Cannabis consumption, crime and victimization – Evidence from the 2004 cannabis declassification in the UK

Nils Braakmann & Simon Jones*

Newcastle University

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Abstract:

This paper investigates the link between cannabis consumption and crime. We exploit the declassification of cannabis in the UK in 2004 as a natural experiment. We show that the declassification increased cannabis consumption by 25% (regular consumption by 8%) for previous non-consumers relative to previous consumers, primarily for individuals from disadvantaged backgrounds. Using IV, we then show that cannabis consumption increases the likelihood of a range of (self-reported) offences, both violent and non-violent and of varying severity, as well as victimization. It does not, by and large, increase the consumption of other drugs.

Keywords: cannabis, crime, gateway theory

JEL Classification: I18, K14, K42

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* Corresponding author: Nils Braakmann, Newcastle University, Business School – Economics, 5 Barrack Road, Newcastle upon Tyne, Tyne and Wear, NE1 4SE, United Kingdom, e-mail: nils.braakmann@ncl.ac.uk.

All analyses used Stata 11.2. Do-Files are available from the corresponding author on request. All analyses and opinions expressed in this paper as well as any possible errors are under the sole responsibility of the authors.

I. Introduction

The effects of cannabis use on a range of outcomes and whether access to it should be regulated have been discussed heavily in both the public and in academia (see, e.g., Pudney, 2010, for a recent survey). Scientific evidence from various countries indicates that cannabis consumption (a) may lead to physical and mental health problems, although effects are often not large (van Ours and Williams, 2011; 2012); (b) has mixed effects on wages (Kaestner, 1991; Gill and Michaels, 1992; Register and Williams, 1992; Kaestner, 1994; van Ours, 2007); (c) has negative, but often weak effects on (un-)employment (e.g., Gill and Michaels, 1992; Register and Williams, 1992; Kaestner, 1994; Burgess and Propper, 1998; Zarkin et al., 1998; MacDonald and Pudney, 2000; French et al., 2001; De Simone, 2002; van Ours, 2006) and (d) is correlated with the use of other, harder drugs, although it is not clear to what extent cannabis causes the consumption of these drugs as predicted by the gateway theory (e.g., van Ours, 2003; Pudney, 2003).

In this paper, we evaluate whether cannabis consumption causes crime. Such a relationship between drug use and crime could arise due to various reasons: (a) consumption of cannabis might have a direct impact on individuals' criminal behaviour (e.g., Adda, McConnel and Rasul, 2011), (b) there might be an increase in property crime if individuals commit crimes to obtain money for buying drugs (e.g., Adda, McConnel and Rasul, 2011), (c) there might be an increase in violent crimes if drug users are also more likely to sell drugs and engage in turf-wars with other dealers (e.g., Adda, McConnel and Rasul, 2011), and (d) buying drugs might bring drug users into contact with criminals, such as dealers, which might influence criminal behaviour through peer effects (e.g., Pudney, 2003).

Evidence on this relationship – despite its prominence in society's opinion and the minds of countless worried parents – is relatively sparse. For Britain, Pudney (2003)

finds some evidence that early cannabis use can increase minor offending and less clear evidence for a link with serious crime. Adda, McConnel and Rasul (2011) look at the effects of a localized depenalization of cannabis, leading to an increase in cannabis possession offences and – through a shift in police resources towards non-drug crime – to lower crime rates. It should be stressed that our approach is somewhat different from their paper: We look at the question whether people who consume cannabis as the result of a depenalization are more or less likely to commit crimes, while they answer the question whether regions that depenalise cannabis experience lower crime rates. To make the difference between the two approaches clear: It might be possible that the individual likelihood to engage in crime increases with the consumption of cannabis and that consumption increases when the associated penalties are reduced. At the same time, regional crime rates could drop as the depenalization allows a shifting of police forces towards non-drug crimes, leading to a general deterrence of potential criminals (who might or might not take cannabis), which could outweigh the increases in crime through the increased cannabis consumption. Our estimates would only capture the effects on cannabis consumers, while Adda, McConnel and Rasul (2011) would identify a combination of all these effects.

Further evidence has linked the uptake of cannabis use to subsequent criminal behavior in New Zealand (Fergusson and Horwood, 1997), while there also exists evidence on the link between the size of drug markets and crime rates (Grogger and Willis, 2000; Pacula and Kilmer, 2003).

We also provide supplementary evidence on the relationship between cannabis consumption and a range of other drugs. This evidence is important to make a statement about a possible channel through which cannabis might influence crime: If,

say, cannabis increases the consumption of harder drugs and if it is the consumption of hard drugs that increases crime, the link between cannabis and crime might be indirect. If not, we can conclude that the link might be a more direct one, i.e., in one case cannabis consumers become criminals because they also start consuming, say, heroin, while in the other cannabis increases the propensity to engage in crime directly.

