DISCUSSION PAPER SERIES

No. 9944

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Ali Palali and Jan C van Ours

PUBLIC POLICY

Centre for Economic Policy Research

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Available online at: **www.cepr.org/pubs/dps/DP9944.php**

ISSN 0265-8003

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Ali Palali, CentER, Tilburg University
Jan C van Ours, CentER, Tilburg School of Economics, University of Melbourne and CEPR

Discussion Paper No. 9944
April 2014

Centre for Economic Policy Research
77 Bastwick Street, London EC1V 3PZ, UK
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820
Email: cepr@cepr.org, Website: www.cepr.org

CEPR Discussion Paper No. 9944

April 2014

ABSTRACT

Cannabis Use and Support for Cannabis Legalization*

We investigate the determinants of the support for cannabis legalization finding a causal effect of personal experience with cannabis use. Current and past cannabis users are more in favor of legalization. We relate this to self-interest and inside information about potential dangers of cannabis use. While the effects of self-interest are not very surprising, the effect of inside information suggests that cannabis use may not be as harmful as cannabis users originally thought it was and not as harmful as non-users are inclined to think it is.

JEL Classification: c31, i18 and k14
Keywords: cannabis use and opinions on cannabis policy

Ali Palali
Department of Economics
CentER
Tilburg University
5000 Le Tilburg
THE NETHERLANDS

Email: a.palali@uvt.nl

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Jan C van Ours
Department of Economics and
CentER
Tilburg University
Room K415
PO Box 90153
5000 Le Tilburg
THE NETHERLANDS

Email: vanours@uvt.nl

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=121886

*The authors are grateful to CentERdata for making their LISS data available for this paper. The authors also thank seminar participants in Tilburg and Potsdam for helpful comments on a previous version of the paper. The authors report no conflict of interest.

Submitted 08 April 2014

1 Introduction

In many countries the production, use and distribution of cannabis is prohibited. However, the legal framework on cannabis is changing as some countries are becoming more tolerant. The Netherlands quasi-legalized cannabis use through the introduction of "coffeeshops" which are licensed cannabis sales outlets. Recently, in two states in the U.S. – Washington and Colorado – a state licensing system for production and supply of cannabis to retail outlets was introduced. There are several alternatives to prohibition varying from decriminalization to regulation and legalization (European Monitoring Center for Drugs and Drug Addiction (2013)). Whereas decriminalization refers to the removal of the criminal status for personal possession or use, regulation refers to limits on access and restrictions on advertizing. Legalization refers to cannabis use and cannabis supply, making lawful what previously was prohibited. Although in the policy debate a distinction is made between legalization and regulation of cannabis, we consider regulation as legalization under restrictions and focus on the dichotomy between prohibition and legalization.[1] In the policy debate on cannabis legalization there are frequent references to studies which find that cannabis use has adverse effects on physical and mental health as well as other negative effects on important life outcomes such as educational attainment and labor market position (Ellickson et al. (1999), Brook et al. (1999), French et al. (2001), Arseneault et al. (2004), Van Ours (2006), Van Ours (2007), Van Ours et al. (2013)). In their overview study on the effects of cannabis use, Van Ours and Williams (2014) conclude that there do not appear to be serious harmful health effects of moderate cannabis use but there is evidence of reduced mental well-being for heavy users who are susceptible to mental health problems. Furthermore, they conclude that while there is robust evidence that early cannabis use reduces educational attainment, there remains substantial uncertainty as to whether using cannabis has adverse labor market effects.

While in the previous studies cannabis use is related to outcome variables such as health, education and labor market outcomes, in the current paper we follow a different strategy to establish whether cannabis use has harmful effects. We analyze the determinants of opinions on the legalization of cannabis. We argue that differences in opinions between non-users, current users and past users of cannabis are informative about potential dangers of cannabis use. If cannabis use changes the opinion in favor of legalization of cannabis this is evidence that cannabis use may not be as

[1] What the optimal cannabis policy is from an economic point of view is not clear. A lot of the economic arguments are based on the tradeoff between legalizing cannabis which would allow taxes to be introduced on cannabis use or prohibiting cannabis use because it is easier to limit cannabis supply than to implement taxation. See for studies that analyze the pros and cons of legalization Becker et al. (2006), Caulkins et al. (2012), Glaeser and Shleifer (2001), Miron and Zwiebel (1995).

harmful as individuals originally thought.

It is well-known that cannabis users are more in favor of legalization than non-users. This is confirmed in a European study on youth attitudes toward drugs (European Commission (2011)). Individuals aged 15-24 years in the 27 EU-countries were asked to report their opinions on specific cannabis policies. On average, 60 percent of the youngsters think that cannabis use should be banned, while 40 percent thinks it should be legalized (with or without restrictions). Figure 1 shows that in EU-countries where the percentage of youngsters who ever used cannabis is high, also the support for legalization of cannabis use is high. The graph also shows the situation in the USA where among youngsters of 18-29 years old 36 percent ever tried cannabis and 69 percent thinks that cannabis use should be legalized. In terms of the combination of cannabis use and opinions on legalization the USA and the Netherlands are not very different. Admittedly, Figure 1 is based on only cross-country averages. Nevertheless, more detailed studies have also found that cannabis users are more in favor of legalizing cannabis and less in favor of prohibition than individuals who have never used cannabis. For example, according to a U.S. study which used data collected in 1997 and 1998 in Houston, 68% of drug users were in favor of legalizing cannabis, while only 33% of the non-drug users were in favor (Trevino and Richard (2002)). A study from Norway performed in 1989 shows that 65% of cannabis users were in favor of prohibition of cannabis while among non-users this was 95% (Skretting (1993)). In the Netherlands, in 2008, among cannabis users only 7% was in favor of prohibition of cannabis, while this was 50% among non-users (Van der Sar et al. (2011)). In Australia, in 1998, 57% of cannabis users were in favor of legalizing cannabis while among the non-users this was only 18% (Williams et al. (2011)).

All in all, several studies suggest that support for cannabis legalization is higher among cannabis users. Interesting as this may be in itself, the fact that cannabis users are more in favor of legalizing cannabis does not necessarily imply that opinions are influenced by cannabis use in a causal way. It could be that individuals who are more likely to consume cannabis are also more in favor of legalization without personal experience affecting opinions. Knowing whether or not there is a causal effect from cannabis use to opinions is interesting because if there is a causal effect, this reveals how potential dangers of cannabis use are assessed. If cannabis use has a favorable effect on opinions about cannabis legalization then this may reveal that cannabis use is not as harmful as what it is originally believed. However, such a causal effect may also have to do with self-interest, i.e. cannabis legalization leading to easier access to cannabis and perhaps lower prices. We argue that is is possible to make a distinction between inside information and self-interest by comparing how past cannabis use and current cannabis use affect opinions. Whereas the effect of current

cannabis use may be a mixture of self-interest and inside information, the effect of past cannabis use is related to inside information only.

The concept of self-interest and information in opinions about public policy is not new in empirical studies. Using Californian data, Green and Gerken (1989) find that self-interest plays a decisive role in forming attitudes toward restrictions on smoking and cigarette taxes. Similarly, Funk (2000) and Timberlake et al. (2003) show that when self-interest is involved in decisions about public policies, individuals may act in a way that is beneficial to themselves. Using the same data set as we do, Van der Sar et al. (2011) and Van der Sar et al. (2012) find that those who have never used cannabis are more likely to support prohibition of cannabis in the Netherlands. Using the results of a national survey, Skretting (1993) studies the attitude of the Norwegian population on drug policies finding that those who use cannabis do not consider drug possession as a serious crime. Trevino and Richard (2002), using data from US drug users, find that drug consumers have different attitudes towards drug policies. Although these studies clearly show that there is a significant difference between cannabis users and non-users in the opinions about cannabis policies, they do not establish whether this has to do with a causal relationship. The only study that establishes a causal relationship between user status and opinions on cannabis policy is Williams et al. (2011). They analyze Australian data from cross-sectional surveys over the period 1993 to 2007 using a quasi-panel approach to account for potential endogeneity of cannabis use. The main conclusion is that past users preference for legalization is consistent with information on net benefits of cannabis use while self-interest as contributing to current users support for legalization cannot be ruled out. Although focusing on a similar research question, our study differs from theirs in many aspects including the econometric specification, identification strategy and the findings.[2]

In the empirical part of our analysis, we use a statistical model that allows us to establish the causal effects of cannabis use on opinions about cannabis policies. We focus on two policy statements in a survey conducted in the Netherlands in 2008. Individuals were asked to indicate their support for statements on prohibition and legalization of cannabis. We estimate simultaneous models that integrate cannabis use dynamics and opinions on cannabis use. We find that cannabis user status is correlated with opinions on cannabis legalization. This correlation partly reflects a causal effect. Current cannabis users and past cannabis users seem to have learned from their

[2]Some of the main difference are: Williams et al. (2011) use a quasi-panel approach and apply an Arellano-Bond (AB) procedure to take account of endogeneity of cannabis use. The results presented by the authors show that magnitude of the effect of cannabis use on opinions increases once endogeneity is taken into account. Using a discrete factor approach we find that the effects of cannabis use on opinions decrease once endogeneity is taken into account. Furthermore, thanks to the well informative nature of the Dutch data, we are able to perform several sensitivity checks and a wide range of robustness analysis to support our findings.

experiences and are therefore more in favor of legalizing cannabis. Current cannabis users are more in favor of legalizing cannabis than past cannabis users. This suggests that self-interest plays a role in opinions about cannabis policies but more interestingly, it also suggests that cannabis use may not be as harmful as non-users are inclined to think.[3]

Our contribution to the literature on the economics of cannabis use is threefold. First, we present an analysis of opinions on cannabis policies in a quasi-legal environment. The Dutch respondents have no incentive to misreport as there is nothing illegal about using cannabis. Because of the quasi-legal environment they are also familiar with potential consequences of making cannabis easily available. Second, we establish a causal link from cannabis use to opinions on cannabis policy. Third, we present a novel strategy to investigate the assessment of potential harmful effects by distinguishing between self-interest and inside information.

