Trends in the use of mind-altering drugs among European adolescents during the Great Recession

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Word count:3,756 (abstract excluded)

Running head: Trends in mind-altering drugs among teens.

Keywords: macroeconomic fluctuations; adolescents health behaviours; substance use; mind-altering drugs.

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Declarations**Ethics Approval and Consent to Participation**

Not applicable.

Role of Funding Sources

This work was supported by AXA Postdoctoral fellowship (NB, PC) . ERC Grant 313590-HRES (VT). ERC Grant 694145-IFAMID (VT). Both AXA and ERC had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

Conflict of Interest

The authors have no financial relationships with any organization that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work.

Data Availability

The data that support the findings of this study are available from ESPAD but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available.

Acknowledgments

We would like to thank the editor Reinhard Busse, two anonymous reviewers, all the participants to Population Association of America 2018, European Population 2018 for their useful comments to previous version of the paper. Pepita Barlow, Amy Clair and Aaron Reeves should be separately thanked for countless discussions on previous version of the manuscript. Usual disclaimers apply.

Authors Contributions

NB conceived the research; PC compiled the dataset; VT drafted the paper; all the authors performed the data analysis, contributed to the interpretation of the results and the revision of the manuscript.

Highlights

- We examine time-trends in drug-use among adolescents during the Great Recession.
- We distinguish between licit (inhalants) and illicit (cocaine and ecstasy) drug-use.
- The Great Recession was associated with an increase in the use of inhalants.
- The Great Recession was associated with a decrease in the use of ecstasy.
- Social protection appears to help buffer the association.

Abstract

Despite the growing evidence of health-responses to macroeconomic fluctuations, little research has been carried out on the economic reflexes of licit and illicit drug-consumption, especially among teenagers. This paper uses data on adolescents between 15 and 17 years old from 25 European countries to test, if and how, the substance-use pattern has changed during the Great Recession. The data come from two cross-sectional waves (2007 and 2011) of the European School Survey Project on Alcohol and Other Drugs (ESPAD) (n= 137,989 individuals). One percentage point increase in the unemployment rate is associated with an increase [decrease] in the probability of having tried inhalants and cocaine [ecstasy] at least once, by about 0.005 (95% CI: 0.004, 0.006) and 0.001 (95% CI: 0.0001, 0.001) [-0.001 (95% CI: -0.001, -0.001)] respectively. Social protection expenditure reduces the use of inhalants, whereas ecstasy consumption rises. The pattern for cocaine is unclear.

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1. Introduction

Drug-use and abuse – both illicit and licit – harm individuals and communities, by increasing criminal activity (1, 2) and the risk of developing chronic and acute health problems (3). Approximately 25% of the population of Europe (88 million) have tried illicit substances at least once in their life (3). Adolescence and young adulthood is often linked with an initiation into drugs (4), therefore, drug use trends among young people are a major public-health concern. The European Monitoring Centre for Drugs and Drug Addiction estimates, in its European Drug Report 2018 (5), that 17.8 million young adults (aged 15-34) used illegal drugs in 2017. Among illegal substances, cannabis was the most common, with 17.2 million young adults (14.1% of the total) using it in 2017. “Hard” drug use (e.g. cocaine and ecstasy) is less widespread within this age-group, but still worrying. In 2017 approximately 2.3 million (1.9%), 2.2 million (1.8%), and 1.2 million (1%) used, respectively, cocaine, ecstasy and amphetamines. About 4% of individuals aged 15-16 have used, at least once, “new psychoactive substances” (or “legal highs”) such as legal gasses, powders, tablets, pills or herbs that imitate the effect of illicit, mind-altering drugs (5).

During the Great Recession, the share of adolescents having “legal highs” has increased markedly (6-8) and a recent survey (6) assesses average European lifetime inhalants

prevalence at around 8% in 2015. However, little it is known about the reasons for this increase.