Contrary to most of the previous literature, we exploit a natural experiment – the declassification of cannabis from a class B to a class C drug in the UK in 2004 – that led to a large reduction in the potential punishment for cannabis possession. The downgrading moved the maximum penalty for possession from 5 to 2 years of imprisonment and also lowered fines. In a first step, we look at the changes in cannabis consumption through this reform. Our focus lies on individuals who did not take cannabis prior to the legal change in 2004 relative to individuals who already took cannabis prior to 2004. The latter effectively serve as a control group as they appear to have been undeterred by the earlier higher punishments. Evidence from difference-in-differences estimates on panel data suggests a relative increase in the likelihood to consume cannabis at least once per year for the treatment group by 25% and in the likelihood of regular consumption by 8%.

In a second step, we look at the consequences of the changes in consumptions for the consumption of other drugs, criminal behaviour and victimization. To address the endogeneity of cannabis consumption (see Pudney, 2004, and van Ours and Williams, 2009, for evidence on the determinants of cannabis uptake), we use the legal changes to construct instruments for consumption. An analysis of complier characteristics reveals that the depenalization primarily affected the consumption behaviour of individuals from less favourable backgrounds, i.e., individuals with a history of

offending and victimization, family problems and a higher likelihood to have engaged in prior risky behaviour. Our results indicate no increases in the likelihood to take other drugs, i.e., cannabis does not seem to serve as a gateway to harder drugs, but we observe strong increases in the likelihood of engaging in criminal activities. We find increases in both violent and non-violent crimes. The former appear to be largely driven by an increase in assaults while the latter are primarily driven by vehicle theft and theft other than robberies and burglaries. We also find some (weaker) increase in burglaries, while robberies and drug offences did not increase. Finally, we find increases in a range of anti-social behaviours[1], such as graffiti spraying or behaving rudely in public, as well as in the risk of victimization.

Section II outlines the estimation approach and provides information on the institutional background, section III introduces the data. Results are found in section IV, section V concludes.

II. Empirical strategy

A. Background: The declassification of cannabis

The possession and distribution of cannabis in the UK is generally illegal. For most of the time cannabis was classified as a class B drug, placing it in the middle category of the classification system created by the Misuse of Drugs Act 1971. Class A covers the most dangerous drugs such as heroin, cocaine or crack, while class C encompasses drugs such as sleeping pills, ketamine or anabolic steroids. Other class B drugs are amphetamine or codeine.

[1] The notion of "anti-social behaviour" was introduced in the 1998 Crime and Disorder Act with some changes being introduced in the 2003 Anti-social Behaviour Act. It basically describes acting "in a manner that caused or was likely to cause harassment, alarm or distress to one or more persons not of the same household as himself [the perpetrator]" (Part I, Chapter 1, Section 1 of the Crime and Disorder Act 1998).

Penalties for possession and distribution differ across drug classifications. The maximum prison sentences for possession are 7 years for class A, 5 years for class B and 2 years for class C. Furthermore, being caught in possession of a class C drug will generally only lead to a formal warning or caution (unless there is a history of drug offences or the intent to distribute), while possession of a class A or B drug is more likely to lead to prosecution.[2] Maximum sentences for distribution are generally much higher and may involve life sentences for class A and imprisonment up to 14 years for both class B and class C drugs.

Following a lengthy discussion about the classification of cannabis (see, e.g., Police Foundation, 1999), then-Home Secretary, David Blunkett, announced the intention to declassify cannabis to a class C drug in 2001. The change itself became effective in January 2004. The decision was later reversed and Cannabis was reclassified as a class B drug in January 2009. However, due to a lack of data this later reclassification plays no role in this paper. The declassification effectively makes possession of cannabis less risky as both the likelihood of a prosecution (as opposed to a warning or caution) and the maximum penalties are lowered. To the best of our knowledge the effects of this declassification have not been considered in any scientific paper.

B. Data

This paper uses the four-year panel version of the Offending, Crime and Justice Survey (OCJS) for the years 2003 to 2006. The data were collected by BMRB Social Research and the National Centre for Social Research (NatCen) on behalf of the Home Office with the aim to provide a longitudinal picture of the prevalence of offending and drug use among the general population, in particular among young

[2] See, e.g., the advice by the British government at http://www.direct.gov.uk/en/youngpeople/crimeandjustice/typesofcrime/dg_10027693.

people. Consequently, the sample covers individuals living in England and Wales who were between 10 and 25 years of age at the time of the first wave in 2003. In each wave individual from the previous waves were re-interviewed. In addition, refreshment samples were drawn in each year the survey was conducted. The version of the OCJS used here is the longitudinal version provided by the Home Office via the Economic and Social Data Service. It covers all individuals who were interviewed in each of the four waves the survey was conducted, in total 2539 individuals and 10,156 person-year observations.

