PEER EFFECTS, UNOBSERVED FACTORS AND RISK BEHAVIOURS IN ADOLESCENCE*

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The objective of this paper is to examine the factors which affect alcohol abuse and truancy among adolescents. We propose a theoretical formulation in which alcohol abuse and truancy appear as derived demands depending on personal, family and peer group variables, and we introduce unobserved individual effects that can influence both behaviours. Empirically, our paper develops an analysis where, after controlling for the existence of unobserved individual factors affecting both decisions, we test for peer influences. Our results first show evidence that alcohol abuse and truancy share unobserved factors affecting both decisions, and then confirm the existence of significant peer group influences on these two deviant behaviours.

Key words: peer, unobserved factors, risk behaviours, alcohol, truancy, bivariate probit.

JEL Classification: I10, I12, I20, I21.

Alcohol abuse and truancy are two widespread risk behaviours which affect the adolescent population. In a recent study, the World Health Organization [WHO (2005)] established that "around 600,000 Europeans died of alcohol-related causes in 2002, representing 6.3% of all premature deaths in the region and more than 63,000 of those deaths were of young people aged 15-29 years". These figures, among others, demonstrate the magnitude of the problem of alcohol abuse among the young of Europe, which, according to WHO (2005), has an alcohol consumption "twice as high as the world average".

With respect to truancy, in a recent study, the OECD [OECD (2003)] established that about one in five secondary school students in the OECD countries had been absent, skipped classes or arrived late at school during the two weeks prior to the study, although in several countries the rate is up to 30% or higher (Spain 34%, Denmark 32.9%, Poland 29.2%, Greece 28.8%).

As is well known, the consumption of alcohol and other drugs has serious consequences for health, with special relevance to adolescence, a stage during which individuals develop their habits of life and consumption. Hawkins *et al*. (1992) concluded that drug and alcohol abuse undermines motivation, interferes with cognitive processes, contributes to mood disorders and increases the risk of accidental injury or death. The abuse of these substances can also imply a significant loss of the individual's human capital, thereby reducing the possibility of higher personal earnings [Dee (1999); Cook and Moore (2001); DeSimone (2008)]. Moreover, alcohol abuse in adolescents may predict antisocial behaviours and alcohol-related problems in adulthood [Scheier *et al*. (1997)].

Additionally, empirical evidence has been found on the strong relationship between low participation at school and educational failure [OECD (2003)]. Studies, such as Baker *et al*. (2001), state that truancy is "one of the early warning signs that youth are headed for potential delinquent activity, social isolation and/or educational failure". Others cite school absenteeism or truancy as a risk factor for substance abuse [Roebuck *et al*. (2004); Duarte and Escario (2006); Lundborg (2006)], delinquency, criminal activity, teen pregnancy and dropping out of school [Bell *et al*. (1994); Baker *et al*. (2001)].

Given the relevance of these risk behaviours, our objective is to go deeper into the factors which determine both alcohol abuse and truancy, paying special attention to the influence of the family and peer group of the adolescent, as well as other observed and unobserved factors which can determine these deviant behaviours.

Our work advances along two lines. First, from a theoretical point of view, we extend the model of DeCicca *et al*. (2000), which introduces the peer factor in the demand for drugs, to the consideration of individual sources of negative affect. We consider that alcohol abuse and truancy can be obtained as derived demands depending on personal, family and peer group variables. Moreover, contrary to the usual approach in empirical works, both behaviours cannot be considered independently, given that they share underlying unobserved factors which exert an influence on them.

Secondly, and consistent with the theoretical framework, the econometric specification addresses two important issues. The existence of these unobserved factors leads us to specify an econometric model where the error terms in the two equations are correlated. If the hypothesis of endogeneity between these variables cannot be rejected, that is to say, if we confirm the existence of unobserved factors affecting alcohol abuse and truancy, we cannot consider one of these variables as an exogenous determinant of the other, since the omission of this correlation will result in biased estimations for the other parameters.

Our econometric model also captures peer group influences on alcohol abuse and truancy. We define classmate peer variables, rather than school-based variables, because they seem more appropriate measures of peer group effects. Never-

theless, the possible endogeneity derived from the distinction between "endogenous and contextual effects" [Manski (1993)], leads us to proceed simultaneously in three ways: to instrument the peer group behaviour variables, to consider some school characteristics (following the strategy of Gaviria and Raphael, 2001), and to use school fixed-effects variables.

From the empirical point of view, the relevance of the above-mentioned problems to Spain is clear. Recent international data puts Spain among the countries in the European Union with the highest level of per capita alcohol consumption [World Health Organization (2001)]. Moreover, the recent data provided by the Spanish Survey on Drug Use in the School Population, corresponding to 2004, show that more than 40% of adolescent students admitted to having been drunk during the previous month. Similarly, the results provided by the OECD (2003) put Spain at the head of the OECD countries in school absenteeism, with 34% of students skipping classes, a much higher figure than the OECD average of 20%.

The rest of the paper is structured as follows. Section 2 presents the relevant existing literature. Section 3 is devoted to developing the theoretical model. Data and variables, as well as the econometric specification and strategy, are described in Section 4. In Section 5 we present the results, and Section 6 closes the paper with a summary of the main conclusions.

1. RELEVANT LITERATURE

Research into alcohol abuse and school absenteeism or truancy has a long history in the sociological and economic literature, and there is a high level of agreement on at least three relevant features.

First, truancy and other irregular behaviours go hand in hand with alcohol abuse in adolescence and youth, with a number of articles mentioning truancy as a predictor of the consumption of alcohol and other drugs [Laukkanen *et al*. (2001); Hallfors *et al*. (2002); Chou *et al*. (2006)]. Other studies maintain that alcohol and drugs are factors which interfere in the cognitive capacity of the students, and in their attitudes at school, with these being powerful indicators for low educational attainment, school absenteeism and dropping out of school [Yamada *et al*. (1996); Roebuk *et al*. (2004); Duarte *et al*. (2006); DeSimone (2008)].

