



# Business cycle impacts on substance use of adolescents: A multi-country analysis



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## ABSTRACT

Populations respond to changes in the economic climate in a variety of ways. The recent 'Great Recession' has brought attention to the vulnerability of many economies around the world to changes in non-domestic macroeconomic fluctuations. However, empirical evidence on the responses of adolescents' substance consumption behaviour when the economy deteriorates is very scarce. Thus, the focus of this paper is to analyse the substance consumption patterns displayed by adolescents in response to changes in macroeconomic conditions in a large number of countries. Our results show that beer and wine consumption vary counter-cyclically (a 1pp increase in the unemployment rate increases the probability of drinking beer (wine) by 3% (5.5%)) while adolescent smoking prevalence varies pro-cyclically (a 1pp increase in the unemployment rate decreases the probability of being a current smoker by 3.8%). More importantly, we find that the probability of ever being drunk increases by 1.3% for a 1pp increase in the unemployment rate. Further to this, substantial heterogeneous effects from the aggregate-level results were found when analysing a variety of demographic and geographic dimensions. In light of the existing empirical evidence which outlines that early substance initiators demonstrate worse neurological deficits and suffer stronger labour market penalties (compared to later initiators or abstainers) these findings can aid policy makers in reducing these lasting adverse outcomes.

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## 1. Introduction

In this paper we analyse the role of business cycle conditions in determining substance consumption patterns among adolescents. More specifically, we use data from the Health Behaviour in School-aged Children (HBSC) survey which includes information on personal characteristics, living environments, social status, and substance consumption behaviours for adolescents aged between 8 and 19 living in 38 countries. We focus on the consumption of alcohol, tobacco and marijuana and use data from five survey waves from 1990 until 2006 which provides us with enough variation to capture changes in economic conditions both across countries and over time.

We believe that the study of adolescent substance consumption patterns is of particular importance for the irreversible damage that it exerts in the adolescent's brain as well as for the long-term

economic and productivity impacts which are observable into adulthood. Adolescence is a crucial developmental period in terms of physicality, sociality, sexuality and neurodevelopment. Adolescent alcohol or marijuana consumption leads to negative outcomes in terms of neurodevelopment. Alcohol has been found to act as a neurotoxin on the adolescent brain (Anderson et al., 2009; Renna, 2007; Squeglia et al., 2014a,b). Clinical literature suggests that heavy adolescent alcohol consumption has a deleterious effect on regions of the brain which are associated with working memory, visual and verbal memory, attention, and executive functioning (Renna, 2007; Squeglia et al., 2014a,b). Furthermore, the empirical evidence suggests that regular marijuana use causes a reduction in grey matter in regions of the brain associated with executive functioning, focused attention, social functioning and awareness, problem solving, impulse responsiveness and motivation (Battistella et al., 2014; Blakemore, 2013; Fontes et al., 2011; McCaffrey et al., 2010). Literature analysing adolescent marijuana consumption finds earlier initiation is associated with greater losses in grey matter, leading to larger adverse consequences (Battistella et al., 2014; Fontes et al., 2011).

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In addition to the findings in the clinical literature, the economics literature suggests early incidence and heavy substance usage during school years leads to a reduction in years of schooling completed, lower grades, and subsequent wage penalties in the labour market (Chatterji, 2006; Cook and Moore, 1993; Dee and Evans, 1997; Marie and Zölitz, 2015; McCaffrey et al., 2010; Renna, 2007; Yamada et al., 1993). Adolescent alcohol and marijuana use can limit the ability to learn which subsequently limits future educational options, therefore contributing to penalties in the labour market. Further to this, adolescent consumption of substances with addictive properties, such as alcohol, tobacco or marijuana, can lead to the development of habits which continue to impact labour market outcomes in the future (Renna, 2007). A study by Gruber reports that 45% of adulthood smoking can be explained by adolescent smoking behaviour (Gruber, 2001) outlining the importance of adolescent substance initiation decisions.

Adolescent substance consumption, therefore, leads to lasting adverse consequences in the form of labour market losses and neurodevelopmental alterations, with adverse consequences increasing in consumption intensity but decreasing with age of initiation. These findings outline adolescence as a crucial developmental period, with the lasting impact of early substance consumption initiation making research in this age group particularly valuable.

Further to the damaging personal effects of substance consumption, numerous external costs are related to substance consumption behaviours. Those external costs place a significant burden on society. With a number of substances leading to alterations in personality characteristics, many anti-social behaviours and personal injuries occur when individuals are under the influence of substances. Furthermore, substance consumption imposes a burden on public health care systems through the utilisation of scarce resources. In addition to external costs associated with health care utilisation, substance consumption also impacts the wider economy through increased absenteeism and productivity losses.