Cannabis consumption is measured by two dummy variables: The first is "1" if the individual reports to have consumed any cannabis in the previous year. The second measures more regular consumption and is "1" if the individual reports to have consumed cannabis at least once per month in the previous year.

As outcomes we consider the consumption of a range of drugs, in particular, heroin, cocaine, crack, amphetamines, ecstasy, acid, amyl nitrites and glue, as well as a summary measure for the consumption of any class A drug. These are all measured by dummy variables that are "1" if an individual took the respective drug at least once per year. In terms of crime, we look at a range of dummy variables that are "1" if an individual reports to have committed a certain type of crime in the respective year. We look at general crime as well as violent and property crime and also consider various subcategories. Finally, we also have data on a range of low-level criminal activities that can be classified as anti-social behavior, as well as information on victimization. All of these variables are self-reported, which might lead to measurement error problems discussed in the next subsection.

After dropping observations with missing values from the estimation sample, we end up with an unbalanced panel of 2539 individuals with 9535 individual-year-observations. Table 1 present descriptive statistics for the whole estimation sample.

(TABLE 1 ABOUT HERE.)

C. Estimation

We begin by looking at the effects of the declassification on the consumption of cannabis. In all of the following we will generally look at individuals who did not consume cannabis prior to the declassification relative to individuals who already consumed cannabis prior to 2004. For the latter group we would expect fewer behavioural changes in terms of their consumption, simply because they appear to have been undeterred by the higher pre-declassification penalties.

In a first step, we run difference-in-differences regressions of the form

$$C_{it} = \alpha_i + \phi_t + \beta \times age_{it} + \tau * (treat_i \times post_t) + \varepsilon_{it}, \quad (1)$$

where C_{it} is the respective measure of cannabis consumption of individual *i* observed in year *t*. α_i is an individual level fixed effect that captures time-constant variables such as family background. ϕ_t are year dummies. We also control for the individual's age. The coefficient of interest is τ which measures changes in cannabis consumption between individuals with and without cannabis consumption prior to 2004 (marked by $treat_i$) after the declassification (marked by $post_t$).

In a second step, we are interested in the consequences of these changes in cannabis consumption for crime and the consumption of other drugs. We estimate

$$y_{it} = \alpha_i + \phi_t + \beta \times age_{it} + \delta \times C_{it} + \upsilon_{it}, \quad (2)$$

where y_{it} is the respective outcome, α_i and ϕ_t are again individual and year fixed effects respectively. The coefficient of interest is δ, which gives us the effect of cannabis consumption.

OLS estimation of (2) will likely be biased for two reasons. First, we would expect some correlation between C_{it} and υ_{it}, i.e., individuals might begin to consume cannabis based on unobservable factors that change over time and also influence their propensity to engage in crime. Prime examples would be peer group effects or general changes in lifestyle. Note that selection based on time-constant unobserved factors is not an issue due to the presence of the individual fixed effects in equations (1) and (2). Second, as we look at self-reported drug consumption and self-reported crime, it seems likely that measurement error due to non-reporting plays a role as well. In the case of classical measurement error, we would expect a bias towards zero, i.e., our estimate for δ would understate the true effect of cannabis consumption. We can also think about cases of non-classical measurement error where, e.g., individuals underreport both drug consumption and criminal activities, or where individuals are more likely to underreport more severe crimes. Biases in these cases could go in either direction, depending on the exact nature of the measurement error.

To overcome the resulting endogeneity problem, we employ an instrumental variable strategy, which exploits the changes in cannabis consumption through the declassification. The first stage is effectively equation (1) with $treat_i \times post_t$ serving as the excluded instrument. In other words, we look at the effects of (increased) cannabis consumption caused by the declassification of cannabis, i.e., δ represents the LATE for those individuals who would not have consumed cannabis under the old regulation, but do so under the new, weaker penalties.

(TABLE 2 ABOUT HERE.)

Table 2 present first stage regressions based on equation (1). The results indicate large increases in the likelihood of cannabis consumption: Consumption for individuals without prior cannabis experience increases by 25% if we include occasional consumption and by about 8% if we only consider at least monthly consumption. At the same time most of the year dummies indicate relatively small general changes in cannabis consumption, in particular when looking at regular consumption. For occasional consumption, we also see a large and statistical significant decline in consumption in 2004. However, consumption in 2005 is again not different from 2003 on conventional levels of statistical significance. These results essentially imply that consumption did not change for individuals who had already consumed cannabis prior to the declassification in 2004. First stage F-values for the interaction, i.e., for the excluded instrument in the later IV regressions, indicate that the instrument is fairly strong with values of 145 and 21 respectively.