Secondly, adolescents, when making their decisions, are strongly influenced by their close environment (family, peer group, school, neighbourhood), with the impact of the family and the peer group being especially relevant to the decision to consume alcohol and other drugs, and to the decision to develop school deviant behaviours such as skipping classes. In this line, several articles observe that family characteristics, including low economic status or living in a single-parent family, have consistent covariates with antisocial behaviours at these ages [Lahey *et al*. (1999); Dekovic *et al*. (2004)]. However, as Dekovic *et al*., (2004) note, as children approach adolescence, they spend increasing time with their peers, who become the most important reference group for them. As a consequence, the literature has found empirical evidence that adolescents who belong to peer groups with deviant behaviours are more likely to exhibit substance abuse [Aseltine (1995)], school problems [Berndt and Keefe (1995)] and other antisocial behaviours.

Thirdly, it is also recognized that it is not only the environment that determines the final decisions of adolescents. Personal characteristics, as well as other sources of negative affect (e.g., stressful life events or personal failures), are powerful risk factors for alcohol and drug abuse in adolescence [Bates and Labouvie (1997); Colder and Chasin (1999); Laukkanen *et al*. (2001)], and for other deviant behaviours [He *et al*. (2004)]. Moreover, this literature also establishes that the existence of peer influences will imply that a particular social policy directed at adolescents could have an amplified effect on society through the indirect influence of peer groups, with this relationship being seen as a way of generating "social multipliers" [Manski (1993)].

With respect to educational attainment, articles such as Winkler (1975), Borjas (1994), Aaronson (1998), Sacerdote (2001) and Hanusek *et al*. (2003), point out that belonging to a deviant peer group can lead the student to high rates of school absenteeism, low commitment to studies and low levels of educational achievement.

As for the consumption of alcohol, tobacco and other drugs, the main line of research has focused on their addictive character [Becker and Murphy (1988); Chaloupka (1991)), although this literature accepts that some of these consumptions depend on related actions in the person's reference group [Becker, 1996]. The specific study of peer group influences on the consumption of these substances has been introduced into the economic literature more recently with works such as DeCicca *et al*. (2000) and Gaviria and Raphael (2001), opening the way for both the theoretical and empirical consideration of peer group influences on these behaviours.

In particular, DeCicca *et al*. (2000) present a theoretical model where the demand for drugs depends on peer acceptance, an influence which is introduced into the utility function and that allows them to find differences between ethnicities in consumption. In turn, Gaviria and Raphael (2001) can be considered as one of the first works to implement an econometric strategy, using an instrumental variable approach suitable for addressing the problems of endogeneity which arise in the definition of the peer group effect, as recognised in Manski (1993). Research in this empirical line of using instrumental variables has been continued recently with the contributions of Powell *et al*. (2005) and Lundborg (2006). In the first, cigarette prices and tobacco policies are allowed to have a direct and an indirect effect (via peer effects) on individual behaviour. In the second, instead of using a peer measure defined at the school level, a narrower measure of peer behaviour, defined at the class level, is used. In all these studies, empirical evidence has been found supporting peer group influence on the consumption of drugs and other deviant behaviours.

Other solutions have been implemented in order to deal with the endogeneity problem. For example, some authors have implemented a fixed effect approach [Hanusek *et al*. (2003); Arcidiacono and Nicholson (2005); Clark and Lohéac (2007)]. Another solution, which began with Sacerdote (2001), consists in using data sets where self-selection is not evident or can be conditioned out. Basically, the approach consists of using data sets where students have been randomly assigned to dorms. A more recent paper which takes advantage of this kind of data is Foster (2006). A very innovative work of Clark and Lohéac (2007) uses a data set collected from several schools, over a number of years, that enables them to

account for the passage of time, and to use lagged peer group behaviour as a right-hand side variable, and the reference group, which is based on other students in the same school in a different year, is likely exogenous. Another approach appears in DeSimone (2009), who achieves identification by including proxies for specific types of unobserved heterogeneity expected to influence the relationship between fraternity membership and several measures of drinking behaviour. Finally, some papers implement a structural model that accounts for both the simultaneity of choice among peers and nonrandom peer selection [Krauth (2005); Krauth (2006)]. The structural estimator addresses the simultaneity by treating the peer behaviour as an endogenous variable, and deals with endogenous peer selection by allowing different sizes of correlation in unobservables between peers.

Moreover, as the literature recognises, though the influences of the family and the adolescent's peer group are relevant in the explanation of the individual's behaviours, we cannot overlook another group of personal factors that, although not directly observable in most cases, also condition the final decision of the adolescents with respect to their consumption, or to their attitudes towards school. Among these sources of negative affect, stressful life events or personal failures are included [Bates and Labouvie (1997); Colder and Chasin (1999); Laukkanen *et al*. (2001)]. These unobserved factors have been reflected theoretically by Becker and Murphy (1988) who consider that the beginning of harmful addictions, such as heavy drinking, is often traceable to stressful events (anxiety, tension, insecurity, and others). These are difficult to measure with, but are incorporated into the utility of the individual. Nevertheless, to date, no empirical works have been published that explicitly include these effects.

2. THEORETICAL FRAMEWORK

Our starting point, the same as for DeCicca *et al*. (2000), is to recognise that the individual in general, and the adolescent in particular, makes choices by comparing the perceived marginal benefits with the perceived marginal costs of each decision. Thus, he/she will decide to consume substances like alcohol, tobacco or other drugs if he/she perceives that the benefits obtained from this consumption (for example, in terms of recognition/leadership in the peer group, positive physical sensations, sense of freedom, disinhibition, and so on) overcome the perceived costs of these consumptions. A similar reasoning will drive his/her decision to attend or to skip classes.

In this context, we consider that the individual utility depends on the alcohol consumption (*A*), leisure time (*L*), time devoted to studying and to going to classes (*S*), and the consumption of other goods (*X*).

In our utility function, we try to reflect four important aspects that, to the best of our knowledge, have not, so far, been considered simultaneously in the literature. First, as Pacula (1998a) notes, the consumption of alcohol depends on a group of personal characteristics that influence the individual's marginal utility of consuming alcohol. In order to capture this fact, we introduce a function $b = f(W)$ that weights, for each individual, the utility obtained from this consumption ac-

cording to the individual characteristics *W*. This weighted sub-utility function is a component of the individual utility function[1].