This paper uses data on adolescents aged between 15 and 17 years old, from 25 European countries, for two years, 2007 and 2011, to test if and how the substance-use pattern changed during the Great Recession. Uncovering the association between substance use and any economic downturn is crucial because of the “fears that [recessions] may be accompanied by an increase in problematic forms of drug use”(9). In doing so, this paper makes three main contributions. First, it extends the literature on the effects of macroeconomic shocks on different forms of health behaviour, by providing new insights into the patterns of substance use among adolescents during the Great Recession. The long-term consequences of drug-use during adolescence appear to be particularly detrimental. For example, chronic marijuana use has been associated with a loss of Intelligence Quotient, which is irrecoverable even if the individual quits. Moreover, drug-use related memory and thinking impairment might lead to educational disruption, which can have long-term consequences in terms both of cognitive and non-cognitive skills development (10, 11). In parallel, it is still unclear to what extent adolescents might be affected, in their behaviour, by fluctuations in the unemployment rate, because they are still embedded in a protective family environment. Second, it provides new evidence on the possible macro-level causes (i.e. unemployment and social protection expenditure), of the rise in the use of “legal highs” among adolescents. We explicitly focus on “inhalants”, defined as solvents or other materials producing vapours that can be inhaled to induce a psychoactive, or mind-altering, effect. Third, it compares “legal highs” with “hard” drugs, namely ecstasy and cocaine, which have similar mind-altering effects, but very different retail costs. This allows us to elucidate whether income played a role in substance-use during the Great Recession.

Identifying the effect of the recent economic crises on substance use has thus far proven challenging. Empirically, the scarce anecdotal and scientific evidence shows a lack of consensus on direction and magnitude. A comprehensive, systematic review on the topic reports (12), however, that the association is mainly counter-cyclical. For example, in Greece, the economic downturn was associated with an 11.6 percentage points increase in the number of drug-addicts, in the period 2008-2010 (13). Similar effects were observed in Spain, where the Great Recession was linked to an increase in the consumption of marijuana and cocaine (14, 15). However, all of these studies focus on the working-age population, rather than on adolescents. To the best of our knowledge, only a handful of studies relates economic conditions to drug-use among young people (16, 17). Arkes finds a counter-cyclical link between drug consumption and the business cycle for young Americans, which is related to their limited response to the income-effect. At the same time, his findings show that the young are more likely to sell drugs, to fund their own consumption (18, 19). Ayllón and Ferreira-Battista (2018) examine the association between youth unemployment rates, drug consumption and risk perceptions in 28 European countries between 2011 and 2014 (20). They find that an increase of one percentage point in the regional unemployment rate is associated with 0.68% and 0.49% increase in the use of, respectively, cannabis and “new substances” (20). However, no evidence of that sort has been provided about other-than-cannabis illicit drugs, such as “hard” substances (e.g., ecstasy).

2. Mechanisms for how the macroeconomic shocks could affect teenage drug use

The contradictory empirical evidence led scholars to speculate on a variety of potentially opposite mechanisms that might explain the impact of macroeconomic fluctuation on substance consumption. This depends on the individual economic and social situation. Also, from a theoretical point of view, the association between the business cycle and drug

consumption is *a priori* ambiguous. On the one hand, we might observe the so-called *stress-related* mechanism: people cope with stress related to real or threatened insecurity about their future and/or to greater family strife by using and abusing substances. At the same time, greater stress-related family strife might lead adolescents to spend more time away from home, which, in turn, might increase their exposure to different drugs (18, 21). On the other hand, a weaker economy might decrease employment opportunities and this will lower the opportunity cost to “get high”, thereby leading to a higher consumption of drugs (18): the so-called *opportunity-cost mechanism*. Conversely, families might have tighter budgets, which may translate into less disposable pocket money for adolescents. This might reduce their drug consumption or lead them to substitute expensive drugs, such as cocaine, for cheaper ones, such as inhalants. This was the case in Italy, for instance. Results from repeated raw analyses in urban wastewater treatment plants, in two Northern Italian cities, show a downward trend in the consumption of expensive drugs such as cocaine and heroin and an increase in the consumption of cheaper drugs, such as methamphetamine (22). Likewise, individuals might be less likely to spend money on substances during period of financial hardship (21), the so-called *income or budget constraint effect*.

Thinking specifically of drugs, another possible mechanism is that when the economy is weak teenagers might be more likely to sell drugs as there are no or fewer legitimate jobs around (18, 23, 24). Drug selling would lower the transaction costs, both in terms of danger and the monetary one, involved with purchasing drugs and might lead to an increase in drug consumption among teenagers themselves (19).

More recently the literature has investigated the moderating role of social protection in the association between macroeconomic fluctuations and health outcomes (25-28), finding that such an association tend to be weaker in countries with a high level of social protection (26).