The set-up of our paper is as follows. In section 2 we give a brief overview of cannabis policy in the Netherlands. In section 3 we discuss our data and give some stylized facts. Section 4 presents our empirical model and in section 5 we discuss our baseline parameter estimates together with estimates from several sensitivity and falsification/placebo analysis. Section 6 finally concludes.

2 Cannabis Policy in the Netherlands

As indicated in the introduction, in the Netherlands, cannabis use is quasi-legalized. Small quantities of cannabis can be bought in cannabis-shops. These are retail outlets and referred to as "coffeeshops". Cannabis policy is focused on health issues (De Graaf et al. (2010)) and can be summarized as *tolerant* (Van Solinge (1999)). The basic aim of the cannabis policy is to lessen the potential harm to users and their environment. Although cannabis together with other forms of soft drugs are tolerated by Dutch authorities, use, production and trade of hard drugs are classified as serious offenses (Palali and van Ours (2013)). The distinction between soft and hard drugs in terms of legal measures is at the heart of drug policy. The intention is to provide an organized environment for cannabis sale, keeping potential customers away from dealers of more harmful illicit drugs and having a control over the quality of cannabis. Coffeeshops are regulated by law. Some of the fundamental rules are: no sale of hard drugs, no advertising, no sale to youngsters below 18 years of age, no nuisance and no more than 500 grams of cannabis on the premises. Failures to operate within the regulations might result in shutting down of the shop. The duration of shut

[3]Note that the expectation about the effect of past use on opinions is not very clear. It can be also the case that past users face with the negative effects of cannabis use and regret the fact that they have used cannabis. Our empirical findings also answer this questiong suggesting that there seems to be no regret.

down depends on the seriousness of the violations committed by the owners of coffeeshops.

The 1980s stand as a crucial period in the history of Dutch cannabis policies. In 1980, the policy of tolerance of coffeeshops was publicly announced by Dutch authorities and this announcement was followed by a sharp increase in the number of coffeeshops (Jansen (1991)). In the mid 1990s there were around 1500 coffeeshops. However, in the 1990s the tolerant cannabis policy was increasingly criticized from inside the country as well as from other countries. In 1995, the Dutch government made changes in the rules under which coffeeshops could operate. From 1996 onwards the limit for personal possession of cannabis was decreased from 30 grams to 5 grams. Moreover the monitoring and punishment of production and trade of cannabis were increased and more importantly local governments were given the opportunity to decide whether or not they wanted to have a cannabis-shop in their municipality. These policies caused a substantial decrease in the number of coffeeshops (Bieleman et al. (2007)). In 1999, there were 846 coffeeshops across the Netherlands, a number that went down to 651 in 2011.

3 Data and Stylized Facts

3.1 Data

Our data are from the 2008 Alcohol and Drugs study, one of the assembled studies of the Dutch Longitudinal Internet Studies for the Social Sciences (LISS) panel. In this specific survey respondents were invited to answer various questions about their opinions on different types of government policies on cannabis. Furthermore, respondents were asked whether they had ever used cannabis and if they answered affirmatively they were faced with the question: *At what age, approximately, did you first use cannabis?* Individuals were also asked to report if they were currently using cannabis, i.e. whether they had used cannabis in the previous 30 days. Because older individuals were never confronted with cannabis supply, we perform our analysis on individuals who were born in 1960 and later. It appears that about 20% of the respondents ever used cannabis whereas less than 5% used cannabis in the previous 30 days. The latter are considered to be current users whereas the others are considered to be past users. A description and summary statistics of all variables used in our analysis are given in Appendix 1.

We use information on past cannabis use and current cannabis use, together with the retrospective question on the age of first cannabis use to perform an analysis of cannabis use dynamics. Figure 2 shows the dynamics in cannabis use. Panel a shows that the starting rate for cannabis

use has a peak at age 17. The probability to use cannabis for the first time is at its highest point at age of 17. There are other smaller peaks at age 19 and 21. After age 25 the probability of using cannabis conditional on not using before virtually becomes zero. Panel b confirms this finding by showing that the slope of the line representing the cumulative probability of using cannabis becomes very small after age 25.

3.2 Stylized Facts

In the main part of our empirical analysis, we focus on two statements. The respondents were asked to indicate their opinion on a scale from 1 to 5 ranging from definitely disagree to definitely agree with the following statement: *cannabis should be prohibited*. We rescaled the responses given to this statement assuming that those who indicated to agree with it would disagree with the statement that *cannabis should be legalized* and vice versa. The respondents were also asked to report their opinion on the statement *coffeeshops should be allowed to sell cannabis.* We assume that this statement on coffeeshops is equivalent to a statement on the current status of cannabis policy in the Netherlands. Panels a and b of Table 1 present the distribution of opinions for the full sample and sub-samples distinguished by user status. On average, the responses are evenly distributed; 45% of the sample agree that cannabis should be legalized whereas another 34% state that they disagree. The remaining 21% is indifferent. Similarly, 46% of the individuals state that they agree with the idea of selling cannabis through coffeeshops whereas 35% disagree.[4]

Dividing the sample into 3 categories based on user status exhibits interesting results. Among current cannabis users only 1 percent definitely disagree and 2 percent disagree that cannabis should be legalized whereas 89 percent agrees. Similarly 85% of the current users of cannabis agree with the statement that coffeeshops should be allowed to sell cannabis. These percentages are different for past users of cannabis of whom 77% disagrees with prohibition whereas 9% agrees with this idea. Similarly 74% of the past cannabis users agree with the statement that coffeeshops should be allowed sell cannabis. The numbers are reversed for those who have never used cannabis in their lives. Almost half of the never users state that they disagree with the idea of legalization whereas only 31% of the never users agree. Among the never users only 32% agree with coffeeshops while 45% of these respondents disagree.

The last column in Table 1 presents the p-values of a chi-square test where we test if the

[4]If no birth year restriction is imposed on the sample, these figures are 39% and 43%, respectively. In 1998 this distribution was very much the same: Back then, 43% of the Dutch population of 19 years and older thought that coffeeshops were admissible while 46% thought they were not admissible (Sociaal en Cultureel Planbureau (1998)).

differences between reported percentages among current, past and never users are statistically significant as compared to never users, never users and ever users respectively. For most of the policy statements, the raw data indicates that there are significant differences in opinions about cannabis policies depending on the user status.

4 Empirical Model

4.1 Cannabis use dynamics

In the analysis of cannabis use starting rates, we assume that individuals become vulnerable to the risk of cannabis use from age 13 onwards. We specify the starting rate for cannabis use at time t ($t = 0$ at age 12) conditional on observed characteristics x and unobserved characteristics u as

$$\theta_c(t \mid x, u) = \lambda_c(t) \exp(x'\beta_c + u) \tag{1}$$

where β_c represent the effects of independent variables and $\lambda_c(t)$ represents individual duration (age) dependence. Unobserved heterogeneity, in this case, is denoted with u which controls for differences in individuals' unobserved susceptibility to cannabis use. We model duration (age) dependence in a flexible way by using a step function $\lambda_c(t) = \exp(\Sigma_k \lambda_k I_k(t))$, where k (= 1,..,8) is a subscript for age categories and $I_k(t)$ are time-varying dummy variables that are one in subsequent categories, 7 of which are for individual ages (age 13, ..,19) and the last interval is for ages above 19 years. Because we also estimate a constant term, we normalize $\lambda_{c,1} = 0$.

The conditional density function of the completed durations until the uptake of cannabis use can be written as

$$f_c(t \mid x, u) = \theta_c(t \mid x, u) \exp(-\int_0^t \theta_c(s \mid x, u) ds) \tag{2}$$

We integrate out the unobserved heterogeneity such that density function for the duration of time until cannabis uptake t conditional on x is

$$f_c(t \mid x) = \int_u f_c(t \mid x, u) dG(u) \tag{3}$$

where $G(u)$ is assumed to be a discrete mixing distribution with 2 points of support u_a and u_b reflecting the presence of two types of individuals in the hazard rate for cannabis uptake. The associated probabilities are denoted as follows: $\Pr(u = u_a) = r$ and $\Pr(u = u_b + u_a) = 1 - r$ with

$0 \leq r \leq 1$, and r is modeled using a logit specification, $r = \frac{\exp(\alpha)}{1+\exp(\alpha)}$.

To account for the discrete nature of the observations of age of onset of cannabis use, the loglikelihood is specified as

$$\sum_{i=1}^{n} d_{c,i} \log \left[F_c(t_i - 1) - F_c(t_i)\right] + (1 - d_{c,i}) \log \left[1 - F_c(t_{s,i})\right] \tag{4}$$

where i is an index for individual, n is the number of individuals in the sample and $d_{c,i}$ is a dummy variable that is equal to 1 if an individual started using cannabis and equal to 0 if an individual did not start using cannabis before being interviewed at age t_s.

In addition to starting rates of cannabis use, we also estimate quitting rates in order to have a complete analysis of cannabis use dynamics. The LISS panel includes questions on the last month use of cannabis. We assume that if the individual reports no use of cannabis in the last 30 days, that individual stopped using cannabis in time period starting from the first use of cannabis until 30 days prior to the survey. The conditional density function for the completed durations until the last use of cannabis can be written as

$$f_q(\tau \mid x_1, v) = \theta_q(x_1, v) \exp(-\theta_q(x_1, v) \cdot \tau) \tag{5}$$

Even though we do not observe the exact time of quitting in terms of age of respondents, we can still analyze the duration of quitting thanks to the interval censored nature of the data. However, note that due to the uncertainty about the exact time of quitting, duration dependence is not estimated here. On the other hand it is certain that the duration of cannabis use, τ, will lie in the interval $[0,\tau_q]$ where τ_q is the difference between age at the time of survey and the age of the first use. This means that we can integrate out the conditional density function over this period to account for the uncertainty of quitting time and obtain the distribution function, F_q. Individuals who report using cannabis in the last 30 days are assumed to be right censored in their quitting i.e. those who did not quit. Since the quitting analysis is performed only on those who ever use cannabis there are no left censored individuals. As in the analysis of the uptake of cannabis, we assume that there are 2 unobserved heterogeneity groups where the probabilities are assumed to follow a logistic distribution. The loglikelihood is specified as

$$\sum_{i=1}^{m} d_{q,i} \log \left[F_q(\tau_{q,i})\right] + (1 - d_{q,i}) \log \left[1 - F_q(\tau_{q,i})\right] \tag{6}$$

where m is the number of individuals that ever used cannabis and $d_{q,i}$ is a dummy variable which has a value of 1 if the individual stopped using cannabis and a value of 0 if the individual did not stop using cannabis.