Secondly, as DeCicca *et al*. (2000) note, individuals obtain utility from the peer acceptance (*PA*) produced by alcohol consumption, as well as truancy. We extend their approach by considering that this peer acceptance depends on the behavioural attitudes observed in the peer group (*Zp*). For example, if the individual belongs to a group with deviant behaviours, alcohol consumption or skipping classes will be valued more highly than if he/she belongs to a more responsible group. In this way, we introduce the influence of the reference group on both decisions, alcohol abuse and truancy, into the utility function, capturing the proposal of Becker (1996).

Thirdly, we consider that the individuals receive utility from family acceptance (*FA*), which also depends on alcohol and truancy, although we can expect a different valuation of these risk attitudes in the family than in the peer group. The inclusion of this strategy is also an extension of the DeCicca *et al*. (2000) specification.

Finally, we introduce into the utility function a term *e* which reflects a group of individual unobserved factors affecting the individual utility and conditioning the consumptions and behaviours. By doing so, we incorporate the proposal of Becker *et al*. (1994), Becker and Murphy (1988) and other psychosocial works with respect to stressful events or personal failures, which condition utility and influence alcohol consumption and other non-desirable behaviours, e.g., truancy. As a consequence, the individual maximizes:

$$U = U (b*V(A), PA(A, S, L, Z_p), FA (A, S, L), X, e)$$

subject to the standard budget and time restrictions, where good *X* can be considered as the numeraire:

$$P_A *A + X = I$$
$$L + S = H$$

with P_A being the price of alcohol, *I* the personal income and *H* the total number of school hours programmed by educational authorities, which the adolescent distributes between school and leisure (truancy). Moreover, as has been noted, $b = f(W)$ is a function of personal characteristics which weight the utility perceived from the consumption of alcohol.

The first order conditions associated with this maximization problem are:

$$U_x - l_I = 0$$
$$U_{bV}*b*V_A + U_{PA}*PA_A + U_{FA}*FA_A - l_I*P_A = 0$$
$$U_{PA}*PA_S + U_{FA}*FA_S - l_H = 0$$
$$U_{PA}*PA_L + U_{FA}*FA_L - l_H = 0$$

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(1) The original proposal of Pacula (1998a) considers a utility function that is separable into drug consumption and other goods. In this work, we assume a more general utility function that does not necessarily imply this simplifying assumption.

where l_I and l_H are the Lagrange multipliers of the first and second restrictions, respectively.

In this context, the demands for alcohol consumption, leisure time (truancy) and school time can be obtained as derived demands:

$$X = X(P_A, I, W, Z_P, e)$$

$$A = A(P_A, I, W, Z_P, e)$$

$$S = S(P_A, I, W, Z_P, e)$$

$$L = L(P_A, I, W, Z_P, e)$$

Note that the derived demands for alcohol consumption and truancy provide a specification which depends on economic variables and personal characteristics, as well as on peer group behaviours and unobserved factors.

3. EMPIRICAL STRATEGY

3.1. Data and variables

In order to implement the above theoretical model, we have used the data provided by the Spanish Survey on Drug Use in the School Population for the year 2004, carried out by the Spanish Government's Delegation for the National Drug Plan. This survey constitutes a representative sample of the Spanish student population, and includes broad information on drug use, personal characteristics, and family and school environments. All the information has been obtained directly from the adolescents, who answered the questionnaire anonymously. Parents were not present during the survey sessions, nor were they informed about their children's responses, in order to reduce underreporting. Moreover, the survey guarantees the anonymity of the participating schools, thus avoiding the reluctance of some teachers and principals that would appear if the results were public. The information was collected in different state and private centres of secondary education and vocational training, with all the students aged between 14 and 15. The sampling framework was constructed from stratified conglomerates obtained via a two-stage selection, first choosing a sample of schools and then sampling classes within the schools. All the students in each selected class were included in the survey. In order to obtain a representative sample at the regional level, a minimum number of 10 schools in each autonomous region is guaranteed, assigning the remaining school centres proportionally to the number of centres in each autonomous region. The response rate is higher than 98.5%.

The dependent variables are *AlcoholAbuse* and *Truancy*, two dichotomous variables defined directly from the responses given to the questions: "During the last month, how many times have you been drunk?" and, "During the last month, how many times have you skipped classes?" The dependent variables take value 1 if the individual reports a positive quantity, and zero otherwise. As can be seen in Table I, 37% of the students had been drunk during the previous month, and 38.2% had played truant in the same period. With respect to the overlap between

Table 1: Descriptive analysis

Variable	Definition	Mean (Std. Deviation)
AlcoholAbuse	This takes value 1 if the adolescent has been drunk in the last month and 0 otherwise	0.370 (0.483)
Truancy	This takes value 1 if the adolescent has skipped classes in the last month and 0 otherwise	0.382 (0.486)
AlcoholPeer	Alcohol abuse prevalence in the class after eliminating the individual's influence	0.370 (0.203)
TruancyPeer	Truancy prevalence in the class after eliminating the individual's influence	0.382 (0.159)
StateSchool	This takes value 1 if the school is a state/public school and 0 otherwise	0.519 (0.499)
StateAssistedSchool	This takes value 1 if the school is a state-assisted school and 0 otherwise	0.456 (0.498)
PrivateSchool	This takes value 1 if the school is a private school and 0 otherwise	0.024 (0.154)
Class15	This takes value 1 if the adolescent attends a class with fewer than 15 students and 0 otherwise	0.209 (0.407)
Gender	This takes the value 1 if the young person is male and 0 if female	0.488 (0.500)
Age14	This takes value 1 if the adolescent is 14 years old and 0 otherwise	0.350 (0.477)
Age15	This takes value 1 if the adolescent is 15 years old and 0 otherwise	0.650 (0.477)
WithoutFather	This takes value 1 if the adolescent lives without the father at home and 0 otherwise	0.111 (0.314)

Table 1: DESCRIPTIVE ANALYSIS (continuation)