As it is always the case with IV estimates allowing for heterogeneous effects of the treatment, the previous as well as all subsequent estimates are only valid for the complier subpopulation, i.e., the group of individuals who changed their consumption behavior due to the cannabis declassification. Compliers are generally unobservable in the data, however, there are ways to characterize them (Angrist and Pischke, 2009, pp. 166-172). In particular, for discrete characteristics x_i, we can describe the likelihood of a complier having that characteristic relative to the population by dividing the first stage for the sub-sample with $x_i = 1$ by the overall first stage.

(TABLE 3 ABOUT HERE.)

Table 3 presents the results from this exercise. Displayed are the respective first stage coefficients and their statistical significance as well as the respective complier-population-rations. These should be interpreted as relative likelihoods, i.e., a value of

2 indicates that compliers are twice as likely to have the characteristic than the general population. Values above 1 indicate that the characteristic is more common among the compliers than in the population and values below 1 indicate the opposite. All characteristics are based on the 2003 data, i.e., they are by construction unaffected by later changes in cannabis consumption.

For general consumption of cannabis, compliers are somewhat less likely to come from richer households, are less likely to have a degree and are less likely to be non-white, employed or a student. They are much more likely not to have grown up with both parents, not to get along with their parents, to have family or friends who are in trouble with the police, to have offended prior to 2004, to have been victim of a crime prior to 2004, to go out drinking or clubbing regularly and to have bad health.

For at least monthly consumption, complies are much less likely to be underage, to have completed a degree or A-levels, to be non-white or to be a student.[3] They are much more likely not to have been brought up by both parents, not to get along with their parents, to have family or friends who are in trouble with the police, to have offended prior to 2004, to have been victim of a crime prior to 2004, to go out drinking or clubbing regularly, to have bad health and to be employed. They are also somewhat more likely to be from a richer background and to be male and somewhat less likely to own the house they live in. Note that the latter is probably simply related to their age: As they are more likely to be adults, it seems more likely that they have already moved out of their parents home, while they are still young enough not to have bought a house.

[3] Note that there are some cases where the first-stage coefficient switches signs. This would normally be a problem, as it would point towards a violation of the monotonicity assumption needed for IV estimation to be valid. However, in all cases effects are close to zero and statistically insignificant, so that it seems safe to treat these coefficients as zeros such that monotonicity is not violated.

In total, it seems fair to conclude that the depenalization of cannabis primarily affected the consumption behavior of individuals from disadvantaged backgrounds with an already higher propensity towards crime and a general tendency towards more risky behaviors.

III. Results

Consider first the results for the consumption of other drugs displayed in table 4. The OLS results in columns (i) and (ii) suggest a positive correlation between cannabis consumption and that of other drugs. They also suggest that this correlation is stronger for regular consumers. Both of these findings are in line with correlations found in earlier studies such as van Ours (2003).

(TABLE 4 ABOUT HERE.)

The picture changes once we look at the IV results in columns (iii) and (iv). There are very few coefficients indicating a positive effect of cannabis consumption. In fact, the only economically large and/or significant results are found for amyl nitrite. For most of the other drugs, the coefficients are negative and usually insignificant, with the exception of cocaine where there is a large and statistical significant drop in consumption. These estimates do not provide much evidence in favour of the idea that cannabis causally serves as a gateway to harder drugs.

Focusing now on the results regarding crime – starting with table 5 –, we see a very different picture. Both the OLS and the IV estimates show increases in the likelihood of committing a crime. Both sets of estimates also suggest economically large effects: Cannabis consumption increases the likelihood of committing a crime by between 6% and 10% for the OLS estimates and between 18% and 27% when instrumenting. Regular cannabis consumption leads to even larger effects between 10% to 14%

(OLS) and 56% to 82% (IV). The pattern of results also indicates (a) larger effects for the IV estimates, suggesting that measurement error in crime and drug consumption matters and/or that effects might be stronger for the compliers than for the general population, (b) larger effects for those who consume cannabis more regularly and (c) stronger effects if we also count less serious crimes. However, the estimates also suggest relatively large increases in criminal activity even if we only consider serious crimes.

(TABLE 5 ABOUT HERE.)

Table 6 presents a more disaggregated picture for property crime. The results suggest that effects are strongest for other theft offences, followed by criminal damage and vehicle theft. Weaker effects are found for more serious crimes such as burglary, while there do not appear to be any effects for robberies. All effects are again stronger for regular, rather than occasional consumption.