There appear to be two mechanisms at play in this association. First, countries with high levels of social protection may push fewer vulnerable groups to work. Therefore, these groups are less likely to become unemployed and experience its negative consequences (26). Second, as Ruhm claims ‘social protection expenditure may be a marker for ‘broader patterns of government involvement’. As such, high levels of social protection might mitigate both the positive and the negative consequences of macroeconomic fluctuations (26, 29).

3. Methods

3.1 Data sources

To assess how patterns in substance use have changed during the Great Recession, we use two waves (2007 and 2011) of the European School Survey Project on Alcohol and Other Drugs (ESPAD) database (30). ESPAD is a vast cross-national school survey that takes in adolescents between 15 and 17 years old in full-time education and collects information on the use of several different drugs. Countries are randomly sampled and should be representative of the population under study. Our final sample consists of nearly 138,000 adolescents from 25 European countries.

3.2 Statistical Model

To investigate the association between macroeconomic fluctuation and substance consumption and the moderating effect of social protection expenditure, we use the following linear probability model:

$$Drug_{ict} = \beta_0 + \beta_1 \tau + \beta_2 U_{ct} + \beta_3 Z_i + \beta_4 SP_{ct} + \beta_5 U_{ct} \cdot SP_{ct} + \beta_6 C_i + \varepsilon_{ict} \quad (1)$$

Here Drug represents respectively the lifetime consumption of cocaine, ecstasy and inhalants for individual i , living in country c , at time t . τ is a dummy variable taking value 1 in the year 2011, and 0 otherwise (i.e. for year 2007), which allows us to control for changes in circumstances between 2007 and 2011, such as changes in taste preferences, as well as drug prices. Z is a set of individual-specific variables, such as gender and the parents' highest educational attainment. C represents country dummy, or country fixed-effect, which allow us to control for country differences in macro-level tobacco and drug policies. Tobacco and specifically cigarettes use appears to be complementary to drug use (31). U represents the unemployment rate and SP represents the social protection expenditure *per capita* expressed in logarithm (32). We are specifically interested in the direction and magnitude of β_2 , β_4 and β_5 . More specifically, β_2 , represents the variation in the probability of using each drug associated with a one percentage point increase in the unemployment rate. β_4 represents the variation in using each drug associated with a variation of one percentage point in social protection, whereas β_5 represents how much the association between drug use and unemployment rate is moderated by social protection expenditure *per capita*.

We engage in the linear probability model, with time and country fixed effects, instead of a multilevel model, to avoid potential bias in the estimates of country-level fixed parameters, as shown by Bryan and Jenkins (2016) (33). The authors, in fact, show that the minimum number of countries required consistently to estimate such a parameter in a multilevel model is 30, here we have only 25 countries (33).

Substance-use was measured using the following questions from the ESPAD survey: “*On how many occasions in your lifetime (if any) have you used any of the following drugs: Inhalants/Cocaine/Ecstasy?* Possible answers were: *0/1-2/3-5/6-9/10-19/20-39/40 or more*”.

Respondents provide one response for each drug. For inhalants, country-specific examples of such substances were given to respondents. For each of the three substances investigated, we categorize the respondent's answer as a dummy variable, which is equal to 1 if the individual used that substance at least once in his/her life, and 0 otherwise. Lifetime consumption appears to be a good proxy for drug initiation, which is associated with both increased drug use and increased criminal activity later in life. (34) Therefore, studying factors that are related to it is particularly relevant from a policy point of view. In parallel, finer-grained data, such as consumption in the last 30 days, are unavailable for cocaine consumption.

Data on the unemployment rate come from the Eurostat. In line with Arkes (18, 19), this analysis uses the country-level unemployment rate, rather than the youth unemployment rate, because the former is estimated using a larger sample. Hence, the potential sampling error will be smaller and the estimates more reliable (18). The adult unemployment rate may also affect adolescents' consumption, as it might serve as proxy for parental income and then, during an economic downturn, a tighter budget might lead to reduced substance consumption, as explained above in the introduction. In parallel, this appears to be the main measure used in the literature, studying the association between macroeconomic conditions and health outcomes (see for example Catalano for a review of the literature (35)). Among the others, Tapia-Granados (2008) examine the association between mortality rates and the four main macroeconomic indicators for Japan between 1960 and the early 2000s: the unemployment rate; GDP; Labour Force Participation Ratio; and GDP (lagged one year) (36). He shows that unemployment rate is the indicator which best predicts mortality rates.