Variable	Definition	Mean (Std. Deviation)
NoStudiesMother	This takes value 1 if the mother has no basic school certificate and 0 otherwise	0.248 (0.432)
PrimaryStudiesMother	This takes value 1 if the mother has a basic school certificate and 0 otherwise	0.248 (0.432)
SecondaryStudiesMother	This takes value 1 if the mother has a secondary school certificate or vocational training and 0 otherwise	0.276 (0.447)
UniversityStudiesMother	This takes value 1 if the mother has a university diploma or a university degree and 0 otherwise	0.228 (0.419)
NoStudiesFather	This takes value 1 if the father has no basic school certificate and 0 otherwise	0.271 (0.444)
PrimaryStudiesFather	This takes value 1 if the father has a basic school certificate and 0 otherwise	0.232 (0.422)
SecondaryStudiesFather	This takes value 1 if the father has a secondary school certificate or vocational training and 0 otherwise	0.253 (0.435)
UniversityStudiesFather	This takes value 1 if the father has a university diploma or a university degree and 0 otherwise	0.244 (0.430)
Membership	This takes the value 1 if the young person is a member of some association or club of a political, religious or sporting type and 0 otherwise	0.538 (0.499)
ParentsSmoke	This takes the value 1 if the adolescent lives with at least one smoker parent and 0 otherwise	0.491 (0.500)
AlcoholPrice	Provincial price index for alcoholic products in 2004 (2001 base)	104.187 (2.706)
Income	Available income per week of the adolescent (in euros)	12.846 (14.445)
InformationCampaigns	This takes the value 1 if the adolescent studies at a school which has information campaigns on the risks associated with tobacco, alcohol and drug consumption and 0 otherwise	0.828 (0.378)

Source: Own elaboration.

the two behaviours, truancy and drinking, of the 5,380 students for whom we have information 38.9%, have not been involved in either of these behaviours in the last month. In contrast, 17.5% report both having skipped classes and having got drunk. With reference to the rest of the students, about 19.5% say that they have got drunk but not skipped classes and, finally, 24% admit having played truant but not having drunk heavily.

With respect to the explanatory variables, two classmate peer variables have been defined to capture the influence of the peer group on the individual's behaviour, *Alcoholpeer* and *Truancypeer*. These variables compute the percentage of alcohol abuse and truancy, respectively, in the classmate sample after eliminating the influence of the individual. That is, for an individual *i* belonging to class *c*:

$$Alcoholpeer_{ic} = \frac{\sum_{j=1 j \neq i}^{n} Alcoholabuse_{jc}}{n-1}$$

$$Truancypeer_{ic} = \frac{\sum_{j=1 j \neq i}^{n} Truancy_{jc}}{n-1}$$

In addition, other explanatory variables have been considered regarding the physical, social and economic characteristics of the adolescent (gender, age, available income, association, the Consumer Price Index for alcoholic beverages) and family environment (level of studies of the parents, home without father). Additional variables have been included for controlling school characteristics, such as state school and private school (*versus* state-assisted school) and school with small classes (under 15 pupils). We have also considered it appropriate to include two variables referring to the presence of parents, at home, who smoke, and the development of school campaigns about the risks of tobacco, alcohol and drug consumption. These variables can be seen, to a certain extent, as proxies both for the permissiveness of the family and the involvement of the school in the fight against drug use.

Finally, we have included school fixed effects[2], given that their omission could attribute some school-specific effects not captured by other school characteristic variables to other exogenous variables. Table 1 provides the definition and descriptive analysis of the above-mentioned endogenous and explanatory variables.

3.2. *Empirical model and strategy*

In order to analyse the alcohol abuse and the truancy behaviours simultaneously, we use a bivariate probit model. The consideration of the two dependent variables enables us to assume that there are unobserved effects that influence both behaviours. Thus, we can present two latent variables:

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(2) For the sake of brevity, these estimates do not appear in the results tables, but are available upon request.

$$y_t^* = Alcohol\ Abuse^* = x_1' \beta_1 + e_1 \tag{1}$$

$$y_t^* = Truancy^* = x_2' \beta_2 + e_2 \tag{2}$$

where e_1 and e_2 follow a bivariate normal distribution with a vector of mean zero and unitary variance. Therefore, $e_2 = r\ e_1 + \xi$, where ρ is the correlation coefficient. This can be interpreted in the following way: the same unobserved variable e_1 exerts an effect on both latent variables, but not of the same magnitude.

However, we only observe y_1 and y_2 as dichotomous variables indicating if the adolescent has been drunk and has skipped classes, respectively:

$$y_1 = \begin{cases} 1 & if \quad\quad y_1^* = x_1' \beta_1 + e_1 + > 0 \\ 0 & \quad otherwise \end{cases} \tag{3}$$

$$y_2 = \begin{cases} 1 & if \quad\quad y_{12}^* = x_2' \beta_2 + e_2 + > 0 \\ 0 & \quad otherwise \end{cases} \tag{4}$$

Thus, we can control for unobserved effects that exert an influence on both equations.

For the Maximum Likelihood estimation of this model, we proceed as follows. We denote the joint distribution of (e_1, e_2) by $\Phi(0, 0; r)$. Therefore, the joint probability distribution can be expressed as:

$$P_{00} = Pr\ ob(y_{1i} = 0, y_{2i} = 0) = \Phi(-x_{1i}\ \beta_1,\ -x_{2i}\ \beta_2;\ \rho) \tag{5}$$

$$P_{10} = Pr\ ob(y_{1i} = 1, y_{2i} = 0) = \Phi(x_{1i}\ \beta_1,\ -x_{2i}\ \beta_2;\ -\rho) \tag{6}$$

$$P_{01} = Pr\ ob(y_{1i} = 0, y_{2i} = 1) = \Phi(-x_{1i}\ \beta_1,\ x_{2i}\ \beta_2;\ -\rho) \tag{7}$$

$$P_{11} = Pr\ ob(y_{1i} = 1, y_{2i} = 1) = \Phi(x_{1i}\ \beta_1,\ x_{2i}\ \beta_2;\ \rho) \tag{8}$$