Finally, we allow for the possibility that conditional on the observed characteristics, the age of uptake and the duration of use cannabis uptake and cannabis quits are correlated through unobserved characteristics. The joint density of completed durations until the uptake of cannabis use and completed durations of cannabis use is specified as:

$$g_1(t, \tau \mid x_1, x_2) = \int_v \int_u f_c(t \mid x_1, v) f_q(\tau \mid x_2, u) dG(u, v) \tag{7}$$

where $G(u, v)$ is the joint distribution of unobserved heterogeneity which assume to be discrete with an unknown number of support points.

4.2 Opinions on cannabis policy

We first model the determinants of opinions on cannabis policy assuming that the dynamics in cannabis use are exogenous. Then we take possible correlation between the two processes into account. Individuals report their opinions on the relevant cannabis policy statements on a scale of 1 to 5; with 1 representing definitely disagree and 5 representing definitely agree. In order to exploit this ordinal character of the dependent variable, we use an ordered probit model with Heckman and Singer type discrete unobserved heterogeneity (Heckman and Singer (1984)). The unobserved latent variable in the ordered response model is defined as

$$y^* = x_2' \beta_p + \rho_c c_c + \rho_p c_p + \epsilon + e \tag{8}$$

where c_c represent current cannabis use, c_p represents past cannabis use and ϵ controls for discrete type of unobserved heterogeneity which is different from the error term e that represents the random error term. The parameters of interest in our study are ρ_c and ρ_p which measure the effect of current and past use of cannabis on the opinions about cannabis policy statements. Furthermore, β_p measures the effect of our control variables whose descriptions and summary statistics are provided in detail in Appendix 1. The observed responses on the cannabis policy statements in the data are,

then, assumed to be

$$y = \begin{cases} 1 \text{ (Definitely disagree)} & \text{if} \quad y^* \leq \mu_1 \\ 2 \text{ (Disagree)} & \text{if} \quad \mu_1 < y^* \leq \mu_2 \\ 3 \text{ (Indifferent)} & \text{if} \quad \mu_2 < y^* \leq \mu_3 \\ 4 \text{ (Agree)} & \text{if} \quad \mu_3 < y^* \leq \mu_4 \\ 5 \text{ (Definitely agree)} & \text{if} \quad \mu_4 < y^* \end{cases} \tag{9}$$

where μ's are to be estimated threshold parameters in the ordered choice models. Assuming that the error term e has a standard normal distribution, we can write the following probabilities for the ordered probit model conditional on observable and unobservable individual heterogeneity[5]:

$$\begin{aligned} &\Pr(y = 1|x_3, \epsilon) = \Phi(\mu_1 - x_3'\beta_p - \epsilon) \\ &\Pr(y = 2|x_3, \epsilon) = \Phi(\mu_2 - x_3'\beta_p - \epsilon) - \Phi(\mu_1 - x_3'\beta_p - \epsilon) \\ &. \\ &\Pr(y = 5|x_3, \epsilon) = 1 - \Phi(\mu_4 - x_3'\beta_p - \epsilon) \end{aligned} \quad . \tag{10}$$

Where $\Phi(.)$ is standard normal cdf. Unconditional probabilities, then, can be written as

$$\Pr(y = j|x_3) = \int_\epsilon Prob(y = j|x_3, \epsilon) dG(\epsilon) \tag{11}$$

where $j \in \{1, 2, 3, 4, 5\}$, denoting ordered responses. $G(\epsilon)$ is assumed to be a discrete mixing distribution with 2 points of support ϵ_a and ϵ_b indicating that conditional on observed characteristics there are 2 types of individuals in the ordered responses given to the policy statements. The associated probabilities are denoted as follows: $\Pr(\epsilon = \epsilon_a) = p$ and $\Pr(\epsilon = \epsilon_b + \epsilon_a) = 1 - p$ with $0 \leq p \leq 1$, where p is modeled using a logit specification, $p = \frac{\exp(\alpha)}{1+\exp(\alpha)}$.

There are a number of assumptions and normalizations which need to be made for model identification. First, we assume that mean and variance of the error term e in the latent equation are 0 and 1, respectively. Since we have heterogeneity specific constants in the model, we also set the first threshold parameter μ_1 to zero. The other threshold parameters are modeled in the following way in order to ensure that probabilities are positive and thresholds are ordered: $\mu_2 = \gamma_1^2$, $\mu_3 = \mu_2 + \gamma_2^2$ and $\mu_4 = \mu_3 + \gamma_3^2$. Finally, we write the likelihood function of the ordered choice model as $\prod_N Prob(y = j|x_3)$.

[5]For simplicity we write $x_3'\beta_p = x_2'\beta_p + \rho_c c_c + \rho_p c_p$

Until now, when estimating the ordered probit model for opinions, we assume that the decision to use cannabis is exogenous, i.e. independent from any factor that would affect the opinions about cannabis policies. However it is possible that there are unobserved personal characteristics that affect both the decision to use cannabis and opinions about cannabis policies. If, for example, certain individuals have an inclination toward cannabis use due to some intrinsic factors that would also lead them to have positive attitudes towards liberal cannabis policies, then we might end up with significant parameter estimates for ρ_c and ρ_p even though there is no causal relationship. In order to control for correlation between unobserved characteristics and establish a causal effect, we jointly estimate the ordered probit model and the mixed proportional hazard models following a discrete factor approach. The joint density function of the completed duration of uptake of cannabis, the duration of cannabis use and opinions on cannabis use is specified as:

$$g_2(t, \tau, y = j \mid x_1, x_2, x_3) = \int_\epsilon \int_v \int_u f_c(t \mid x_1, v) f_q(\tau \mid x_2, u) Prob(y = j \mid x_3, \epsilon) dG(v, w, \epsilon) \quad (12)$$

where $G(v, w, \epsilon)$ is a discrete mixing distribution underlying unobserved heterogeneity affecting age of onset of cannabis use, duration of use and opinions about cannabis policies. This approach is introduced by Heckman and Singer (1984) in order to control for unobserved heterogeneity in hazard rates and used for example by Mroz (1999) to estimate the effects of dummy endogenous variables. The approach is equivalent to a correlated random effects model in which the main idea is that unobserved heterogeneity affecting opinions about cannabis policies and unobserved heterogeneity affecting cannabis use dynamics can be correlated, i.e. they come from a joint mixing distribution. The assumption on support points of this joint distribution defines the types of individuals regarding opinions and cannabis use. If, for example, conditional on observed characteristics there are two types of individuals in terms of uptake of cannabis and two types in terms of quitting cannabis, then there could be four types of individuals in terms of cannabis dynamics. If in addition to this conditional on unobserved characteristics there are two types of individuals in terms of opinions on cannabis policy, then there could be eight types of individuals in terms of cannabis dynamics and opinions on cannabis policy. However, it could also be that there are only two types of individuals in terms of cannabis dynamics: Individuals who are inclined to used cannabis and individuals who will never start using cannabis. If this is the case, then there could be four types of individuals: Those who are more in favor of cannabis policies and more likely to use drugs, those who are less in favor of cannabis policies and more likely to use drugs, those who are more in favor of liberal drug policies and more likely to abstain from drugs and those who are against liberal drug

policies and more likely to abstain from drugs. Finally, if there is a perfect correlation between unobserved heterogeneity behind cannabis use dynamics and opinions, only the first and the last types are identified. An important advantage of using the functional form assumptions behind this approach is that identification is achieved without relying on exclusion restrictions which can be very challenging to find because cannabis use is likely to be affected by the same determinants as opinions on cannabis policy.

5 Parameter Estimates

5.1 Cannabis use dynamics

The parameter estimates of the various models are obtained through the method of maximum likelihood. The parameter estimates of the mixed proportional hazard models describing starting rates and quitting rates of cannabis use are presented in Table 2. The first column presents the results for the starting rates. The parameter estimate for female is found to be negative and significant. Thus, as in previous studies we find that on average females start using cannabis at a later age. Religiosity of the parents during the childhood of respondents is found to be significantly negative. So, as the parents are more religious, the age of initiation to cannabis use increases. Migrant status of the individual is found to be insignificant. Moreover, the degree of urbanization of the municipality has a significant effect on the uptake of cannabis indicating that individuals residing in highly urban areas start using cannabis at earlier ages. The most likely reasons are that cannabis happens to be more available and living styles of individuals might make them more vulnerable to the risk of cannabis use in highly urban regions. Educational attainment does not seem to affect the uptake of cannabis.[6] Finally, there is a clear cohort effect since age at the time of the survey is an important determinant of cannabis uptake. Older cohorts were less likely to start using cannabis. In line with figure 2, age dependency parameters indicate that there is a peak in the uptake of cannabis at age 17 and another peak at age 19. The mass point estimates of column 1 show that unobserved heterogeneity is indeed significant in the data at hand. The estimate of -1.25 for α implies that 22% of the respondents have a high starting rate of cannabis use whereas 78% of them have a substantially lower starting rate.

Column 2 of Table 2 presents the parameter estimates for quitting rates. We find that females are not only more likely to start using cannabis at later ages but they are also more likely to

[6] We assume that educational attainment represents ability since many individuals start using cannabis before finishing school.

quit at earlier ages. The parameter estimate for the first urbanization category is negative and significant, indicating that those who live in highly urban areas quit using cannabis at later ages. Lower educated individuals have a smaller quit rate and individuals from the older birth cohorts have a smaller quit rate as well. Finally, we find that those who start using cannabis at a later age quit earlier, i.e. early starters quit late. Conditional on the observed characteristics we did not find evidence of the presence of unobserved heterogeneity in the quit rate. If we estimate a joint model of cannabis starting and cannabis quitting we find that there is correlation between the two processes through unobserved heterogeneity. However, the second LR-test reported at the bottom of the table compares the independent models of cannabis uptake and cannabis quits against the correlated model. As shown we cannot reject the hypothesis that the two processes are independent.