(TABLE 6 ABOUT HERE.)

For non-property crime, we observe strong increases in all measures of violent crime. As shown in table 7 these appear to be driven primarily by assaults. Note that excluding school fights decreases the statistical significance of the estimates considerably, even though the effects are still economically large. Note that there is no increase in drug offences, which makes sense as (a) the results in tables 2 and 4 suggest that the only increase in drug consumption arises for cannabis and (b) the declassification should make it less likely that cannabis consumption leads to a drug offence.

(TABLE 7 ABOUT HERE.)

Finally, table 8 presents evidence on anti-social behaviour and victimization. We again observe strong increases for all measures and we again observe stronger effects

for more regular consumers. Furthermore, increased cannabis consumption also seems to put individuals at a much higher risk of falling victim to a crime. While these effects appear to be very large, it should be kept in mind that average victimization in the sample is relatively high anyway.

(TABLE 8 ABOUT HERE.)

The overall picture that emerges from these estimates suggests that while cannabis might not be a gateway to harder drugs, it seems to causally increase individuals' propensity to engage in criminal activities. Furthermore, it also seems to put them at greater risk of being victimized themselves. Overall, our estimates appear to be very large, however, there are two plausible explanations for this: First, it should be kept in mind that we measure crime by having committed at least one offence per year, i.e., it might very well be the case that a large number of individuals is nudged into committing criminal offences by cannabis consumption but immediately stops afterwards and never offends again. Second, the IV estimates are LATEs for the complier subpopulation. In our case, these are individuals who already had a relatively high propensity to engage in criminal activities and come from generally less favourable backgrounds (see section II). It has been suggested in the literature on drug use initiation that the effects of cannabis consumption are much more severe for individuals who experienced a "troubled youth", defined as having experienced problems with the police, school or their family and friends (e.g., Melberg et al., 2010) – a description that appears to fit our complier subpopulation reasonably well. In that sense, our estimates should be seen as evidence that there is indeed a subset of the population – those coming from "troubled" backgrounds – for whom cannabis consumption has severe adverse effects, even though it might not matter that much for the population at large.

IV. Conclusion

We looked at the impact of cannabis consumption on a range of criminal behaviors as well as drug consumption and victimization risks using the 2004 cannabis declassification in the UK as a natural experiment. Our estimates indicate (a) large increases in individuals' propensity to consume cannabis after the reforms, (b) almost no change in the consumption of other, harder drugs as would be predicted by the gateway theory, (c) large increases in the likelihood to have committed various violent and non-violent offences with the exception of drug offences and (d) large increases in the likelihood of having fallen victim to a crime.

Overall, the estimates indicate that cannabis consumption – and in particular regular cannabis consumption – may induce people to at least "try out" criminal activities, while the increase in victimization may also point towards them engaging in riskier lifestyles in general. One should keep in mind that our estimates do not say anything about whether individuals are turned towards a life of crime or whether they are just more likely to try out criminal activities for some time in their life and then return to a life in legality. However, the estimates do suggest that cannabis consumption might prompt people to leave the path of legality, at least for some time. Furthermore, our estimates are LATEs for a specific subpopulation. In our case, these are individuals who already had a relatively high propensity to engage in criminal activities and come from generally less favourable backgrounds. Our estimates should be seen as evidence that there is indeed a subset of the population – those coming from "troubled" backgrounds – for whom cannabis consumption has severe adverse effects, even though it might not matter that much for the population at large. Finally, it should be stressed that our estimates do not contradict potential aggregate crime-

reducing effects of cannabis depenalization. As stated earlier, it might be possible that the aggregate or regional effect of cannabis depenalization is positive as found in Adda, McConnel and Rasul (2011) if depenalization allows for a shifting in police resources towards other crimes, while still increasing the propensity of engaging in criminal activities for some people.

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Table 1: Descriptive statistics

