731

Note: The reported values are the means. The standard deviations are in parentheses. The means are weighted according to the final annual weights provided by the 1996-2013 (not including 2002) Behavioral Risk Factor Surveillance Survey.

Table 5: Descriptive statistics for UNEMPLOY and SELF-EMPLOY, with percent unemployed and self-employed as the dependent variables.

Variables	Unemployment/Self-Employment
Dependent Variables	
Percent Unemployment	0.051 (0.20)
Percent Self-Employment	0.090 (0.29)
Key Independent Variables	
Legalized for Recreational Use	0.0039 (0.063)
Legalized for Medical Use	0.24 (0.43)
Permit Dispensaries	0.11 (0.31)
Permit Home Cultivation	0.20 (0.4)
Independent Variables	
Age	43.12 (10.68)
Race	
White	0.67 (0.47)
Black	0.10 (0.31)
Hispanic	0.15 (0.36)
Other	0.075 (0.26)
Education Level	
Less than high school	0.12 (0.33)
High school graduate	0.31 (0.46)
Some college	0.27 (0.45)
College or higher	0.30 (0.46)
Marital Status	
Single	0.35
Married	0.65 (0.48)
Number of Observations	1,838,728

Note: The reported values are the means. The standard deviations are in parentheses. The means are weighted according to the final annual weights provided by the 1995-2014 Current Population Survey.

Table 6: OLS regression with log hourly wages as the dependent variable.

INDEPENDENT VARIABLES	(1) Both	(2) Male	(3) Female
<u>Key Independent Variables</u>			
Legalized for recreational use	-0.038 (0.028)	0.018 (0.039)	-0.103** (0.042)
Legalized for medical use	-0.004 (0.011)	-0.006 (0.016)	-0.002 (0.016)
Dispensaries permitted	0.023*** (0.008)	0.019* (0.011)	0.028** (0.012)
Home Cultivation permitted	0.006 (0.013)	0.002 (0.018)	0.012 (0.019)
<u>Age</u>			
Age	0.042*** (0.001)	0.047*** (0.002)	0.036*** (0.002)
Age squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
<u>Race</u>			
Black	-0.128*** (0.005)	-0.196*** (0.007)	-0.079*** (0.006)
Hispanic	-0.167*** (0.005)	-0.191*** (0.007)	-0.136*** (0.008)
Other Race	-0.096*** (0.006)	-0.111*** (0.009)	-0.077*** (0.009)
<u>Education</u>			
High School Graduate	0.248*** (0.005)	0.248*** (0.007)	0.257*** (0.009)
Some College	0.397*** (0.006)	0.374*** (0.007)	0.425*** (0.009)
College or higher	0.734*** (0.006)	0.697*** (0.007)	0.775*** (0.009)
Married	0.089*** (0.003)	0.141*** (0.004)	0.036*** (0.004)
Part-time	-0.184*** (0.005)	-0.188*** (0.012)	-0.168*** (0.006)
Female	-0.208*** (0.003)		
Constant	1.674*** (0.026)	1.572*** (0.037)	1.561*** (0.037)
Number of Observations	223,841	113,019	110,822
R-squared	0.262	0.253	0.234

Note: The standard errors are presented in parentheses. The values in the table represent the marginal effects of each independent variable. All of the regressions are weighted according to the final annual weights provided by the Current Population Survey (1995-2014). Dummy variables for state and year were included in the regression but not reported.

*Statistically significant at the 0.10 level.

**Statistically significant at the 0.05 level.

***Statistically significant at the 0.01 level.

Table 7: Probit marginal effects with high school dropout rates as the dependent variable.

INDEPENDENT VARIABLES	(1) Both	(2) Male	(3) Female
<u>Key Independent Variables</u>			
Legalized for recreational use	0.005 (0.013)	0.015 (0.018)	-0.007 (0.018)
Legalized for medical use	0.008 (0.007)	0.009 (0.010)	0.006 (0.009)
Dispensaries permitted	0.004 (0.004)	0.012** (0.006)	-0.006 (0.006)
Home Cultivation permitted	-0.010 (0.008)	-0.017 (0.011)	-0.003 (0.011)
<u>Age</u>			
Aged 17 years	0.031*** (0.002)	0.031*** (0.003)	0.032*** (0.003)
Aged 18 years	0.103*** (0.002)	0.109*** (0.003)	0.097*** (0.003)
<u>Race</u>			
Black	0.019*** (0.003)	0.026*** (0.004)	0.012*** (0.003)
Hispanic	0.061*** (0.002)	0.071*** (0.003)	0.049*** (0.003)
Other	0.008** (0.004)	0.010** (0.005)	0.005 (0.005)
Married	0.196*** (0.007)	0.163*** (0.015)	0.201*** (0.008)
Female	-0.007*** (0.002)		
Number of Observations	149,507	78,161	71,346

Note: The standard errors are presented in parentheses. The values in the table represent the coefficients for each independent variable. All of the regressions are weighted according to the final annual weights provided by the Current Population Survey (1995-2014). Dummy variables for state and year were included in the regression but not reported.

*Statistically significant at the 0.10 level.

**Statistically significant at the 0.05 level.

***Statistically significant at the 0.01 level.

Table 8: OLS regression with the number of depressive days in the past 30 days as the dependent variable.