5.2 Opinions on cannabis use – baseline parameter estimates

Table 3 presents our baseline parameter estimates. The results for the univariate ordered probit model for the first policy statement – cannabis should be legalized – are shown in the first column. We found no evidence of unobserved heterogeneity having a significant effect. The parameter estimates of both past use and current use of cannabis are positive and significant indicating that both self-interest and information may have an effect on opinions. However, the estimates in the first column are based on the assumption that the decision to use cannabis is exogenous to the opinions regarding cannabis policies. The correlated models whose parameter estimates are presented in the second column of Table 3 are obtained after controlling for possible endogeneity. Now, we are able to identify two mass-point in the ordered probit for opinions indicating that once we take correlation with cannabis use dynamics in account there is unobserved heterogeneity affecting opinions.[7] Clearly, the parameter estimates of cannabis use status become smaller in absolute terms indicating that part of the effects found in the univariate model are due to correlated unobserved heterogeneity. The remaining effect may be interpreted as causal. The second LR test shows that past and current cannabis use have significant effects on opinion on cannabis legalization while the third LR test shows that the effect of past cannabis use is significantly smaller than the effect of current cannabis use. The opinions of current cannabis users are expected to be affected by both self-interest and information. The opinions of past cannabis users are not affected by self-interest simply because they are no longer users. Thus, for them their parameter estimates reflect only the

[7]The first Likelihood Ratio test-statistic has a value of 6.6 which is significant with 1 degree of freedom (ϵ_b).

effect of information about cannabis use. The results obtained for past users indicate that cannabis may not be as harmful as they originally thought or as non-users are inclined to think. Past users of cannabis – knowing about cannabis use more than never users – are more likely to support liberal policies. Since the parameter estimate for current users is larger in absolute terms than the parameter estimate for past users there is also evidence of self-interest influencing opinions. Indeed likelihood ratio test 3 in Table 3 shows that we strongly reject the hypothesis that current and past use of cannabis have the same effect on opinions.

5.3 Robustness checks: Sensitivity to policy statements

Table 4 presents the results of a sensitivity analysis focusing on opinions about different types of cannabis policy. For reasons of comparison panel *a* replicates the main findings of Table 3. Panel *b* present the results of the same correlated parameter estimates for the second policy statement on coffeeshops: *It should be permitted to sell cannabis at coffeeshops.* We obtain very similar results. Both current use of cannabis and past use of cannabis have positive and significant effects on opinions. In panel *b* of column (2), similar to column 2 of Table 3, the parameter estimate of current use is found to be twice as large as the coefficient estimate of past use.[8] This suggests that the magnitude of the effect of self-interest is almost the same as that of inside information. For opinions on the first and the second type of cannabis policy there is a causal effect from past cannabis use to opinions. Individuals that used cannabis in the past changed their opinion after they had personal experience with cannabis towards a more liberal policy. They became more likely to support no-prohibition and more likely to support cannabis legalization. This suggests that cannabis use is not as harmful as they originally thought.

Panels *c* to *f* of Table 1 give information about opinions on other drug policy statements which are not directly related to availability of cannabis. For all these policies, the distribution of the responses is very skewed. Almost 90% of the individuals agree with the statements that *coffeeshops should not sell cannabis to people below 18 years old*, *the government should organize education campaigns against drugs*, *there should not be coffeeshops in the vicinity of schools* and *the government should ensure that schools organize education campaigns against drugs.* The percentages

[8]Note that for the second policy, we can identify a significant unobserved heterogeneity in the univariate model although the estimated probability parameter is not well-identified. For this opinion, we can compare univariate models with unobserved heterogeneity and the correlated models through likelihood ratio tests. Once we performed such a test, the results indicated that we fail to reject the correlated model against the univariate one. Therefore there is further evidence supporting the findings of the previous LR tests that correlation between unobserved heterogeneity affecting opinions and cannabis use dynamics is significant.

of those who agree with a specific cannabis policy remain high irrespective of the user status. Nevertheless, to investigate whether there was a causal effect from cannabis use to opinions we performed a similar type of analysis as for the two main policy statements that referred to cannabis prohibition and cannabis legalization. Since the following policy statements are not directly about availability of cannabis, they serve as falsification analysis on the self-interest aspect of cannabis use.

Panels c and d of Table 4 present the parameter estimates of the effects of current and past cannabis use on restriction on sale of cannabis.[9] Concerning no sale of cannabis to youngsters there is correlation with user status but this disappears once correlated unobserved heterogeneity is taken into account. Apparently, individuals who started using cannabis did not change their opinion on no sale of cannabis to youngsters because they started using cannabis. They had a different opinion all along. They were less likely to support the idea of no sale of cannabis to youngsters anyway. The findings for the statement that there should be no coffeeshops near schools is somewhat different. In order to explore the possible reason behind the significant negative parameter estimate we performed the same correlated analysis by dividing the current cannabis use variable into 3 parts: those who frequently (more than once) used cannabis in the last 30 days, those who used cannabis only once in the last 30 days but started using cannabis at an earlier age and those who for the first time used cannabis only once in the last 30 days. This distinction shows that the negative effect is located among those who used cannabis for the first time in the last 30 days, which has a very small number of observations. Once they are ignored, there is no effect. Moreover since these people cannot accumulate inside information from one time use and they are mostly below 25 years old, we argue that self-interest plays a small role.[10]

Panels e and f of Table 4 show the main parameter estimates for statements on education programs. For education campaigns there is no big difference between the univariate model and the correlated model. This suggests that initially opinions were not different but once some individuals started using cannabis they changed their minds. Moreover, the fact that there is no difference between the effects of past use and current use suggests that it is inside information that is driving the results. Apparently, after personal experience with cannabis, some individuals were less inclined to support education campaigns because they thought there was less need for such campaigns. For drugs education at school, there is no difference in opinions according to user status.

[9] See also Appendix 2.

[10] Making the same distinction in 2 main legalization policies whose results are given in Table 3 did not make any changes. This distinction seems to make a difference only for this specific policy statement on the location of coffeeshops.

All in all, the findings for the specific types of drug policy show that cannabis use did not have a big effect on opinions and if it did such as is the case for education campaigns, inside information is driving the results.[11] As expected self-interest does not play a significant role in shaping opinions about these policy statements.

5.4 Robustness checks: placebo analysis

In order to investigate whether the results obtained on the first two policy statements about cannabis legalization are driven by some overlooked unobserved confounding factors, we perform placebo analysis investigating the effect of past and current cannabis use on opinions about policies unrelated to cannabis use.

In the first placebo analysis we use information about opinions on various types of alcohol policy all aiming at restricting access to alcohol. The proposed policies are: no sale of alcohol in supermarkets, banning alcohol advertisements, no sale of alcohol to youngsters under age 16, no happy hours in bars and discos, no sale of alcohol in places which are frequently visited by youngsters. Table 5 presents the results. The first column presents the results of univariate models in which unobserved heterogeneity and correlation with cannabis use dynamics is ignored. For all statements about restricting alcohol availability, current and past use of cannabis have significant negative effects. The second column presents the results of the correlated models where we take account of correlation between opinions and cannabis use dynamics through correlated unobserved heterogeneity. For the first two statement there is no significant correlation between unobserved heterogeneity affecting opinions and cannabis use dynamics, but we cannot reject the joint hypothesis of no significant effects of cannabis use on opinions in the correlated models. For the last three statements we do find significant correlation between unobserved heterogeneity affecting opinions and cannabis use dynamics but here too we find no causal effect of cannabis use on opinions about restricting alcohol availability in the correlated models. The reason behind why there are significant negative effects in univariate models but not in correlated models is that unobserved factors related to cannabis use are likely to be correlated with alcohol consumption and therefore opinions about alcohol legislation, which is ignored by the first model. In correlated models such correlation is taken into account and presented coefficients show causal effects of cannabis use on opinions about alcohol availability. As expected there is no causal effect.

There is a strand of literature on substance use claiming that alcohol use and drug use can

[11] The exception to these findings is the negative of current cannabis use on support for the ban of coffeeshops near schools. It is hard to imagine that this has a causal interpretation.

be complementary. If that is true, then our expectation about no-causal effect of cannabis use on opinions toward alcohol availability no longer holds. Therefore we perform a second set of placebo analysis using opinions about policy statements which are unrelated to substance use. Table 6 presents the parameter estimates of these new placebo analysis. In the first panel, we use information about opinions on "*The state should no longer give students a study grant but only a study loan under favorable conditions*". In both univariate and correlated models there is no effect of cannabis use on opinions. In the second panel, we use information about opinions on "*Citizens should have more influence on government policies*". Again there is no effect of cannabis use. It does not seem to be the case that cannabis users and non-users are systematically different in responses given to policy statements regardless of the nature of the policies.[12]

5.5 Robustness checks: Sensitivity to model specifications

As a further set of robustness checks, we investigate the sensitivity of our baseline results to various model specifications. Table 7 presents the results of some of these robustness checks. Panel (a) repeats our baseline results. In panel (b) we remove education dummies from starting rate analysis as these dummies are expected to be endogenous in age of onset of cannabis use. The presented results show that our conclusion remains the same. Panel (c) presents the results when we add political preference dummies in the starting rates. Again our conclusion remains the same.

One issue with retrospective responses about substance use is that there might be measurement errors due to recall bias. In order to see if our results are sensitive to such a recall bias, we restrict our sample to a much younger cohort as they are expected to recall more accurately. Panel (d) presents the results of this estimation where we use information on individuals who were born after 1969. Although we lose almost half of our main sample, we still obtain similar results.