Variable	Mean	Std. dev.	Min.	Max.
Treatment and controls				
Not taken cannabis prior to 2004	0.771	0.420	0	1
Taken cannabis at least once last year	0.167	0.373	0	1
Taken cannabis at least once per month last year	0.081	0.273	0	1
Age	17.382	4.539	10	29
2003 characteristics				
Household income £20,000 or higher	0.384	0.486	0	1
Younger than 18 years of age	0.688	0.463	0	1
Has degree	0.059	0.235	0	1
Has A-levels	0.114	0.318	0	1
Has GCSE	0.160	0.367	0	1
Nonwhite	0.080	0.272	0	1
Not brought up by both parents	0.315	0.465	0	1
Employed	0.189	0.392	0	1
Student	0.728	0.445	0	1
Household owns house	0.699	0.459	0	1
Male	0.472	0.499	0	1
Any anti-social behavior	0.343	0.475	0	1
Any offence	0.189	0.392	0	1
Any violent offence	0.129	0.336	0	1
Any property offence	0.093	0.290	0	1
Ever victim of crime	0.317	0.465	0	1
Considers criminal actions to be okay	0.317	0.465	0	1
Trusts local people	0.064	0.244	0	1
Negative attitude towards local area	0.225	0.418	0	1
Disorder problems in local area	0.202	0.402	0	1
Does not get along with parents	0.666	0.472	0	1
Peers/family in trouble with police	0.071	0.257	0	1
Ever goes to clubs	0.130	0.336	0	1
Drunk at least once per month	0.411	0.492	0	1
Bad health	0.118	0.323	0	1
Outcomes:	0.112	0.315	0	1
Any offence last year	0.226	0.418	0	1
Any offence last year, minus minor offences	0.211	0.408	0	1
Any serious offence last year	0.107	0.310	0	1
Any property offence last year	0.124	0.330	0	1
Any property offence last year, minus minor theft	0.115	0.319	0	1
Any vehicle theft last year	0.013	0.115	0	1
Any burglary last year	0.009	0.095	0	1
Any robbery last year	0.002	0.043	0	1
Any other theft last year	0.102	0.303	0	1
Any other theft last year, minus minor theft	0.091	0.287	0	1
Any criminal damage last year	0.039	0.193	0	1
Any violent offence last year	0.145	0.352	0	1
Any violent offence last year, minus school fights	0.134	0.340	0	1
Any assault last year	0.145	0.352	0	1
Any assault last year, minus school fights	0.133	0.340	0	1
Any drug offence last year	0.029	0.168	0	1
Taken any class A drug last year	0.055	0.227	0	1
Taken heroin last year	0.001	0.035	0	1
Taken cocaine last year	0.038	0.191	0	1
Taken crack last year	0.003	0.050	0	1
Taken amphetamines last year	0.022	0.146	0	1
Taken ecstasy last year	0.030	0.171	0	1
Taken acid last year	0.015	0.123	0	1
Taken amyl nitrite last year	0.028	0.164	0	1
Taken glue last year	0.008	0.091	0	1
Tried to avoid paying fare on public transport	0.198	0.398	0	1

Behaved noisily/rude in public	0.134	0.341	0	1
Neighbor complained about person	0.104	0.305	0	1
Sprayed graffiti on building	0.038	0.190	0	1
Attacked or threatened someone because of race or religion	0.012	0.110	0	1
Carried weapon last year	0.035	0.185	0	1
Was victim of a personal crime last year	0.255	0.436	0	1
Was victim of any crime last year	0.464	0.499	0	1
No. of individuals		2535		
No. of person-year-obs		9535		

Table 2: First stage results

Dependent variable:	Smokes cannabis (1 = yes)	Smokes cannabis at least once per month (1 = yes)
No cannabis before 2004 * post 2004	0.2476***	0.0808***
	(0.0205)	(0.0176)
2004	-0.1420***	-0.0154
	(0.0326)	(0.0287)
2005	-0.0894	0.0311
	(0.0546)	(0.0496)
2006	0.0638	0.0659
	(0.0789)	(0.0176)
No. of individuals	2535	
No. of person-year-obs.	9535	
Angrist-Pischke F-value	144.74	21.11

Coefficients, standard errors adjusted for clustering on the individual level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively. All estimates also contain individual fixed effects and the individual's age.

Table 3: Characterizing compliers, 2003 charateristics

	Treatment = smokes cannabis		Treatment = smokes cannabis at least once per month	
	First stage coefficient	Compl./pop. rel. likelihood	First stage coefficient	Compl./pop. rel. likelihood
Base estimates	0.2489***	n/a	0.0823***	n/a
Household income £20,000 or higher	0.2268***	.91	0.0838**	1.02
Younger than 18 years of age	0.2532***	1.02	0.0155	.19
Has degree	0.2008***	.81	0.0342	.42
Has A-levels	0.2509***	1.0	0.0617*	.75
Has GCSE	0.2527***	1.02	0.1319***	1.60
Nonwhite	0.2122*	.85	-0.0214	-.26
Not brought up by both parents	0.2836***	1.14	0.1451***	1.76
Employed	0.2273***	.91	0.1113***	1.35
Student	0.2201***	.88	-0.0021	-.03
Household owns house	0.2455***	.99	0.0764***	.93
Male	0.2493***	1.00	0.0898***	1.09
Any anti-social behavior	0.3148***	1.26	0.1449***	1.76
Any offence	0.3561***	1.43	0.1712***	2.08
Any violent offence	0.3654***	1.46	0.1500**	1.82
Any property offence	0.4281***	1.72	0.2214***	2.69
Ever victim of crime	0.2720***	1.09	0.1203***	1.49
Considers criminal actions to be okay	0.3977***	1.60	0.2314**	2.81
Trusts local people	0.2642***	1.06	0.0899***	1.09
Negative attitude towards local area	0.2421***	0.97	0.0936**	1.14
Disorder problems in local area	0.2470***	0.99	0.0790***	0.96
Does not get along with parents	0.3073***	1.23	0.1726***	2.10
Peers/family in trouble with police	0.3363***	1.35	0.0374	0.45
Ever goes to clubs	0.2946***	1.18	0.1040***	1.26
Drunk at least once per month	0.3335***	1.34	0.1787***	2.17
Bad health	0.2876***	1.16	0.0984*	1.19