Social protection data represent direct transfer or "in kind" benefits to households and individuals, including benefits for sickness/healthcare, disability, old age and survivors'

pension, unemployment, family and children, housing and for social exclusion. Data on social-protection expenditure *per capita* indexed to 2010 were taken from Eurostat.

We use population weights and robust standard errors at the country level to reflect the non-independent sampling. All models were estimated using STATA version 15.

Table A1 in the Web Appendix presents the descriptive statistics.

4. Results

Figure 1 shows the bivariate association between the level of unemployment and the proportion of young people using drugs, separately by drug-type (diamonds represent inhalants, circles cocaine and squares ecstasy). The dashed lines represent the estimated trend in the association. At first glance, we can distinguish two different trends. First, inhalant consumption tends to be counter-cyclical (i.e. it increases when unemployment surges), suggesting that the economic recession is a significant factor in their use. Second, both cocaine and ecstasy consumption seems to be a-cyclical (e.g. consumption does not respond to variations in the unemployment rate).

[Figure 1 about here]

To investigate some possible compositional differences not accounted for in Figure 1, Figure 2 presents the prevalence of substance-users by parental socio-economic status (SES) and by drug-type (blue represents inhalants, red cocaine and green ecstasy) in 2007 (Figure 2a) and in 2011 (Figure 2b). For all three substances, we can see that use is more common among adolescents in the lowest SES. However, the pattern for higher SES is not clear. Time-trends

also vary according to the substance. What is strikingly evident is the overall decrease in ecstasy consumption. Whereas the use of inhalants increased rapidly in the same period. Cocaine-use appears to be flat. It is worth noting the moderating role played by parental SES. Adolescents from higher SES have increased consumption in inhalants, while they decreased their consumption of both cocaine and ecstasy. The decrease in the ecstasy consumption for the medium SES between 2007 and 2011 is particularly evident.

[Figure 2 about here]

Table 1 presents the results of the linear probability model described in Equation 1. We report, in the top and bottom panels, the results with and without social protection expenditure as a moderator in the relationship between, respectively, unemployment and drug consumption. In Web Appendix Table A3, we present the estimation results using the full variation scale, offering similar results to the main ones reported here.

Our results suggest that being female, as well as belonging to a higher SES are negatively associated with the probability of having tried any drug. Looking specifically at the association with macroeconomic fluctuations, measured by unemployment rate, we found two completely different drug-related patterns. Inhalants and cocaine consumption appear to be counter-cyclical. More precisely, a one percentage point increase in the unemployment rate is associated with an increase in the probability of having tried inhalants and cocaine at least once by respectively about 0.005 (95% CI: 0.004, 0.006, P-value $\leq$ 0.001) and 0.001 (95% CI: 0.0001, 0.001, P-value=0.03). Conversely, ecstasy consumption appears to be pro-cyclical. A one percentage point increase in the unemployment rate is associated with a decreased probability of having tried ecstasy at least once by about 0.001 (95% CI: -0.001, -

0.001, P-value=0.001). To reconcile these conflicting results, we present in Web Appendix Figure 1 the time-trend in the price of ecstasy *vis-à-vis* cocaine. This shows that while the cocaine price markedly decreased during the period under investigation, the price of ecstasy rose, confirming that our results are driven by an income-mechanism.

[Table 1 about here]

An additional goal of this study is to investigate whether social protection expenditure moderates the association between macroeconomic fluctuation and drug consumption. Table 1 reports the estimates, while Figure 3 presents the results graphically: Figure 3a shows the results for inhalants consumption, 3b for ecstasy and 3c for cocaine. To test the possible moderating role of social protection, we present the association between drug consumption and unemployment at three different levels of social protection: in blue when the social protection expenditure *per capita* in logs equals to seven; in red when it amounts to eight; and in green when it reaches nine. Two different types of trends are observed. Higher social protection appears to buffer (boost) the detrimental effects of unemployment on inhalants (ecstasy) consumption. The pattern for cocaine is unclear. In fact, while higher levels of social protection appear to intensify cocaine consumption, the interaction between social protection and unemployment rate appears to buffer it.

[Figure 3 about here]

5. Discussion

This paper sheds further light on how drug-use changed among adolescents from 25 European countries during the Great Recession. Our results show that the relationship between economic cycle and drug-use is very much substance-specific. Our analysis suggests that a one percentage point variation in the unemployment rate led to an increase (decrease) in the probability of having tried, at least once, inhalants and cocaine (ecstasy) by, respectively, about 0.005 (95% CI: 0.004, 0.006, P-value $\leq$ 0.001) and 0.001 (95% CI: 0.0001, 0.001, P-value=0.03) [-0.001 (95% CI: -0.001, -0.001, P-value=0.001)].