In panel (e), we investigate the sensitivity of the effect of current use of cannabis to the intensity of use in the last 30 days. Respondent in the LISS panel also report how many days a week on average they used cannabis in the last 30 days. In order to use this information, we divide current use variable into 4 parts depending on the intensity of use. Coefficient estimates in panel (e) indicate that even for those who used cannabis only one day a week on average, there is a causal effect on opinions. However, a likelihood ratio test indicates that for those who used cannabis only one day a week on average or less, we fail to reject the null hypothesis that coefficient estimates of current use

[12]Note that for both of these policy statements we have to match Alcohol and Drugs study of LISS panel with other studies of the panel, which causes a substantial loss in the number of observations. However dynamics and patterns of cannabis use in these smaller samples is found to be very similar to what we have in the main sample of our study.

and past use are the same. It seems that for those who very rarely use cannabis, inside information is driving the results rather than self-interest, which is consistent with our interpretations of the results. Panel (f) investigates the effect of duration of cannabis use. The coefficient estimate of duration is found to be positive but insignificant.

In the last couple of robustness checks presented in Table 7, we investigate other possible mechanisms that can harm our interpretation of the results. We interpret the positive effect of past use of cannabis on the support given to cannabis legalization as an evidence that those who used cannabis in the past have superior information about cannabis use and costs/benefits related to it. That is why we conclude that cannabis use may not be as harmful as it is originally thought. An alternative mechanism can be that both past cannabis use and opinions about cannabis legalization are driven by peer effects (Williams et al. (2011)). Panel (g) shows that controlling for peer use of cannabis does not cause considerable changes in our conclusion.[13] Another mechanism could be that those who used cannabis have engaged with some negative aspects of drug markets such as crime even though possession and use of soft drugs are not criminal offenses in the Netherlands. Such people might be in favor of legalization not because they think cannabis is not substantially detrimental but because legalization can be a way of reducing criminal activity related to drugs. Panel (h) presents the results after controlling for opinions of the respondents about criminal nature[14] of the drug market. Again our conclusion remains the same.[15]

Finally, we estimated ordered logit models with discrete unobserved heterogeneity to re-analyze the effect of past and current use of cannabis on opinions about two legalization policies. The probabilities for the ordered logit specification of opinions conditional on observable and unobservable characteristics are defined as

$$\begin{aligned}
&\Pr(y=1|x_3,\epsilon) = F(\mu_1 - x_3'\beta_p - \epsilon) \\
&\Pr(y=2|x_3,\epsilon) = F(\mu_2 - x_3'\beta_p - \epsilon) - F(\mu_1 - x_3'\beta_p - \epsilon) \\
&. \\
&\Pr(y=5|x_3,\epsilon) = 1 - F(\mu_4 - x_3'\beta_p - \epsilon)
\end{aligned} \quad . \tag{13}$$

where $F(.)$ is cumulative density function of the logistic distribution. Although not reported here

[13]LISS panel also has information on peer use: The respondents are asked if they have family members or friends who use cannabis. They report "no", "1 person" or "several people".

[14]The respondent in LISS panel also report their opinions about the following statement on a scale of 1-to-7: "*The drugs problem should first of all be considered as a criminal issue*".

[15]One remaining mechanism is the reverse causality. If opinions about cannabis legalization are formed earlier in life and if they are rigid in the sense that they do not change over time, then opinions might be driving cannabis use instead.

the parameter estimates of univariate and correlated models with ordered logit are found to be qualitatively and quantitatively very similar to those in Table 3.[16] Thus, we conclude that the results are not peculiar to the assumption of normality. Furthermore as a final robustness analysis we estimated the univariate and correlated models by fitting opinion variables into a scale from 1 to 3. In other words, the observed responses on the cannabis policy statements in the data are assumed to be

$$y = \begin{cases} 1 \text{ (Definitely disagree or Disagree)} & \text{if } y^* \leq \mu_1 \\ 2 \text{ (Indifferent)} & \text{if } \mu_1 < y^* \leq \mu_2 \\ 3 \text{ (Agree or Definitely agree)} & \text{if } \mu_2 < y^* \end{cases} \tag{14}$$

The rest of the model specifications is kept the same. The parameter estimates of this model are found to be very similar to those which are reported until now, indicating that results are mainly driven by differences between individuals who agree or disagree to given policy statements; not by differences between those who agree (disagree) or definitely agree (definitely disagree).

5.6 Magnitude of the effects

To indicate the magnitude of the effect of past and current use of cannabis, we simulated the probabilities for each alternative in the ordered response variable. The simulation results are given in Table 8. The first panel presents the results for the first policy statement (cannabis should be legalized). As shown there is a large effect of cannabis use. The estimated probability of agreeing with the idea of no-prohibition is 33% for our reference person who has never used cannabis which is reported in row (3). If that reference person used cannabis in the past, support for no-prohibition increases to 60% and if this person is still using cannabis the support for no-prohibition jumps to 81%. Similarly, the second panel presents the simulation results for the second policy statement on cannabis legalization. The numbers in the table indicate that estimated probability of agreeing with the idea of selling cannabis at coffeeshops is 36% for a never user reference person. This probability increases to 53% if this reference person is a past-user and to 74% if the individual is a current user. Similarly the probability of disagreeing decreases from 43% to 26% and 11%, respectively. A comparison of these figures with the unconditional distribution given in Table 1 shows that even though difference between cannabis users and non-users decreases after controlling for observable and unobservable factors, it remains as considerable.

[16] As expected the coefficient estimates in logit models are higher than those in probit models. A rescaling of logit estimates with 1.7 gave almost the same coefficient estimates as those given by probit models.

6 Conclusions

Opinions on cannabis policy are interesting to study as they provide some indication for public support of certain types of policy. From previous studies and a simple cross-country comparisons it appears that support for legalization of cannabis increases with the share of cannabis users. Interesting as this may be in itself, the fact that cannabis users are more in favor of legalizing cannabis does not necessarily imply that opinions are influenced by cannabis use in a causal way. Cannabis users may be more in favor of legalization because individuals who are more likely to consume cannabis are also more in favor of legalization without the personal experience affecting opinions. Knowing whether or not there is a causal effect from cannabis use is interesting because if so, it reveals how potential dangers of cannabis use are assessed. If cannabis use increases the support for legalizing cannabis then this implicitly reveals that cannabis use may not be so harmful as individuals were inclined to think before they started using cannabis. However, such a causal effect may also have to do with self-interest, i.e. the expectation that cannabis legalization will induce easier access and perhaps lower prices.

We follow a research strategy that enables us to distinguish between self-interest and inside information about potential harmful effects. We make a distinction between the causal effects of current cannabis use and past cannabis use. The effect of current cannabis use on opinions about legalization is a mixture of self-interest and information; the effect of past cannabis use has to do with information only. Whereas self-interest presumably makes individuals more likely to be in favor of legalization this is not necessarily the case for information. It could be that past users regret the fact that they ever used cannabis and this might make them less in favor of legalization.

We use data from a 2008 survey which includes detailed questions about cannabis use and opinions about cannabis policies in the Netherlands. After an extensive sensitivity analysis we conclude that there is a causal effect of personal experience with cannabis use on the support given to more liberal cannabis policies. Those who currently use cannabis and those who used it in the past are more in favor of legalization. The opinion of current cannabis users may be driven by self-interest and inside information but the opinion of past users will be driven mainly by inside information about the dangers of cannabis use. From the significance of the effect of past cannabis use we conclude that cannabis use may not be as harmful as cannabis users originally thought it was and non-users are inclined to think.

References

Abraham, M. D., P. D. A. Cohen, R. J. van Til, and M. A. L. de Winter (1999). *Licit and illicit drug use in the Netherlands*. Amsterdam: CEDRO.

Arseneault, L., M. Cannon, J. Witton, and R. Murray (2004). Causal association between cannabis and psychosis: examination of the evidence. *British Journal of Psychiatry 184*, 110–117.

Becker, G., K. Murphy, and M. Grossman (2006). The market for illegal goods: the case of drugs. *Journal of Political Economy 114*, 38–60.

Bieleman, B., A. Beelen, R. Nijkamp, and E. de Bie (2007). *Coffeeshops in Nederland. Aantallen en gemeentelijk beleid in 2007 ("Coffeeshops in the Netherlands. Numbers and local policy in 2007")*. Groningen: Intraval.

Brook, J., E. Balka, and M. Whiteman (1999). The risks for late adolescence of early adolescent marijuana use. *American Journal of Public Health 89*, 1549–1554.

Caulkins, J., C. Coulson, C. Farber, and J. Vesely (2012). Marijuana legalization: certainty, impossibility, both, or neither? *Journal of Drug Policy Analysis 5*, 1–27.

De Graaf, R., M. Radovanovic, M. Van Laar, B. Fairman, and L. Degenhardt. (2010). Early cannabis use and estimated risk of later onset of depression spells: epidemiologic evidence from the population-based world health organization world mental health survey initiative. *American Journal of Epidemiology 172*, 149–159.

Ellickson, P., R. Collins, and R. Bell (1999). Adolescent use of illicit drugs other than marijuana: How important is social bonding and for which ethnic groups? *Substance Use & Misuse 34*, 317–346.

European Commission (2011). *Youth Attitudes on Drugs: Analytical Report*. European Commision, Luxembourg.

European Monitoring Center for Drugs and Drug Addiction (2013). *Models for the legal supply of cannabis: recent developments*. Lisbon.

French, M. T., M. C. Roebuck, and P. K. Alexandre (2001). Illicit drug use, employment & labour force participation. *Southern Economic Journal 68*(2), 349–368.

Funk, C. L. (2000). The dual influence of self-interest and societal interest in public opinion. *Political Research Quarterly 53*, 37–62.

Glaeser, E. and A. Shleifer (2001). A reason for quantity regulation. *American Economic Review Papers and Proceedings 91*, 431–435.

Green, D. P. and A. E. Gerken (1989). Self-interest and public opinion toward smoking restrictions and cigarette taxes. *The Public Opinion Quarterly 53*, 1–16.

Heckman, J. J. and B. Singer (1984). A method for minimizing the impact of distributional assumptions in econometric models for duration data. *Econometrica 52*, 271–320.

Jansen, A. (1991). *Cannabis in Amsterdam. A geography of hashish and marihuana*. Muiderberg: Countinho.