First stage coefficients are based on the specification in table 2. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively. The complier-population ratio is calculated as the first stage coefficient for the subsample who posses the characteristic in column 1 divided by the first stage coefficient for the whole sample.

Table 4: Cannabis consumption and other drug consumption

	(i)	(ii)	(iii)	(iv)
	OLS		IV	
Cannabis consumption	At least once	Regular	At least once	Regular
	Taken any class a drug last year			
Consumes cannabis	0.1124***	0.1996***	-0.0583	-0.1786
	(0.0126)	(0.0216)	(0.0641)	(0.2054)
	Ever taken heroin last year			
Consumes cannabis	0.0026	0.0058*	-0.0053	-0.0161
	(0.0016)	(0.0031)	(0.0112)	(0.0344)
	Ever taken cocaine last year			
Consumes cannabis	0.0720***	0.1221***	-0.1200**	-0.3665*
	(0.0108)	(0.0181)	(0.0571)	(0.1956)
	Ever taken crack last year			
Consumes cannabis	0.0075***	0.0134**	0.0110	0.0335
	(0.0028)	(0.0058)	(0.0193)	(0.0590)
	Ever taken amphetamine last year			
Consumes cannabis	0.0530***	0.0957***	-0.0655	-0.2001
	(0.0089)	(0.0178)	(0.0466)	(0.1516)
	Ever taken ecstasy last year			
Consumes cannabis	0.0612***	0.1139***	-0.0428	-0.1308
	(0.0099)	(0.0200)	(0.0548)	(0.1727)
	Ever taken acid last year			
Consumes cannabis	0.0318***	0.0692***	-0.0080	-0.0246
	(0.0070)	(0.0148)	(0.0400)	(0.1228)
	Ever taken amyl nitrite last year			
Consumes cannabis	0.0696***	0.1055***	0.0883*	0.2538
	(0.0105)	(0.0187)	(0.0497)	(0.1568)
	Ever taken glue last year			
Consumes cannabis	0.0144***	0.0357***	0.0206	0.0627
	(0.0056)	(0.0113)	(0.0241)	(0.0741)
No. of individuals	2535			
No. of person-year-obs.	9535			

Coefficients, standard errors adjusted for clustering on the individual level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively. All estimates contain individual fixed effects, year dummies and the individual's age.

Table 5: Cannabis consumption and general crime

	(i)	(ii)	(iii)	(iv)
	OLS		IV	
Cannabis consumption	At least once	Regular	At least once	Regular
	Any offence in the last year			
Consumes cannabis	0.0950***	0.1339***	0.2692***	0.8211***
	(0.0185)	(0.0275)	(0.0871)	(0.3046)
	Any offence in the last year, minus minor offences			
Consumes cannabis	0.0997***	0.1442***	0.2307***	0.7120**
	(0.0182)	(0.0272)	(0.0848)	(0.2849)
	Any serious offence in last year			
Consumes cannabis	0.0638***	0.0984***	0.1806**	0.5599**
	(0.0152)	(0.0228)	(0.0732)	(0.2428)
No. of individuals	2535			
No. of person-year-obs.	9535			

Coefficients, standard errors adjusted for clustering on the individual level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively. All estimates contain individual fixed effects, year dummies and the individual's age.