The counter-cyclical nature of both cocaine and inhalant consumption suggests that during economic downturns adolescents tend to cope with uncertainty about their future, and related stress, by increasing the consumption of both substances. However, as the rise in inhalants was the largest, this suggests that adolescents have adapted to their tighter budget and swapped to cheaper substances, such as inhalants. These results are in line with the recent reports published in the press, suggesting that today's adolescents are more likely to have tried drugs, especially gasses and other “new substances”, than cigarettes (7, 8).

Conversely, ecstasy appears to be pro-cyclical. To reconcile this conflicting result, we build our results on the different characteristics of this drug. Ecstasy is labelled both in the literature and in the media as a “recreational” drug, i.e. it is often used in festive occasions such as parties (37). Its hedonistic reputation might allow us to speculate on the predominance of the income-effect during periods of financial hardship, which is confirmed by the time-trend in its price as presented in Web Appendix Figure 1.

Social protection appears to help in buffering the increase in inhalants consumption due to soaring unemployment during the Great Recession, thereby helping reduce any stress-related effect. Conversely, if the income effect is the predominant mechanism in explaining variations in ecstasy consumption, an increase in disposable income through social protection benefits might boost its use (27).

The results for cocaine are unclear. On the one hand, higher levels of social protection are associated with higher consumption. On the other hand, the interaction term between unemployment rates and social protection appears to buffer the drug-response to the Great Recession. However, two caveats need to be borne in mind here. Cocaine is a stimulant drug, used to increase euphoria and/or to boost individual's performance, including academic performance. Therefore, its use, among adolescents, might increase in a situation where parental unemployment is high and where they need to cope with the psychological distress caused by family strife. In parallel, it is an expensive drug. In fact, it is definitely the most expensive among the drugs analysed here. However, some descriptive evidence on the price of cocaine presented in the Web Appendix Figure 1 shows that its price declined on average after the onset of the Great Recession, hence making it as affordable to those who were hit by the recession itself as before the onset of the Great Recession. In parallel, increments in disposable income through social benefits might compensate the income-effect induced by the Great Recession and might lead to higher consumption.

Before analyzing the potential implications for policy and future research, we must note several limitations in our analysis for future research. First, the results cannot provide us with any causal relationship, but only associations: this is essentially the case with all studies in

this field. Second, our data are limited to 2011, hence, we are unable capture the long-term effects of the Great Recession and its aftermath. Third, ESPAD is a cross-sectional survey, hence we are unable to analyze changes in an individual's behaviour. Fourth, adolescents, who are full-time students, represent our sample of interest. Therefore, our estimates might be conservative, as we are unable to capture the effect of the labor market on them. Fifth, we observe only lifetime consumption, not distinguishing between occasional and regular substance use. However, our analysis and findings are relevant in that they provide new evidence of trends among young people in the use of “hard” and “new” substances. These are trends that have not yet been investigated previously, but where even exploratory or sporadic use might prove dangerous.

Our results have important policy and health-related implications. In terms of policy implications, our findings are particularly relevant for anti-drug policies aimed towards adolescents, as they show that: i) economic conditions should be considered by policy-makers in implementing effective drug-prevention strategies; and ii) social protection expenditure might be an effective way to reduce some of the potential detrimental consequences of economic downturns. Future research could focus, for example, on disentangling whether the initiation into “soft” and “hard” drugs during adolescence leads to addiction and the particular groups which are most exposed to that.

Our study also provides new evidence about the rising consumption of inhalants. Since inhalants are very cheap and easy to access, and since they have concomitantly strong and lasting mind-altering effects, their rising consumption during an economic downturn, might be driven by both income and stress-related effects. This is particularly worrying as inhalants

are mainly legal substances, the least-studied form of abuse, and there are no clearly effective treatments reported in the clinical literature to prevent or treat their consequences (38).