As a result, we can write the likelihood as:

$$L(\beta_1, \beta_2; \rho) = P_{11}^{y_1 y_2}\ P_{10}^{y_1(1-y_2)}\ P_{01}^{(1-y_1)y_2}\ P_{00}^{(1-y_1)(1-y_2)} \tag{9}$$

Before implementing the estimation procedure, we follow the economic literature in order to account for the potential endogeneity of the variables that measure peer effects. We deal with this endogeneity by instrumenting the peer effect variables and implementing school fixed effects. Traditionally, researchers have used as instruments the class or school averages of some selected exogenous variables, after excluding the individual [Gaviria and Raphael (2001); Lundborg (2006)]. However, we consider that, even if these instruments could overcome the over-identification tests, from a conceptual point of view, some doubts can still persist regarding their validity as instruments. Thus, in our view, it is inappropriate to assume that these class or school averages are uncorrelated with the disturbance terms corresponding to the equations of interest. Thus, we have used as instruments exogenous

variables defined at the provincial level[3], provided by the Spanish National Institute of Statistics. In particular, we have used as instruments for the peer-alcohol behaviour the following variables: unemployment rate, per capita income, death prevalence associated with lung cancer, cirrhosis, and car accidents (per 100,000 inhabitants), death prevalence for alcoholic psychosis (per 100,000 inhabitants) and suicide rate (per 100,000 inhabitants). Similarly, in order to instrument the peer-truancy behaviour, the following variables are used: centres of child education per 1,000 children aged up to 14 years, the unemployment rate, the per capita income and traffic accidents (per 100,000 inhabitants).

In this way, and following Pacula (1998b), and Evans and Ringel (1999), among others, we randomize peer group variables by exploiting differential rates of some socio-economic variables among the Spanish provinces. With these instruments, we derive the predicted peer effect variables and the residual vectors and, in order to assess the validity of the instruments, we carry out several tests, explained in the next section.

We are conscious that, once we have introduced observable school factors and used instrumental variables defined at the provincial level, there may still be concerns about the sorting problem, because families could choose where to live based on the unobservable characteristics of the schools. In our context, although the survey does not provide information about mobility, we can consider that most movements will be across neighbourhoods within cities, rather than across provinces.

Although we are aware that it is impossible to completely avoid the sorting problem, we think it is reasonable to assume that, given the data used and the strategy followed, this problem is significantly diminished in our paper. Firstly, we follow the proposal of Gaviria and Raphael (2001) to include school characteristics. These authors find that, after applying their strategy, the problem of sorting is dealt with in a plausible way[4]. Secondly, and although we have followed their proposal, there may still be some sorting due to unobservable school heterogeneity that it is not captured by our variables. This would be problematic if the unobservable heterogeneity were correlated with the instruments of the peer variables. The advantage of our instruments, against those defined at the class or school level, is that, as they are defined at the provincial level, they are not correlated with unobserved heterogeneity across schools of the same city or province. So, provided that, as we expect, most sorting takes place within cities (that is, across neighbourhoods), we can assume that our instruments are not significantly affected by this problem.

Finally, the use of school fixed effects is another approach for dealing with the endogeneity problem and is used, for example, in Arcidiacono and Nicholson

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(3) Spain has 52 provinces, including the autonomous cities of Ceuta and Melilla, with these provinces comprising the 19 autonomous regions into which the Spanish territory is organised.

(4) For example, Gaviria and Raphael (2001) divided the sample of students into two groups, "movers" (those youths whose families had moved during the last two years) and "stayers". The underlying hypothesis was that, under relevant endogenous sorting, the peer effects will be higher for the "movers" group. They found that, after controlling for school characteristics, there were no significant differences in the peer effects for alcohol drinking, cigarette smoking, church attendance and dropping out. This result provides some support for our strategy as a way of dealing with the sorting problem.

(2005) and Hanuseck *et al.* (2003). We have also included these school fixed effects in our estimates.

Given that the units of our data set are clustered in classes, shared unobserved heterogeneity may induce intra-cluster correlation among the responses. However, as Wooldrige (2002, p. 6) points out, standard methods can correct for the presence of this correlation, provided the number of clusters (classes in our case) is large relative to the cluster size. In this context, the Stata program produces correct standard errors, even if the observations are correlated, provided the "robust" and "cluster" options are specified. Therefore, we present clustered robust standard errors.

4. RESULTS

We carry out several tests in order to ensure the validity of the instruments. First, we check the joint significance of the instruments with an F-test. To that end, we regress the peer effect variables in terms of the exogenous variables, in addition to several instruments, namely, the five instruments for the peer alcohol effects and the four for the peer truancy effects. The results for this first stage estimation for both peer effects appear in Table A.1 (see Appendix). F-statistics reject the null hypothesis that the coefficients of the instruments are zero. Their values are, respectively, 15.11 and 36.54, which clearly exceed the 1% critical values.

We have also carried out two over-identifying tests, one suggested by Bollen, *et al.* (1995) and implemented in Lundborg (2006), and the other explained in Wooldrige (2002, p. 123). In the first, we have compared, for each behaviour, the log-likelihood function of the following models: the probit model estimated by a two-stage procedure and the probit model estimated after replacing the peer substance variable with the instruments. One test of the validity of the instruments can be obtained by comparing the log-likelihood values in both models. Under the null hypothesis of the validity of the instruments, both log-likelihood values should be similar. We evaluate this similarity with an LR test. In our case, the LR statistics take the following values: 0.48 for alcohol abuse and 0.13 for truancy. Obviously, they do not exceed the 5% critical values of $\chi^2_{.95}(4) = 9.49$ and of $\chi^2_{.95}(3) = 7.81$. Consequently, we cannot reject the validity of the instruments. The second test of over-identification consists of estimating the structural model by two-stage least squares, obtaining the residuals of this regression, and then regressing these residuals on all exogenous variables. Under the null hypothesis of the validity of the instruments, the statistic NR^2_u of this last regression follows a chi-squared distribution, with the degrees of freedom being the number of indentifying restrictions. The statistics are 0.58 for alcohol and 0.13 for truancy, which are less than the critical values $\chi^2_{.95}(4) = 9.49$ and $\chi^2_{.95}(3) = 7.81$.