Miron, J. and J. Zwiebel (1995). The economic case against drug prohibition. *Journal of Economic Perspectives 9*, 175–192.

Mroz, T. A. (1999). Discrete factor approximations in simultaneous equation model: Estimating the impact of a dummy endogenous variable on a continious outcome. *Journal of Econometrics 92*, 233–274.

Palali, A. and J. C. van Ours (2013). Distance to cannabis-shops and age of onset of cannabis use. *CEPR Discussion Paper 9632*.

Skretting, A. (1993). Attitude of the Norwegian population to drug policy and drug-offences. *Addiction 88*, 125–131.

Sociaal en Cultureel Planbureau (1998). *Sociale en Culturele Verkenningen 1998*. Den Haag: VUGA Uitgeverij.

Timberlake, J. M., E. D. Lock, and K. A. Rasinski (2003). How should we wage the war on drugs? Determinants of public preferences for drug control alternatives. *The Policy Studies Journal 31*, 71–88.

Trevino, R. A. and A. J. Richard (2002). Attitudes towards drug legalization among drug users. *American Journal of Drug and Alcohol Abuse 28(1)*, 91–108.

Van der Sar, R., E. Brouwers, L. van de Goor, and H. Garretsen (2011). The opinion on Dutch cannabis policy measures: A cross-sectional survey. *Drugs: education, prevention and policy 18(3)*, 161–171.

Van der Sar, R., E. Odegard, J.Rise, E. Brouwers, L. van de Goor, and H. Garretsen (2012). Acceptance of illicit drug use in the Netherlands and Norway: A cross-national survey. *Drugs: education, prevention and policy 19 (5)*, 397–405.

Van Laar, M., G. Cruts, A. van Gageldonk, M. van Ooyen-Houben, E. Croes, R. Meijer, and T. Ketelaars (2011). The Netherlands drug situation 2011. Technical report, Trimbos Instituut.

Van Ours, J. C. (2006). Cannabis, cocaine and jobs. *Journal of Applied Econometrics 21*, 897–917.

Van Ours, J. C. (2007). The effect of cannabis use on wages of prime age males. *Oxford Bulletin of Economics and Statistics 69*, 619–634.

Van Ours, J. C. and J. Williams (2014). Cannabis use and its effects on health, education and labor market success. *CentER Discussion Paper 2014-24*.

Van Ours, J. C., J. Williams, D. Fergusson, and L. Horwood (2013). Cannabis use and suicidal ideation. *Journal of Health Economics 32*, 524–537.

Van Solinge, T. (1999). Dutch drug policy in a European context. *Journal of Drug Issues 29(3)*, 511–528.

Williams, J., J. C. van Ours, and M. Grossman (2011). Why do some people want to legalize cannabis use? *CEPR Discussion Paper 8228*.

Appendix 1: Details on the LISS data

The LISS survey is administered by CentERdata, a research institute of Tilburg University. The data used in our study are from one of the special cross-sectional surveys conducted in November 2008. The online survey is addressed to a representative Dutch sample. Table 9 provides a description and summary statistics of the variables used in our analysis. Most of the descriptions are self-explanatory. For the question on political preferences we grouped the various parties in the Netherlands as follows: Conservatives (VVD, Trots op Nederland, PVV), Left wing (PvdA, SP, Groen-Links, D66, Partij van de Dieren), Center (CDA, Christenunie, SGP), Others (other party, would rather not say, would not vote, is not entitled to vote, blank vote, does not know).

Appendix 2: Opinions on cannabis policy apart from legalization

Apart from the main policy statements on cannabis legalization, the LISS survey includes various other statements on drug policy. Table 4 panel *c* presents the parameter estimates on opinions about the statement that *the government should ensure that coffeeshops don't sell cannabis to people below 18 years old.* As with prohibition and legalization, respondents are asked to report their opinions in a scale from 1 to 5; 5 indicating definite agreement. A study by Abraham et al. (1999) shows that around 40% of the individuals aged between 12 and 17 obtain the cannabis that they use from coffeeshops. This is a striking percentage considering the regulations on coffeeshops which forbid selling of cannabis to people below 18 years old. Panel *d* of the same table present the parameter estimates on opinions about the statement that *coffeeshops should not be located in the vicinity of schools.* In 2008, it was decided that all municipalities would ban coffee shops which are located within a distance of 250 meters of schools for secondary education. The main purpose of the law was to prevent pupils from considering soft drugs as non-detrimental or normal and prevent them from constantly coming across drug purchase points. The distance of 250 meter is to be increased to 350 meter as of January 2014 (Van Laar et al. (2011)). The results show that even though there seems to be an effect of past use of cannabis on opinions about these two policy statements, this effect is solely due to correlations. In correlated models the effect of past use of cannabis on opinions virtually disappears. Current use of cannabis displays slightly different results. There is no causal effect of current use of cannabis on opinions about sale of cannabis to youngsters at coffeeshops. There is, however, an effect on opinions about coffeeshops being close to schools. Those who currently uses cannabis seem to worry less about the existence of coffeeshops

in the vicinity of schools. We show that this effect solely comes through those who used cannabis for the first time in the last 30 days. Since these people are likely to be less than 25 years old (cannabis use literature shows that people above 25 years old are very unlikely to use start using cannabis), self-interest can play a role. Likelihood ratio tests on the joint significance of past and current use of cannabis show that only in the case of the second policy statement the parameters are jointly significant.

Table 4 panel *e* shows the parameter estimates on opinions regarding the statement that *the government should conduct drug education campaigns.* From a likelihood ratio test it appears that in the correlated model we cannot reject the hypothesis that there is an effect of cannabis use on opinions. However, we cannot reject the hypothesis that the effect is the same for current cannabis use and past cannabis use. This suggests that self-interest does not play a role and the causal effect has to do with inside information. Finally, panel *f* presents the parameter estimates on opinions about the statement that *the government should ensure that schools provide drug education.* For these policy statements, the parameter estimates of current and past use of cannabis are found to be jointly insignificant. For the rest of the policy statements used in the falsification analysis and reported in Tables 5 and 6, we do not find any causal effect of cannabis use which gives empirical support to our main findings.

Table 1: Opinions on various types of cannabis policy (percentages)

		Definitely disagree	Disagree	Indifferent	Agree	Definitely agree	Total	N	P-value[a]
a. Cannabis legalized									
1	All	16	18	21	28	17	100	2016	
2	Current users	1	2	8	33	56	100	96	0.00
3	Past users	4	5	14	43	34	100	529	0.00
4	Never users	21	24	24	22	9	100	1391	0.00
b. Coffeeshops permitted									
1	All	19	16	19	36	10	100	2015	
2	Current users	3	5	7	45	40	100	95	0.00
3	Past users	6	7	13	57	17	100	529	0.00
4	Never users	25	20	22	27	5	100	1391	0.00
c. No sale to youngsters									
1	All	1	3	12	50	34	100	2015	
2	Current users	3	7	15	50	26	100	95	0.01
3	Past users	1	4	11	53	31	100	529	0.04
4	Never users	1	2	12	50	36	100	1391	0.00
d. No coffeeshops near schools									
1	All	2	4	11	39	44	100	2014	
2	Current users	5	11	27	33	24	100	95	0.00
3	Past users	2	5	15	47	31	100	528	0.00
4	Never users	2	3	8	36	50	100	1390	0.00
e. Education campaigns									
1	All	1	1	6	52	40	100	2012	
2	Current users	1	1	10	52	36	100	95	0.00
3	Past users	1	1	6	57	35	100	528	0.00
4	Never users	1	1	6	50	42	100	1389	0.00
f. Drugs education at schools									
1	All	1	1	8	53	36	100	2005	
2	Current users	2	5	14	50	29	100	95	0.49
3	Past users	1	2	9	58	30	100	528	0.03
4	Never users	1	1	7	2	39	100	1382	0.02

[a] shows the p-value of a chi-square test of independence with null hypothesis that the reported difference in opinion categories between current (past, never) users and never (never, ever) users is not significant. For most of the cases we reject this null hypothesis.

Table 2: Dynamics in cannabis use: parameter estimates of mixed proportional hazard models on starting age and quitting age of cannabis use.

	Bivariate			
	Starting rates (1)		Quitting rates (2)	
Female	-0.68	(5.0)**	0.33	(2.6)**
Religion	-0.22	(5.2)**	0.00	(0.1)
Migrant	-0.27	(1.3)	0.06	(0.3)
Urban 1	0.92	(3.8)**	-0.76	(3.2)**
Urban 2	0.21	(1.0)	-0.38	(1.8)*
Urban 3	0.28	(1.2)	-0.41	(1.8)*
Secondary1	-0.03	(0.1)	0.46	(1.7)*
Secondary2	0.08	(0.2)	1.14	(3.6)**
Vocational1	-0.37	(1.1)	0.62	(2.4)**
Vocational2	0.15	(0.5)	1.00	(3.6)**
University	0.31	(0.8)	1.06	(3.4)**
Age25-34	-0.11	(0.6)	-0.36	(1.7)*
Age35-44	-1.27	(6.1)**	-0.89	(4.5)**
Age45+	-2.05	(7.3)**	-0.85	(2.4)**
Age of onset			0.76	(5.6)**
Age dependence				
Age dep. 20+	1.39	(3.7)**		
Age dep. 19	2.98	(8.2)**		
Age dep. 18	2.50	(6.6)**		
Age dep. 17	3.26	(9.7)**		
Age dep. 16	2.72	(8.3)**		
Age dep. 15	2.89	(9.9)**		
Age dep. 14	1.86	(6.4)**		
Age dep. 13	0.94	(3.0)**		
Unobserved heterogeneity				
u_a	-2.49	(5.3)**	-3.11	(7.9)**
u_b	-5.95	(14.1)**	-	
α	-1.25	(8.5)**	-	
-Loglikelihood	2921.6			
LR test 1	4.6			
LR test 2	0.4			
Observations	2016			

The Likelihood Ratio test 1 indicates that unobserved heterogeneity is not significant in the quitting rates. Note that d.o.f of the test is 2 since when $u_b = 0$, α is not identified in the quitting rates estimation.