Table 6: Cannabis consumption and property crime

	(i)	(ii)	(iii)	(iv)
	OLS		IV	
Cannabis consumption	At least once	Regular	At least once	Regular
	Any property offence in last year			
Consumes cannabis	0.0645***	0.1142***	0.2755***	0.8547***
	(0.0163)	(0.0261)	(0.0769)	(0.2840)
	Any property offence in last year, minus minor theft			
Consumes cannabis	0.0606***	0.1119***	0.2178***	0.6797***
	(0.0158)	(0.0257)	(0.0736)	(0.2561)
	Any vehicle theft offence in last year			
Consumes cannabis	0.0165**	0.0278**	0.0746**	0.2298**
	(0.0070)	(0.0141)	(0.0347)	(0.1163)
	Any burglary offence in last year			
Consumes cannabis	0.0167**	0.0367***	0.0454**	0.1382*
	(0.0067)	(0.0123)	(0.0217)	(0.0707)
	Any robbery offence in last year			
Consumes cannabis	-0.0003	0.0076	0.0109	0.0357
	(0.0033)	(0.0073)	(0.0123)	(0.0377)
	Any other theft offence in last year			
Consumes cannabis	0.0519***	0.0794***	0.2196***	0.6806***
	(0.0156)	(0.0241)	(0.0710)	(0.2494)
	Any other theft offence in last year, minus minor theft			
Consumes cannabis	0.0424***	0.0763***	0.1482**	0.4638**
	(0.0149)	(0.0238)	(0.0656)	(0.2148)
	Any criminal damage offence last year			
Consumes cannabis	0.0541***	0.0933***	0.1086**	0.3362**
	(0.0113)	(0.0191)	(0.0512)	(0.1660)
No. of individuals	2535			
No. of person-year-obs.	9535			

Coefficients, standard errors adjusted for clustering on the individual level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively. All estimates contain individual fixed effects, year dummies and the individual's age.

Table 7: Cannabis consumption and non-property crime

	(i)	(ii)	(iii)	(iv)
	OLS		IV	
Cannabis consumption	At least once	Regular	At least once	Regular
	Any violent offence in last year			
Consumes cannabis	0.0564***	0.0660***	0.1718**	0.5151**
	(0.0169)	(0.0238)	(0.0759)	(0.2513)
	Any violent offence in last year, minus school fights			
Consumes cannabis	0.0635***	0.0795***	0.1476**	0.4489*
	(0.0166)	(0.0231)	(0.0740)	(0.2383)
	Any assault offence in last year			
Consumes cannabis	0.0586***	0.0700***	0.1752**	0.5254**
	(0.0169)	(0.0238)	(0.0757)	(0.2517)
	Any assault offence in last year, minus school fights			
Consumes cannabis	0.0661***	0.0834***	0.1425*	0.4335*
	(0.0166)	(0.0229)	(0.0736)	(0.2371)
	Any drug offence in last year			
Consumes cannabis	0.0611***	0.1333***	-0.0195	-0.0576
	(0.0099)	(0.0201)	(0.0478)	(0.1485)
No. of individuals	2535			
No. of person-year-obs.	9535			

Coefficients, standard errors adjusted for clustering on the individual level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively. All estimates contain individual fixed effects, year dummies and the individual's age.

Table 8: Cannabis consumption, anti-social behavior and victimization

	(i)	(ii)	(iii)	(iv)
	OLS		IV	
Cannabis consumption	At least once	Regular	At least once	Regular
	Tried to avoid paying fare on public transport			
Consumes cannabis	0.1156***	0.1629***	0.5152***	1.5969***
	(0.0179)	(0.0251)	(0.0903)	(0.3941)
	Behaved noisily/rude in public			
Consumes cannabis	0.0738***	0.1322***	0.3536***	1.1201***
	(0.0166)	(0.0243)	(0.0802)	(0.3123)
	Neighbors complained about person			
Consumes cannabis	0.0598***	0.0728***	0.2209***	0.6762***
	(0.0146)	(0.0210)	(0.0735)	(0.2566)
	Sprayed graffiti on building			
Consumes cannabis	0.0329***	0.0543***	0.2012***	0.6163***
	(0.0104)	(0.0178)	(0.0492)	(0.1890)
	Attacked or threatened someone because of race or religion			
Consumes cannabis	0.0201***	0.0269***	0.0640**	0.1952**
	(0.0062)	(0.0085)	(0.0307)	(0.0989)
	Carried a weapon (including knifes)			
Consumes cannabis	0.0419***	0.0811***	0.2802***	0.8577***
	(0.0112)	(0.0186)	(0.0553)	(0.2286)
	Was victim of a personal crime			
Consumes cannabis	0.0609***	0.1059***	0.3996***	1.1927***
	(0.0196)	(0.0279)	(0.0973)	(0.3688)
	Was victim of any crime			
Consumes cannabis	0.0634***	0.0571*	0.3133***	0.9386**
	(0.0212)	(0.0296)	(0.1058)	(0.3773)
No. of individuals	2535			
No. of person-year-obs.	9535			

Coefficients, standard errors adjusted for clustering on the individual level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively. All estimates contain individual fixed effects, year dummies and the individual's age.