Our results lead us speculate on the possible long-term health consequences. It is well-known that drug use and abuse during adolescence is associated with long-term deficits in neurodevelopment such as a decline in gray matter volume, dysfunctions in memory and learning ability, and neural changes (39). Previous lab-experiments on rats show that the exposure to ethanol, which is used in the preparation of solvents, reduced their response to stress and immune challenges (40), increasing their deficits in risk-decision making (41). Moreover, the rising use of cocaine and inhalants during a period of economic recession encourages us to speculate on additional potential costs for the economy driven by health costs. The increased risk of deficits in neurodevelopment, might lead adolescents to drop-out of school. This has implications both for an individual's education stock, as it will determine future earnings, and for human capital accumulation in the economy as a whole, as it will jeopardize economic growth.

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Table 1: Estimation results

Figure 1: Bivariate association between unemployment rate and prevalence of drug use, separately by type of drug.

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Figure 2: Prevalence of drug-use, by type of drug, by parental socio-economic status. Data for 2007 (a) and 2011 (b).

a) 2007

b) 2011

Source: Authors' computation on two waves (2007-2011) from the European School Survey Project on Alcohol and Other Drugs (ESPAD). Bars represent 95% confidence intervals.

Figure 3: The moderating effect of Social Protection Expenditure per capita (in Logs) on the association between unemployment rate and substance use

a) Inhalants

b) Ecstasy

c) Cocaine

Table 1: Estimation Results

	(1)	(2)	(3)
	Inhalants	Ecstasy	Cocaine
Female	-0.01**	-0.01***	-0.02***
	[-0.02,-0.003]	[-0.02,-0.01]	[-0.03,-0.01]
	<i>0.008</i>	<i><0.001</i>	<i><0.001</i>
Parental Education (reference: Low Educated)			
Secondary school educated	-0.02*	-0.02**	-0.02*
	[-0.04,-0.01]	[-0.03,-0.00]	[-0.03,0.00]
	<i>0.005</i>	<i>0.02</i>	<i>0.06</i>
College Educated	-0.02*	-0.02**	-0.02*
	[-0.04,-0.005]	[-0.03,-0.004]	[-0.03,-0.004]
	<i>0.013</i>	<i>0.010</i>	<i>0.012</i>
Unemployment rate	0.005***	-0.001*	0.001**
	[0.004,0.006]	[-0.001,-0.0001]	[0.001,0.001]

	<i><0.001</i>	<i>0.03</i>	<i>0.001</i>
<i>Including Social Protection Expenditure as Moderator</i>			
Female	-0.01**	-0.01***	-0.02***
	[-0.02,-0.003]	[-0.02,-0.006]	[-0.03,-0.01]
	<i>0.008</i>	<i><0.001</i>	<i><0.001</i>
Parental Education (reference: Low Educated)			
Secondary school educated	-0.02**	-0.01*	-0.01
	[-0.04,-0.007]	[-0.03,-0.002]	[-0.03,0.001]
	<i>0.005</i>	<i>0.02</i>	<i>0.06</i>
College Educated	-0.02*	-0.02**	-0.02*
	[-0.04,-0.004]	[-0.03,-0.004]	[-0.04,-0.004]
	<i>0.01</i>	<i>0.01</i>	<i>0.01</i>
Unemployment rate	0.06***	-0.01**	0.01***
	[0.05,0.07]	[-0.01,-0.002]	[0.007,0.02]
	<i><0.001</i>	<i>0.007</i>	<i><0.001</i>
Social Protection Expenditure	-0.11***	-0.01	0.03**

per capita (in Logs)

	[-0.14,-0.07]	[-0.03,0.02]	[0.01,0.06]
	<i><0.001</i>	<i>0.521</i>	<i>0.004</i>
Unemployment*Log(Social Protection Expenditure)	-0.01***	0.008*	-0.001***
	[-0.008,-0.005]	[0.0003,0.001]	[-0.002,-0.001]
	<i><0.001</i>	<i>0.011</i>	<i><0.001</i>
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
<i>N</i>	137,967	137,989	137,502

Source: Two waves (2007-2011) of the European School Survey Project on Alcohol and Other Drugs (ESPAD). The dependent variable is each drug lifetime consumption.

The explanatory variables are the individual gender, the education of the higher educated parent (low educated, secondary education, college educated), unemployment rate and social protection expenditure per capita at constant prices 2010. 95% Confidence Interval in brackets. P-values in italics.