INDEPENDENT VARIABLES	(1) Both	(2) Male	(3) Female
<u>Key Independent Variables</u>			
Legalized for recreational use	-0.166 (0.139)	-0.027 (0.179)	-0.310 (0.211)
Legalized for medical use	-0.135 (0.096)	-0.204 (0.128)	-0.072 (0.143)
Dispensaries permitted	-0.254 (0.156)	-0.034 (0.213)	-0.482** (0.225)
Home Cultivation permitted	0.205** (0.093)	0.143 (0.125)	0.297** (0.136)
<u>Age</u>			
Age	0.107*** (0.007)	0.089*** (0.010)	0.118*** (0.010)
Age squared	-0.001*** (0.000)	-0.001*** (0.000)	-0.002*** (0.000)
<u>Race</u>			
Black	-0.220** (0.094)	0.168 (0.163)	-0.578*** (0.102)
Hispanic	-0.472*** (0.122)	-0.538*** (0.153)	-0.397** (0.189)
Other Race	0.066 (0.090)	0.211* (0.122)	-0.100 (0.134)
<u>Education</u>			
High School Graduate	-1.206*** (0.105)	-1.189*** (0.144)	-1.221*** (0.153)
Some College	-1.409*** (0.106)	-1.344*** (0.145)	-1.508*** (0.154)
College or higher	-2.400*** (0.111)	-2.153*** (0.145)	-2.706*** (0.166)
Married	-1.352*** (0.050)	-1.359*** (0.070)	-1.468*** (0.074)
Female	1.230*** (0.047)		
Constant	3.795*** (0.237)	3.790*** (0.337)	5.200*** (0.330)
<u>Number of Observations</u>			
R-squared	0.033	0.025	0.029

Note: The standard errors are presented in parentheses. The values in the table represent the coefficients for each independent variable. All of the regressions are weighted according to the final annual weights provided by the Behavioral Risk Factor Surveillance Survey (1996-2013, not including 2002). Dummy variables for state and year were included in the regression but not reported.

*Statistically significant at the 0.10 level.

**Statistically significant at the 0.05 level.

***Statistically significant at the 0.01 level.

Table 9: Probit marginal effects with unemployment as the dependent variable.

INDEPENDENT VARIABLES	(1) Both	(2) Male	(3) Females
<u>Key Independent Variables</u>			
Legalized for recreational use	-0.003 (0.003)	-0.002 (0.005)	-0.004 (0.004)
Legalized for medical use	0.002 (0.001)	0.002 (0.002)	0.003 (0.002)
Dispensaries permitted	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Home Cultivation permitted	-0.001 (0.002)	0.001 (0.003)	-0.002 (0.002)
<u>Age</u>			
Age	0.001*** (0.000)	0.000 (0.000)	0.001*** (0.000)
Age squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
<u>Race</u>			
Black	0.019*** (0.001)	0.023*** (0.001)	0.016*** (0.001)
Hispanic	0.004*** (0.001)	0.002*** (0.001)	0.006*** (0.001)
Other Race	0.004*** (0.001)	0.005*** (0.001)	0.004*** (0.001)
<u>Education</u>			
High School Graduate	-0.011*** (0.001)	0.013*** (0.001)	-0.009*** (0.001)
Some College	-0.019*** (0.001)	0.025*** (0.001)	-0.014*** (0.001)
College or higher	-0.036*** (0.001)	0.045*** (0.001)	-0.028*** (0.001)
Married	-0.022*** (0.000)	0.026*** (0.001)	-0.018*** (0.000)
Female	-0.013*** (0.000)		
Number of Observations	1,838,728	882,128	956,600

Note: The standard errors are presented in parentheses. The values in the table represent the marginal effects for each independent variable. All of the regressions are weighted according to the final annual weights provided by the Current Population Survey (1995-2014). Dummy variables for state and year were included in the regression but not reported.

*Statistically significant at the 0.10 level.

**Statistically significant at the 0.05 level.

***Statistically significant at the 0.01 level.

Table 10: Probit marginal effects with self-employment as the dependent variable.

INDEPENDENT VARIABLES	(1) Both	(2) Male	(3) Female
<u>Key Independent Variables</u>			
Legalized for recreational use	-0.014*** (0.004)	-0.021*** (0.007)	-0.009** (0.004)
Legalized for medical use	-0.004 (0.002)	-0.002 (0.003)	-0.005 (0.002)
Dispensaries permitted	0.010*** (0.001)	0.014*** (0.002)	0.006*** (0.001)
Home Cultivation permitted	0.004** (0.002)	-0.001 (0.004)	0.009*** (0.003)
<u>Age</u>			
Age	0.012*** (0.000)	0.015*** (0.000)	0.008*** (0.000)
Age squared	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
<u>Race</u>			
Black	-0.058*** (0.001)	-0.079*** (0.002)	-0.039*** (0.001)
Hispanic	-0.036*** (0.001)	-0.047*** (0.001)	-0.026*** (0.001)
Other Race	-0.013*** (0.001)	-0.018*** (0.002)	-0.008*** (0.001)
<u>Education</u>			
High School Graduate	0.013*** (0.001)	0.014*** (0.001)	0.014*** (0.001)
Some College	0.020*** (0.001)	0.013*** (0.001)	0.025*** (0.001)
College or higher	0.030*** (0.001)	0.032*** (0.001)	0.029*** (0.001)
Married	0.024*** (0.001)	0.029*** (0.001)	0.019*** (0.001)
Female	-0.055*** (0.000)		
Number of Observations	1,838,728	882,128	956,600

Note: The standard errors are presented in parentheses. The values in the table represent the marginal effects for each independent variable. All of the regressions are weighted according to the final annual weights provided by the Current Population Survey (1995-2014). Dummy variables for state and year were included in the regression but not reported.

*Statistically significant at the 0.10 level.

**Statistically significant at the 0.05 level.

***Statistically significant at the 0.01 level.