The maximum likelihood estimates for the bivariate probit model are presented in Table 2. The first column shows the estimated coefficients for the alcohol abuse equation and the second column the estimates for the truancy equation.

We are primarily interested in the coefficients of the peer effects and in the existence of the unobserved life events that can affect the two behaviours. The peer effect estimates appear at the top of the table. The results reveal, as we expected, that there is a positive and significant peer effect on both behaviours. That

Table 2: ESTIMATION RESULTS

	Alcohol abuse				Truancy behaviour		
Variable	Parameter		Robust standard error	Variable	Parameter		Robust standard error
AlcoholPeer	3.471	**	1.409	TruancyPeer	3.677	**	1.596
StateSchool	-0.353		0.508	StateSchool	0.410		0.346
PrivateSchool	-0.618	**	0.294	PrivateSchool	0.811	**	0.380
Class15	-0.133		0.119	Class15	-0.199	***	0.069
Gender	-0.001		0.045	Gender	-0.066		0.045
Age15	0.270	***	0.061	Age15	0.229	***	0.055
WithoutFather	0.317	***	0.074	WithoutFather	0.319	***	0.068
PrimaryStudiesMother	-0.036		0.085	PrimaryStudiesMother	0.079		0.084
SecondaryStudiesMother	-0.108		0.082	SecondaryStudiesMother	0.027		0.077
UniversityStudiesMother	-0.090		0.087	UniversityStudiesMother	0.009		0.081
PrimaryStudiesFather	0.046		0.082	PrimaryStudiesFather	0.064		0.083
SecondaryStudiesFather	0.044		0.076	SecondaryStudiesFather	0.033		0.077
UniversityStudiesFather	0.016		0.080	UniversityStudiesFather	-0.040		0.076
Membership	-0.125	***	0.043	Membership	-0.056		0.043
ParentsSmoke	0.109	***	0.040	ParentsSmoke	0.120	***	0.039
AlcoholPrice	-0.010		0.030	AlcoholPrice	0.028		0.037
Income	0.015	***	0.003	Income	0.009	***	0.003
IncomeSquared	-0.000	***	0.000	IncomeSquared	-0.000		0.000
InformationCampaigns	-0.162	***	0.057	InformationCampaigns	-0.172	***	0.058
Intercept	-0.600		2.864	Intercept	-5.121		3.765
Correlation coefficient	0.145	***	0.024				
N° observ.	5453						
Log. Likel.	-6372.97						

* significant at the 10% level. ** significant at the 5% level. *** significant at the 1% level.

Source: Own elaboration.

is to say, the higher the prevalence of these behaviours in the whole class, the higher the probability that the individual will take part in alcohol abuse and truancy[5]. In addition, we find a positive and significant correlation coefficient. This result, consistent with Becker and Murphy (1988), suggests that unobserved factors associated with a higher probability of skipping classes are also correlated with a higher probability of drunkenness. Thus, our estimates confirm the need to control for these unobserved effects.

Turning to the influence of the remaining variables on alcohol abuse and truancy, we begin with the characteristics of the school. These variables help us to discriminate between spurious estimates or peer effects due to sorting and true peer effects [Lundborg (2006); Gaviria and Raphael (2001)]. We find that, while attendance at a private school is negatively related to the probability of alcohol abuse, and positively related to the probability of skipping classes, the probability of truancy is lower for those students who are in classes with fewer than 15 students.

Concerning the physical characteristics, alcohol abuse increases with age among adolescents. Similarly, the probability of skipping classes is higher among the older students.

With respect to the family variables, the students who live without their father have a higher probability of getting drunk and skipping classes. However, we do not find any significant effect from the educational level of the parents. What does appear to have a significant effect, on both self-reported alcohol abuse and truancy, is living with parents who smoke. This can be interpreted as that parents who smoke are probably more permissive with other substances such as alcohol. Alcohol abuse by teenagers is also less probable among students belonging to an association or club.

With respect to the economic status of the adolescent, which is measured by his/her available income, the estimates show that the probability of alcohol abuse and the probability of skipping classes are positively related to available income. However, the Consumer Price Index appears as non-significant in both behaviours.

School information campaigns significantly reduce the probability of both behaviours. This result has been found for marijuana smoking among Spanish adolescents by Duarte *et al*. (2006). Unfortunately, this effect is not sufficiently large to offset the increase in the probability of self-reported alcohol abuse from the simple fact of becoming a year older.

As an additional analysis, and given that the interpretation of the x_j coefficient, b_j, is that each one-unit increase in x_j leads to an increase in the probit index $x'\beta$ in β_j, for three relevant variables, *AlcoholPeer*, *TruancyPeer* and *Income*, we present the change in the probability yielded by a one-unit increase in x_j, that is to

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(5) In the Appendix, we also report the results for bivariate probit estimates when peer effects are not instrumented (see Table A.2), and when peer effects are excluded (see Table A.3). In both these tables, some variables appear as significant that are not significant when peer effects are instrumented (see Table 2). It is noteworthy that, as expected, the standard errors of the peer variables increase considerably after they are instrumented.

say, the marginal effect, which is easier to interpret and more meaningful. For this purpose, we compute $\dfrac{\partial \Phi(x_i \beta)}{\partial x_{ij}} = \varphi(x_i \beta)\beta_j$ and average it over all individuals[6]. The results appear in Table 3, and can be interpreted in the following way. If students attend classes where the proportion of classmates that abuse alcohol is 10 points higher, then the probability of becoming a heavy drinker will increase by around 10.68 points. Similarly, if adolescents attend a class with a 10 point higher proportion of truants, their probability of becoming a truant will be 12.82 points higher.

The changes in the probability of alcohol abuse and truancy of an increase of one unit in available income are also displayed in Table 3[7]. The estimates imply that an increase of 10 euros in the available income will increase the probability of heavy drinking by 4.1 points, and the probability of truancy by 2.6 points.