The Likelihood Ratio test 2 compares the independent models against the correlated model and shows that we cannot reject that the two processes are independent; absolute t-statistics in parentheses. * and ** are for statistical significance at 10% and 5%, respectively.

Table 3: Parameter estimates of the effect of past and current use of cannabis on the cannabis policy statement: *Cannabis should be legalized.*

	Univariate (1)		Correlated (2)	
Past cannabis use	0.97	(16.0)**	0.71	(5.7)**
Current cannabis use	1.60	(10.5)**	1.35	(7.8)**
Female	0.01	(0.2)	-0.03	(0.6)
Religion	-0.05	(3.1)**	-0.05	(3.6)**
Migrant	-0.07	(1.0)	-0.11	(1.6)
Urban 1	-0.12	(1.2)	-0.07	(0.7)
Urban 2	-0.09	(1.2)	-0.08	(1.0)
Urban 3	-0.12	(1.4)	-0.10	(1.1)
Secondary1	0.04	(0.1)	-0.03	(0.2)
Secondary2	0.30	(2.2)**	0.26	(2.1)**
Vocational1	0.21	(1.6)	0.13	(1.2)
Vocational2	0.41	(3.1)**	0.37	(3.2)**
University	0.56	(3.7)**	0.53	(3.8)**
Couple without child	-0.03	(0.5)	-0.05	(0.5)
Couple with child	-0.27	(3.7)**	-0.28	(3.7)**
Single with child	-0.06	(0.6)	-0.09	(0.7)
Other	-0.33	(1.3)	-0.39	(1.5)
Age 25-34	-0.06	(0.7)	-0.09	(1.4)
Age 35-44	-0.24	(2.9)**	-0.29	(3.6)**
Age 45+	-0.20	(2.1)**	-0.25	(2.7)**
Left wing	0.28	(3.8)**	0.26	(3.8)**
Center	-0.31	(3.4)**	-0.29	(3.5)**
Others	-0.20	(2.0)**	-0.18	(2.0)**
I don't know	0.01	(0.2)	0.00	(0.0)
ϵ_a	1.5	(7.3)**	0.73	(3.0)**
ϵ_b			0.43	(2.3)**
α			-1.26	(8.7)**
γ_1	1.01	(52.7)**	1.02	(50.8)**
μ_2	[1.1]		[1.0]	
γ_2	0.82	(44.4)**	0.81	(44.1)**
μ_3	[1.8]		[1.7]	
γ_3	0.81	(41.2)**	0.82	(41.6)**
μ_4	[2.5]		[2.4]	
-Loglikelihood	5783.25		5779.9	
LR test 1			6.6 **	
LR test 2			50.1 **	
LR test 3			24.8 **	
Observations	2016		2016	

The LR test 1 tests the univariate model against the correlated model. The Likelihood Ratio test 2 is for the joint significance of cannabis use variables. The LR test 3 is for equality of the parameters of past cannabis use and current cannabis use. Absolute t-statistics in parentheses. * and ** are for statistical significance at 10% and 5%, respectively.

Table 4: Parameter estimates of the effect of past and current cannabis use on support for various types of cannabis policies.

	Univariate (1)		Correlated (2)	
a. Cannabis legalized				
Past cannabis use	0.97	(16.0)**	0.71	(5.7)**
Current cannabis use	1.60	(10.5)**	1.35	(7.8)**
LR-Test 1		6.6**		
LR-Test 2		50.1**		
LR-Test 3		24.8**		
b. Coffeeshops permitted				
Past cannabis use	0.80	(13.1)**	0.47	(4.0)**
Current cannabis use	1.33	(10.7)**	1.05	(7.0)**
LR-Test 1		11.8**		
LR-Test 2		44.0**		
LR-Test 3		21.1**		
c. No sale to youngsters				
Past cannabis use	-0.54	(5.0)**	-0.04	(0.3)
Current cannabis use	-0.56	(2.3)**	-0.06	(0.3)
LR-Test 1		9.4**		
LR-Test 2		0.6		
LR-Test 3		0.4		
d. No coffeeshops near schools				
Past cannabis use	-0.31	(4.9)**	0.01	(0.3)
Current cannabis use	-0.67	(5.5)**	-0.41	(2.5)**
LR-Test 1		6.8**		
LR-Test 2		2.4		
LR-Test 3		12.0**		
e. Education campaigns				
Past cannabis use	-0.13	(2.1)*	-0.17	(1.6)
Current cannabis use	-0.32	(2.6)**	-0.35	(2.1)**
LR-Test 1		0.2		
LR-Test 2		4.2		
LR-Test 3		2.1		
f. Drugs education at schools				
Past cannabis use	-0.06	(1.0)	-0.05	(0.3)
Current cannabis use	-0.03	(0.2)**	-0.01	(0.3)
LR-Test 1		0.2		
LR-Test 2		0.2		
LR-Test 3		0.6		

The numbers of observations are 2016, 2015, 2015, 2014, 2012 and 2005, respectively.

The LR test 1 tests the univariate model against the correlated model. The Likelihood Ratio test 2 is for the joint significance of cannabis use variables. The LR test 3 is for equality of the parameters of past cannabis use and current cannabis use. Absolute t-statistics in parentheses. * and ** are for statistical significance at 10% and 5%, respectively.

For opinions b & c, LR tests indicate that unobserved heterogeneity is significant in opinions in the univariate models although the distribution is not well-identified. For these two opinions we also compared univariate models with unobserved heterogeneity and the correlated models through likelihood ratio tests. The results indicate that in both cases we fail to reject the correlated model against the univariate one, which supports the findings of the previous LR tests that correlation between unobserved heterogeneity affecting opinions and cannabis use dynamics is significant.

Table 5: Parameter estimates of placebo regressions: Opinions on alcohol availability.

	Univariate (1)		Correlated (2)	
a. No alcohol in the supermarkets				
Past cannabis use	-0.43	(7.3)**	-0.29	(2.3)**
Current cannabis use	-0.39	(3.0)**	-0.25	(1.1)
LR-Test 1		1.2		
LR-Test 2		3.6		
LR-Test 3		1.6		
b. Alcohol advertisements should be banned				
Past cannabis use	-0.31	(5.2)**	-0.21	(1.7)*
Current cannabis use	-0.46	(3.2)**	-0.37	(1.9)*
LR-Test 1		0.4		
LR-Test 2		3.8		
LR-Test 3		1.3		
c. No alcohol to those under 16				
Past cannabis use	-0.13	(2.0)**	0.16	(1.2)
Current cannabis use	-0.37	(2.4)**	-0.07	(0.3)
LR-Test 1		5.8**		
LR-Test 2		3.6		
LR-Test 3		1.2		
d. No happy hours in bars and discos				
Past cannabis use	-0.31	(5.5)**	0.01	(0.2)
Current cannabis use	-0.54	(4.4)**	-0.25	(1.4)
LR-Test 1		7.0**		
LR-Test 2		3.0		
LR-Test 3		0.2		
e. No alcohol sale at places which are frequently visited by those under 16				
Past cannabis use	-0.48	(7.8)**	-0.19	(1.5)
Current cannabis use	-0.50	(3.1)**	-0.21	(1.2)
LR-Test 1		4.4**		
LR-Test 2		1.8		
LR-Test 3		0.4		

The number of observations is 2016.

The LR test 1 tests the univariate model against the correlated model. The Likelihood Ratio test 2 is for the joint significance of cannabis use variables. The LR test 3 is for equality of the parameters of past cannabis use and current cannabis use. Absolute t-statistics in parentheses. * and ** are for statistical significance at 10% and 5%, respectively.

Table 6: Parameter estimates of placebo regressions: Opinions on policies unrelated to substance use.

	Univariate (1)		Correlated (2)	
a. The state should no longer give students a study grant, but only a study loan under favorable conditions				
Past cannabis use	-0.04	(0.1)	-0.01	(0.3)
Current cannabis use	0.03	(0.1)	0.01	(0.1)
Observations			802	
LR-Test 1			0.4	
LR-Test 2			0.1	
LR-Test 3			0.3	
b. Citizens should have more influence on government policy				
Past cannabis use	0.19	(1.9)*	-0.18	(1.0)
Current cannabis use	0.21	(0.7)	0.19	(0.7)
Observations			1158	
LR-Test 1			0.2	
LR-Test 2			1.2	
LR-Test 3			0.8	

The LR test 1 tests the univariate model against the correlated model. The Likelihood Ratio test 2 is for the joint significance of cannabis use variables. The LR test 3 is for equality of the parameters of past cannabis use and current cannabis use. Absolute t-statistics in parentheses. * and ** are for statistical significance at 10% and 5%, respectively.

Although the sample size drops considerably after matching different data sets, pattern of cannabis use remains the same. The percentage of ever users, past users and current users are 30%, 25% and 4% for panel a and 31%, 25% and 5% for panel b, respectively. Note that these are very much the same as those reported in Table 9 for the main sample.

Table 7: Sensitivity analysis on "cannabis should be legalized".

	Correlated (1)		LogLikelihood (2)	Observ. (3)
a. Baseline estimates				
Past cannabis use	0.71	(5.7)**	5779.9	2016
Current cannabis use	1.35	(7.8)**		
b. No education in the starting rates				
Past cannabis use	0.72	(5.7)**	5786.1	2016
Current cannabis use	1.36	(7.8)**		
c. Political preferences in the starting rates				
Past cannabis use	0.69	(5.4)**	5744.11	2016
Current cannabis use	1.33	(7.6)**		
d. Individuals born after 1969				
Past cannabis use	0.51	(3.0)**	3442.60	1149
Current cannabis use	1.18	(5.6)**		
e. On average how many days a week cannabis is used by the respondent				
Past cannabis use	0.71	(5.5)**		
6-7 days a week	1.62	(5.3)**	5778.85	2016
2-5 days a week	1.45	(3.5)**		
1 day a week	1.16	(4.6)**		
Less than 1 day	1.23	(4.4)**		
f. Duration of use				
Past cannabis use	0.72	(5.6)**		
Current cannabis use	1.30	(5.6)**	5779.8	2016
xDuration of use	0.01	(0.3)		
g. Peer and family influences				
Past cannabis use	0.44	(3.7)**	5713.47	2011
Current cannabis use	1.03	(5.8)**		
1 friend/family using cannabis	0.35	(5.0)**		
Less than 1 friend/family using cannabis	0.68	(10.6)**		
h. Criminal aspect of drug use				
Past cannabis use	0.65	(5.0)**	5591.13	2007
Current cannabis use	1.11	(6.5)**		
Criminal aspect of drug use	-0.27	(20.5)**		

Table 8: Simulations of the effects of past and current use of cannabis on opinions about cannabis legalization and cannabis-shops policy (percentages).