The individual and societal impact of adolescent substance consumption in the short, medium and long-term outlines the importance of this research. However, this is an underdeveloped area of research and, the few papers that present evidence on adolescent substance consumption responses to business cycle conditions, reach contradictory results. Two US-specific studies find adolescent drinking patterns to follow a counter-cyclical trend with one of these studies only identifying a weakly significant relationship (Arkes, 2007; Compton et al., 2014). Counter to the US findings, a study of Swedish adolescents finds adolescent alcohol consumption patterns to vary pro-cyclically (Svensson and Hagquist, 2010). The literature analysing smoking responses also fails to find a consensus. A study of Greek adolescents finds a pro-cyclical relationship in adolescent smoking patterns (Kokkevi et al., 2014) while US and Spanish studies find adolescent smoking consumption to vary counter-cyclically (Aguilar-Palacio et al., 2015; Arkes, 2012). Literature analysing cyclical trends in adolescent marijuana consumption consistently finds consumption to vary counter-cyclically, with Greek and US studies finding prevalence of marijuana consumption increasing during weak economic periods (Arkes, 2007; Kokkevi et al., 2014). The empirical evidence in this area of research is underdeveloped with little consensus in its findings. Further to this, the study samples are mostly country-specific. As far as we are aware of, this is the first study that simultaneously analyses substance consumption responses of adolescents to business cycle conditions for multiple substance measures, in multiple countries across two continents and over a twenty-year time horizon.

Our results show that adolescent beer and wine consumption, two of four alcohol measures considered, vary counter-cyclically, a result consistent with the findings of some of the literature for the US (Arkes, 2007; Compton et al., 2014). Furthermore, we also report a counter-cyclical pattern for the probability of being drunk. Counter to the significant cyclical consumption patterns of beer and wine, spirit consumption is found to be unresponsive to macroeconomic fluctuations. Consistent with the findings in the analysis of Greek adolescent smokers, our results point towards a pro-cyclical response in adolescent tobacco consumption behaviour. Finally, against the counter-cyclical consensus found in the adolescent marijuana consumption literature, this research fails to identify a significant cyclical relationship with marijuana consumption. However, significant pro-cyclical results are found when analysing marijuana measures at a more disaggregated level for females, adolescents aged 16 or more and for countries with a high minimum legal drinking age.

Drinking and substance use behaviours are influenced by personal circumstances, a lot of which is dictated by the level of development which can be observed in a country. Using the UN human development index (HDI) as a proxy for development, we split the countries in our sample into two groups, high development and low development. This allows us to run a supplementary analysis in which we allow the impact to be heterogeneous according to the developmental status of the country. Thus, we are able to assess if individuals feel the impact of business cycle fluctuations more in countries with higher or lower levels of development. Additionally, we also look at differences in the minimum legal drinking age across the countries analysed and divide them into high (ages 18, 19 and 21) and low (ages 16 and 17) minimum drinking ages (MLDA). We find that most of the effects come from countries with a high MLDA. Thus, even if adolescents are not legally able to drink, their drinking behaviour does respond very strongly to business cycle conditions.

Thus, this research improves on current evidence in the following ways. Firstly, it analyses multiple countries enabling the derivation of more general conclusions while, at the same time, also exploring heterogeneous results across sub-groups of countries. Secondly, this research simultaneously analyses adolescent cyclical responses in marijuana use, tobacco consumption and different types of alcoholic beverage. Thirdly, the analysis uses data spanning a twenty year period which includes several phases of booms and recessions and improves, therefore, the identification of business cycle fluctuations. Finally, this study also tests for additional heterogeneous results for different demographic groups, giving additional insights into the most responsive adolescent groups. We believe that these results represent an important piece of information that policy makers should take into account in the design of anti-drug policies, allowing for better targeting of high risk groups and better timing of implementation.

## 2. Theoretical predictions

With increasing unemployment and financial uncertainty being well-documented side-effects of economic downturn, three main hypotheses have been established which outline some of the potential mechanisms by which changes in the wider economy impact individuals; the income effect, the economic stress effect and the substitution effect. The income effect hypothesis suggests that as incomes decrease individuals will reduce the consumption of normal goods to a point where equilibrium in personal finances is restored. Thus, if we assume that drugs act as normal goods for the majority of the population who choose to consume them, when incomes fall so will substance consumption patterns. Under this scenario substance consumption will behave in a pro-cyclical direction (Arkes, 2012; Dávalos et al., 2012; Ettner, 1997; Freeman,

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