Table 3: AVERAGE CHANGES IN PROBABILITY

Alcohol abuse		Truancy	
Variable	Probability change	Variable	Probability change
AlcoholPeer	1.0684***	TruancyPeer	1.2082***
	(0.3470)		(0.3189)
Income	0.0041***	Income	0.0026***
	(0.0015)		(0.0007)

Standard errors in parentheses.

* significant at the 10% level. ** significant at the 5% level. *** significant at the 1% level.

Source: Own elaboration.

Finally, we consider two extensions of the basic model. In the first, we analyse whether peer effects vary across different groups of adolescents. Following Steimberg's (1987) suggestion that peer effects could be more important in families with fewer ties, we introduce an interaction term between the peer effect variables and the dummy variable indicating whether the father lives with the student or not. The results of this strategy appear in Table 4. As can be seen, the results do not confirm the hypothesis that students living in a household without the father

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(6) The density function has been evaluated using the true explanatory variables, that is to say, we have used the true peer effect variables instead of the instrumented peer effect variables. However, the results are very similar.

(7) In this case, the equation evaluated differs slightly from the one used before, as the variable income appears in levels and as its square. Now, we have averaged the following expression:

$$\frac{\partial \Phi(x_i \beta)}{\partial Income} = \varphi(x_i \beta)(\beta_j^1 + 2\beta_j^2 * Income)$$

where β_j^1 and β_j^2 are the coefficients associated with *Income* and *IncomeSquared*, respectively.

Table 4: Estimation results (with interaction effects)

Variable	Alcohol abuse			Variable	Truancy		
	Parameter		Robust standard error		Parameter		Robust standard error
AlcoholPeer	3.491	**	1.411	TruancyPeer	3.681	**	1.595
AlcoholPeerWithoutFather	-0.089		0.423	TruancyPeerWithoutFather	-0.316		0.532
StateSchool	-0.355		0.508	StateSchool	0.402		0.343
PrivateSchool	-0.619	**	0.295	PrivateSchool	0.808	**	0.380
Class15	-0.134		0.119	Class15	-0.200	***	0.069
Gender	-0.001		0.045	Gender	-0.067		0.045
Age15	0.270	***	0.061	Age15	0.228	***	0.055
WithoutFather	0.350	**	0.175	WithoutFather	0.440	**	0.216
PrimaryStudiesMother	-0.037		0.085	PrimaryStudiesMother	0.079		0.084
SecondaryStudiesMother	-0.109		0.082	SecondaryStudiesMother	0.028		0.077
UniversityStudiesMother	-0.090		0.087	UniversityStudiesMother	0.008		0.081
PrimaryStudiesFather	0.046		0.082	PrimaryStudiesFather	0.063		0.083
SecondaryStudiesFather	0.044		0.076	SecondaryStudiesFather	0.032		0.077
UniversityStudiesFather	0.017		0.080	UniversityStudiesFather	-0.040		0.076
Membership	-0.125	***	0.043	Membership	-0.056		0.043
ParentsSmoke	0.109	***	0.040	ParentsSmoke	0.120	***	0.039
AlcoholPrice	-0.010		0.030	AlcoholPrice	0.027		0.037
Income	0.015	***	0.003	Income	0.009	***	0.003
IncomeSquared	-0.000	***	0.000	IncomeSquared	-0.000		0.000
InformationCampaigns	-0.162	***	0.057	InformationCampaigns	-0.172	***	0.058
Intercept	-0.600		2.874	Intercept	-5.043		3.774
Correlation coefficient	0.145	***	0.024				
N° observ.	5453						
Log. Likel.	-6372.76						

* significant at the 10% level. ** significant at the 5% level. *** significant at the 1% level.

Source: Own elaboration.

are more sensitive to peer effects. This result is consistent with other works, such as Lundborg (2006), who uses a dummy variable including the absence of one parent, mother or father, and does not find a significant interaction effect.

Additionally, in order to be more confident of our analysis, we enable the model to have different peer effects among state and private schools, given that the parents can choose the type of school in order to pre-select the classmates of their children. We introduce an interaction between the peer effect variables and the dummy variable for private school. The estimates of this strategy appear in Table 5.

According to the results, while the peer effects continue to be significant, the corresponding interaction terms are insignificant in both equations. Therefore, there is no value in computing marginal effects for both types of school separately.

In the second extension, we consider the possible existence of non-linearities in the peer effects. Thus, we first create four dummy variables, one for each behaviour, depending on which range the peer effect measure takes value: 0-0.25, 0.25-0.50, 0.50-0.75, and 0.75-1.00. We then create four iteration terms (between the peer variable and the dummy variables)[8], which are added to the model as explanatory variables, replacing the peer variable. The results of this model appear in Table 6. The estimates yield mixed results. In both equations, as the peer measures increase, the associated index also increases[9]. However, these effects are less than linear in the alcohol case and more than linear in the truancy behaviour.

5. SUMMARY AND CONCLUSIONS

The objective of this paper was to go deeper into the study of the factors affecting two risk behaviours in adolescence, alcohol abuse and truancy, by considering both the influence of peer group behaviours on adolescent decisions and the existence of unobserved individual factors which also condition these behaviours.

Overall, the findings presented in this paper are consistent with the theory of peer effect influences postulated by sociologists, but they also confirm that these risk behaviours share a significant correlation, which leads us to study them non-independently. The main results of our analysis have been presented in the paper. As a summary, we can highlight the following aspects.

The results confirm the existence of significant peer group influences on the consumption of alcohol and on truancy in adolescents. It can be observed that, apart from other personal and social factors, the fact that an individual belongs to

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(8) Thus, we split the peer variable into four variables taking their true value if the variable is in the interval considered, and zero otherwise. The means of these variables are 0.198, 0.366, 0.555 and 0.693, respectively.

(9) This may not be obvious for the alcohol equation, since the coefficients become smaller when the peer variable increases. However, the impact of the peer effect on the index $y_t^* = Alcohol\ Abuse^* = x_t'\beta_1 + e_1$ is the product of the coefficient and the peer variables with the increase in these variables being proportionally greater than the decrease in the coefficients.