	Definitely disagree	Disagree	Indifferent	Agree	Definitely agree	Total
a. *Cannabis should be legalized*						
1. Current use	1	5	13	37	44	100
2. Past use	6	12	21	38	22	100
3. Never use	20	23	25	26	7	100
b. *Legalization: It should be permitted to sell cannabis at the coffeeshops*						
1. Current use	4	7	15	53	21	100
2. Past use	12	14	20	44	9	100
3. Never use	23	20	22	32	4	100

The simulations are based on the parameter estimates of the correlated models presented in Table 3; the reference person has sample mean values for all of the observable characteristics except for cannabis use.

Table 9: Description and summary statistics of the variables.

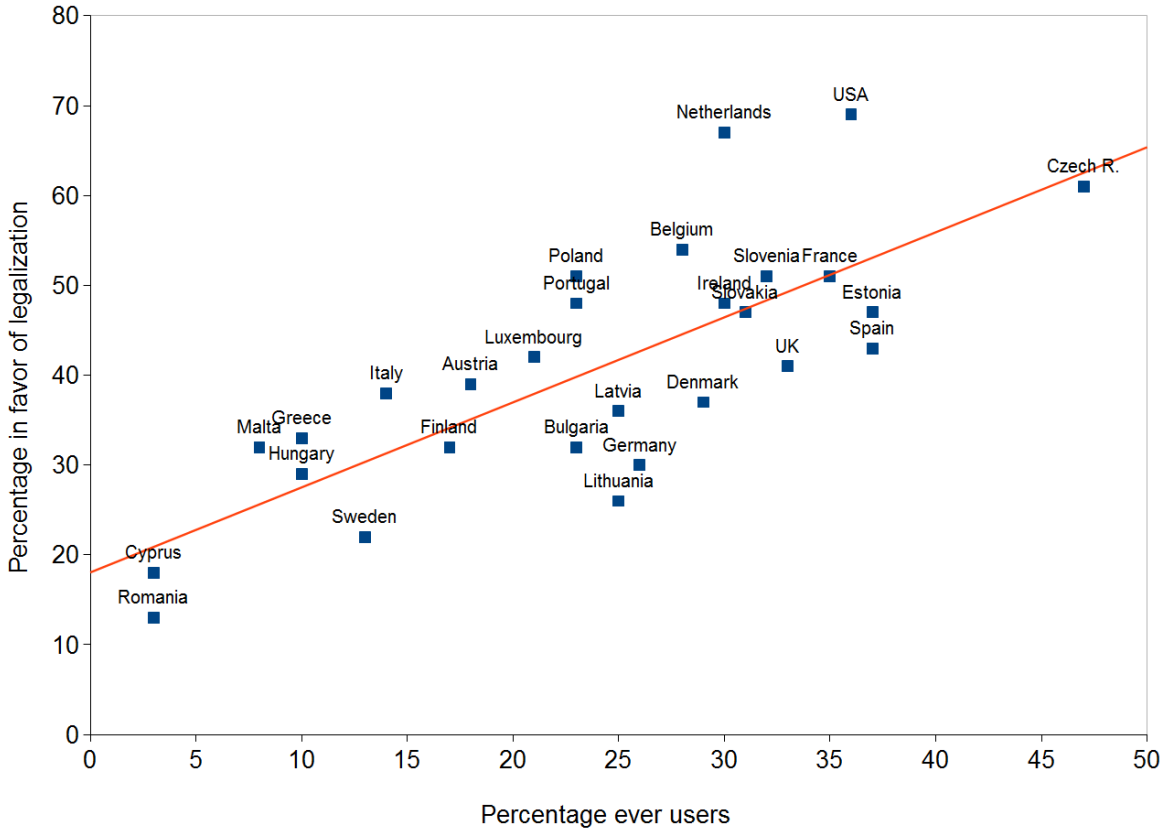
Variable	definition	Mean	St.Dev.	Min.	Max.
Female	1 if the respondent is female	0.57	0.50	0	1
Religion	amount of the times that the parents of the respondent visited the church in a week when the respondent was 15 years old	1.72	1.93	0	6
Migrant	1 if the respondent is migrant	0.14	0.34	0	1
Urban 1	1 if the resident is located in an area which is extremely urban	0.13	0.33	0	1
Urban 2	1 if the resident is located in an area which is very or moderately urban	0.49	0.50	0	1
Urban 3	1 if the resident is located in an area which is slightly urban	0.22	0.42	0	1
Urban 4	(Reference group) 1 if the resident is located in an area which is not urban	0.16	0.36	0	1
Primary	(Reference group) 1 if the respondent has primary education	0.05	0.28	0	1
Secondary1	1 if the respondent has intermediate secondary education	0.19	0.44	0	1
Secondary2	1 if the respondent has high secondary education	0.15	0.31	0	1
Vocational1	1 if the respondent has intermediate vocational education	0.30	0.42	0	1
Vocational2	1 if the respondent has high vocational education	0.24	0.42	0	1
University	1 if the respondent has university education	0.08	0.26	0	1
Ever use	1 if the respondent ever used cannabis	0.31	0.41	0	1
Past use	1 if the respondent ever used cannabis but not in the last 30 days	0.26	0.39	0	1
Current use	1 if the respondent used cannabis in the last 30 days	0.05	0.17	0	1
Starting age	starting age of cannabis (conditional on ever using cannabis)	18.13	4.05	13	60

Table 9 Continued

Variable	definition	Mean	St.Dev.	Min.	Max.
Single without child	(Reference group) 1 if the respondent is single with no children	0.13	0.36	0	1
Couple without child	1 if the respondent is in a couple without children	0.20	0.49	0	1
Couple with child	1 if the respondent is in a couple with children	0.60	0.49	0	1
Single with child	1 if the respondent is single with children	0.06	0.20	0	1
Other	1 if otherwise	0.01	0.10	0	1
Age 15-24	(Reference group) 1 if the respondent is between 15-24 years old	0.16	0.27	0	1
Age 25-34	1 if the respondent is between 25-34 years old	0.27	0.34	0	1
Age 35-44	1 if the respondent is between 35-44 years old	0.40	0.40	0	1
Age 45+	1 if the respondent is more than 45 years old	0.17	0.49	0	1
Conservative	(Reference group) 1 if the respondent is categorized as conservative voter	0.18	0.38	0	1
Left wing	1 if the respondent is categorized as left wing voter	0.27	0.47	0	1
Center	1 if the respondent is categorized as center voter	0.14	0.38	0	1
Others	1 if the respondent is categorized as other	0.10	0.30	0	1
I don't know	1 if the respondent did not want to disclose his/her political preference	0.28	0.41	0	1
Policy opinion 1	cannabis should be legalized	2.91	1.32	1	5
Policy opinion 2	it should be permitted to sell cannabis at coffeeshops	2.81	1.29	1	5
Policy opinion 2	government should ensure that coffeeshops don't sell cannabis to people below 18 years old	4.29	0.78	1	5
Policy opinion 4	coffeeshops should not be located in the vicinity of schools	4.28	0.91	1	5
Policy opinion 5	government should conduct drug education campaigns	4.30	0.68	1	5
Policy opinion 6	government should ensure that schools provide drug education campaign	4.34	0.65	1	5

Policy opinion variables (1-6): Respondents are asked to give their opinion about the corresponding statement. 1 means definitely disagree while 5 means definitely agree. The number of observations is 2016.

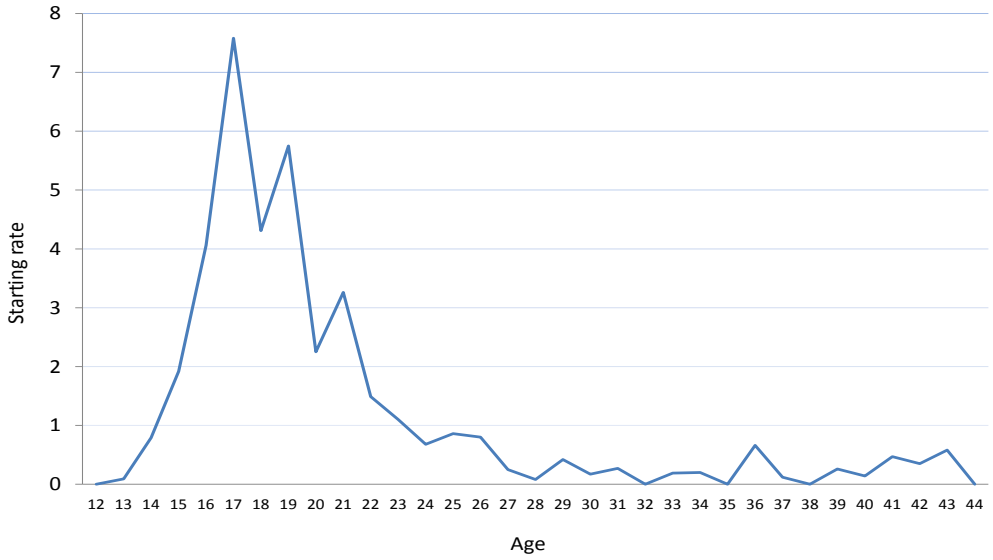
Figure 1: Percentage of those who support a policy of cannabis regulation and percentage of ever cannabis users among youngsters in 27 European Union countries and the USA



Source: EU: European Commission (2011); youngsters: 15-24 years USA: 2013; youngsters: 18-29 years

Figure 2: Starting rates and cumulative starting probabilities cannabis use

a. Starting rates (% per year)



b. Cumulative starting probabilities (%)