* p<0.05, ** p<0.01, *** p<0.001

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Figure 1: Time-Trend in Ecstasy and Cocaine Price

Cocaine prices are in Euro/grams (right axis), Ecstasy Euro/tablet (left axis).
Source: Author's Computation on EMCDDA data

Table A1: Descriptive Statistics

Variables	Mean	S.D.	Min.	Max.	Sample Size
Individual information					
Female	0.53 (66,365)	0.50	0	1	138,355
Age	16	0.11	15	17	135,088
Low Educated Parents	0.18 (24,583)	0.38	0	1	138,355
Secondary School Educated Parents	0.46 (63,878)	0.50	0	1	138,355
College Educated Parents	0.36 (49,894)	0.48	0	1	138,355
Social Protection per capita (in Logs) (Indexed to 2010)	38.53	26.70	4.88	113.44	138,355
Outcome Variables					
I have tried inhalants at least once	0.09 (12,847)	0.29	0	1	137,967
I have tried cocaine at least once	0.02 (3,358)	0.15	0	1	137,502
I have tried ecstasy at least once	0.03 (3,999)	0.17	0	1	137,989
Countries					
Belgium	0.02 (2,753)	0.14	0	1	138,355

Bulgaria	0.03 (3,566)	0.16	0	1	138,355
Cyprus	0.06 (8,649)	0.24	0	1	138,355
Czech Republic	0.05 (6,597)	0.21	0	1	138,355
Denmark	0.02 (2,197)	0.13	0	1	138,355
Estonia	0.03 (3,887)	0.17	0	1	138,355
Finland	0.05 (6,449)	0.21	0	1	138,355
France	0.04 (5,778)	0.20	0	1	138,355
Greece	0.09 (12,492)	0.29	0	1	138,355
Hungary	0.04 (5,425)	0.19	0	1	138,355
Iceland	0.04 (5,350)	0.19	0	1	138,355
Ireland	0.03 (3,619)	0.16	0	1	138,355
Italy	0.03 (4,161)	0.17	0	1	138,355
Latvia	0.03 (4,040)	0.17	0	1	138,355
Lithuania	0.03	0.16	0	1	138,355

	(3,573)				
Malta	0.04 (5,625)	0.20	0	1	138,355
The Netherlands	0.02 (3,388)	0.15	0	1	138,355
Norway	0.03 (4,355)	0.17	0	1	138,355
Poland	0.16 (22,021)	0.37	0	1	138,355
Portugal	0.03 (4,055)	0.17	0	1	138,355
Romania	0.03 (4,696)	0.18	0	1	138,355
Slovakia	0.03 (3,736)	0.16	0	1	138,355
Slovenia	0.04 (5,095)	0.19	0	1	138,355
Sweden	0.03 (3,962)	0.17	0	1	138,355
The U.K.	0.02 (2,887)	0.14	0	1	138,355

Source: Authors' computation on two waves (2007-2011) from the European School Survey Project on Alcohol and Other Drugs (ESPAD). Weighted results. Numbers in parenthesis represent the sample size.

Table A2: Descriptive evidence on the frequency of use of each drug under examination

N. times	Inhalants Freq. %	Ecstasy Freq. %	Cocaine Freq. %
0	90.84	97.08	97.44
1/2	5.38	1.72	1
3/5	1.48	0.45	0
6/9	0.78	0.25	0.27
10/19	0.59	0.19	0.21
20/39	0.31	0.13	0.1
40+	0.62	0.18	0.14
Total	137,976	137,998	137,510

Table A3: Estimation Results using the Full Variation Scale

	(1)	(2)	(3)
	Inhalants	Ecstasy	Cocaine
	(1)	(2)	(3)
Female	-0.03**	-0.03***	-0.06***
	[-0.06,-0.01]	[-0.06,-0.01]	[-0.06,-0.01]
	<i>0.004</i>	<i><0.001</i>	<i><0.001</i>
Parental Education (reference: Low Educated)			
Secondary school educated	-0.11***	-0.06**	-0.05*
	[-0.17,-0.05]	[-0.11,-0.02]	[-0.01,-0.003]
	<i>0.001</i>	<i>0.007</i>	<i>0.036</i>
College Educated	-0.10**	-0.06**	-0.06**
	[-0.17,-0.04]	[-0.11,-0.02]	[-0.11,-0.02]
	<i>0.002</i>	<i>0.008</i>	<i>0.008</i>
Unemployment rate	0.01***	-0.002*	0.001*
	[0.01,0.01]	[-0.003,-0.0004]	[0.0001,0.003]
	<i><0.001</i>	<i>0.012</i>	<i>0.029</i>
<i>Including Social Protection Expenditure as Moderator</i>			
Female	-0.03**	-0.03***	-0.06***
	[-0.057,-0.011]	[-0.045,-0.015]	[-0.076,-0.038]
	<i>0.004</i>	<i><0.001</i>	<i><0.001</i>
Parental Education (reference: Low Educated)			
Secondary school educated	-0.11***	-0.06**	-0.05*
	[-0.174,-0.048]	[-0.106,-0.017]	[-0.098,-0.003]
	<i>0.001</i>	<i>0.007</i>	<i>0.037</i>
College Educated	-0.10**	-0.06**	-0.06**
	[-0.167,-0.039]	[-0.107,-0.016]	[-0.112,-0.016]
	<i>0.002</i>	<i>0.008</i>	<i>0.009</i>
Unemployment rate	0.10***	-0.01*	0.02***
	[0.081,0.122]	[-0.027,-0.001]	[0.010,0.032]
	<i><0.001</i>	<i>0.034</i>	<i><0.001</i>
Social Protection Expenditure per capita (in Logs)	-0.31***	-0.03	0.05
	[-0.405,-0.220]	[-0.094,0.036]	[-0.009,0.100]
	<i><0.001</i>	<i>0.378</i>	<i>0.100</i>
Unemployment Rate*Social Protection	-0.01***	0.002	-0.002***
	[-0.014,-0.009]	[-0.000,0.003]	[-0.004,-0.001]
	<i><0.001</i>	<i>0.060</i>	<i><0.001</i>
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes

Source: Two waves (2007-2011) of the European School Survey Project on Alcohol and Other Drugs (ESPAD). The dependent variable is each drug lifetime consumption. The explanatory variables are the individual gender, the education of the higher educated parent (low educated, secondary education, college educated), unemployment rate and social protection expenditure per capita at constant prices 2010. 95% Confidence Interval in brackets. P-values in italics.

* p<0.05, ** p<0.01, *** p<0.001

Table A4: Estimation Results using Industrial Production as Main Business Cycle Indicator

	(1) Inhalant	(2) Ecstasy	(3) Cocaine
Female	-0.01** [-0.02, -0.00] 0.01	-0.01*** [-0.02, -0.01] <0.001	-0.02*** [-0.02,-0.01] <0.001
Parental Education (reference: Low Educated)			
Secondary school educated	-0.02** [-0.04, -0.01] 0.01	-0.01* [-0.03, -0.00] 0.03	-0.01 [-0.03,0.00] 0.07
College Educated	-0.02* [-0.04, -0.00] 0.02	-0.02* [-0.03, -0.00] 0.01	-0.02* [-0.04, -0.00] 0.02
Industrial production	0.0006*** [0.0003,0.0009] <0.001	-0.0003*** [-0.0005, -0.0001] 0.001	0.0002** [0.0000,0.0004] 0.009
<i>With social protection as moderator</i>			
Female	-0.01** [-0.02,-0.00] 0.009	-0.01*** [-0.02,-0.01] <0.001	-0.02*** [-0.03,-0.01] <0.001
Parental Education (reference: Low Educated)			
Secondary school educated	-0.02** [-0.04,-0.01] 0.007	-0.01* [-0.03,-0.00] 0.025	-0.01 [-0.03,0.00] 0.068
College Educated	-0.02* [-0.04,-0.00] 0.017	-0.02* [-0.03,-0.00] 0.012	-0.02* [-0.04,-0.00] 0.015
Industrial Production	-0.0022*** [-0.0034,-0.0009] 0.001	0.0005 [-0.0004,0.0014] 0.302	-0.0012** [-0.0020,-0.0004] 0.004
Social Protection per capita (in Logs)	-0.21*** [-0.28,-0.14] <0.001	0.03 [-0.01,0.07] 0.147	-0.01 [-0.04,0.03] 0.705
Industrial Production* Log(Social Protection)	0.0008*** [0.0005,0.0012] <0.001	-0.0002 [-0.0005,0.0000] 0.082	0.0004** [0.0001,0.0005] 0.001

Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
<i>N</i>	131832	131849	131385

Source: Two waves (2007-2011) of the European School Survey Project on Alcohol and Other Drugs (ESPAD). The dependent variable is each drug lifetime consumption. The explanatory variables are the individual gender, the education of the higher educated parent (low educated, secondary education, college educated), the annual index of industrial production. 95% Confidence Interval in brackets. P-values in italics.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$