Table 5: ESTIMATION RESULTS (WITH INTERACTION EFFECTS)

	Alcohol abuse				Truancy		
Variable	Parameter		Robust standard error	Variable	Parameter		Robust standard error
AlcoholPeer	3.446	**	1.421	TruancyPeer	3.695	**	1.599
AlcoholPeerPrivateSchool	0.441		2.564	TruancyPeerPrivateSchool	1.100		3.188
StateSchool	-0.379		0.511	StateSchool	0.459		0.393
PrivateSchool	-0.832		1.289	PrivateSchool	0.508		0.899
Class15	-0.131		0.120	Class15	-0.199	***	0.069
Gender	0.000		0.045	Gender	-0.066		0.045
Age15	0.270	***	0.061	Age15	0.230	***	0.055
WithoutFather	0.317	***	0.074	WithoutFather	0.319	***	0.068
PrimaryStudiesMother	-0.036		0.085	PrimaryStudiesMother	0.080		0.084
SecondaryStudiesMother	-0.108		0.082	SecondaryStudiesMother	0.027		0.077
UniversityStudiesMother	-0.090		0.087	UniversityStudiesMother	0.009		0.081
PrimaryStudiesFather	0.046		0.082	PrimaryStudiesFather	0.064		0.083
SecondaryStudiesFather	0.044		0.076	SecondaryStudiesFather	0.033		0.077
UniversityStudiesFather	0.016		0.080	UniversityStudiesFather	-0.040		0.076
Membership	-0.125	***	0.043	Membership	-0.056		0.043
ParentsSmoke	0.109	***	0.040	ParentsSmoke	0.120	***	0.039
AlcoholPrice	-0.010		0.030	AlcoholPrice	0.027		0.037
Income	0.015	***	0.003	Income	0.009	***	0.003
IncomeSquared	-0.000	***	0.000	IncomeSquared	-0.000		0.000
InformationCampaigns	-0.162	***	0.057	InformationCampaigns	-0.172	***	0.058
Intercept	-0.585		2.848	Intercept	-5.157		3.767
Correlation coefficient	0.145	***	0.024				
N° observ.	5453						
Log. Likel.	-6372.91						

* significant at the 10% level. ** significant at the 5% level. *** significant at the 1% level.

Source: Own elaboration.

Table 6: ESTIMATION RESULTS (NON-LINEAR PEER EFFECTS)

	Alcohol abuse				Truancy		
Variable	Parameter		Robust standard error	Variable	Parameter		Robust standard error
AlcoholPeer-0-25%	4.632	***	1.600	TruancyPeer-0-25%	3.606	**	1.648
AlcoholPeer-25-50%	4.474	***	1.522	TruancyPeer-25-50%	3.799	**	1.648
AlcoholPeer-50-75%	3.537	**	1.509	TruancyPeer-50-75%	3.733	**	1.650
AlcoholPeer-75-100%	3.640	**	1.495	TruancyPeer-75-100%	4.193	**	1.660
StateSchool	-0.319		0.543	StateSchool	0.395		0.349
PrivateSchool	-0.579	*	0.307	PrivateSchool	0.815	**	0.381
Class15	-0.135		0.137	Class15	-0.220	***	0.070
Gender	0.000		0.045	Gender	-0.067		0.045
Age15	0.282	***	0.063	Age15	0.231	***	0.055
WithoutFather	0.319	***	0.074	WithoutFather	0.324	***	0.068
PrimaryStudiesMother	-0.035		0.085	PrimaryStudiesMother	0.080		0.084
SecondaryStudiesMother	-0.104		0.082	SecondaryStudiesMother	0.026		0.077
UniversityStudiesMother	-0.086		0.087	UniversityStudiesMother	0.008		0.081
PrimaryStudiesFather	0.050		0.082	PrimaryStudiesFather	0.063		0.083
SecondaryStudiesFather	0.046		0.076	SecondaryStudiesFather	0.032		0.077
UniversityStudiesFather	0.022		0.080	UniversityStudiesFather	-0.040		0.076
Membership	-0.128	***	0.043	Membership	-0.055		0.043
ParentsSmoke	0.117	***	0.039	ParentsSmoke	0.121	***	0.039
AlcoholPrice	0.002		0.037	AlcoholPrice	0.024		0.038
Income	0.016	***	0.003	Income	0.009	***	0.003
IncomeSquared	-0.000	***	0.000	IncomeSquared	-0.000		0.000
InformationCampaigns	-0.172	***	0.057	InformationCampaigns	-0.175	***	0.058
Intercept	-2.109		3.668	Intercept	-4.824		3.909
Correlation coefficient	0.147	***	0.024				
N° observ.	5453						
Log. Likel.	-6349.40						

* significant at the 10% level. ** significant at the 5% level. *** significant at the 1% level.

Source: Own elaboration.

a class with a 10% higher alcohol rate than another class, can raise his/her probability of being a heavy drinker by around 10.68 points, with similar results, 12.08, being obtained for truancy. Thus, these results confirm the existence of peer effects on the adolescent decision to behaviours such as alcohol abuse and truancy.

The existence of peer effects provides evidence of "social multipliers", that is, the effects of changes in the exogenous variables may be higher than those implied by the estimated coefficients. This is because an exogenous change will yield two effects. The first is a direct effect due to the impact of this variable on the probability of alcohol abuse or skipping classes. However, this is not the end of the story, since an indirect effect will appear from the corresponding change in the proportion of classmates who abuse alcohol and play truant. In light of this, we can conclude that the change in the peer effect variable will reinforce the direct effect. This result is of great importance for policy makers, as peer effects may serve to amplify the effects of intervention policies.

Moreover, as has been said, our results provide evidence that alcohol abuse and truancy share unobserved factors that affect both decisions. Apart from the empirical consequences of this result, which will lead us to consider alcohol and truancy as not being exogenously determined, these unobserved characteristics seem to confirm the theoretical hypothesis of life events [Becker and Murphy (1988)] or sources of negative affect [Laukkanen *et al.* (2001)] which determine risk behaviours, after controlling for other personal and social covariates. This suggests that it could be interesting to take into account the possible existence of unobserved effects in the analysis of other risky behaviours, which would be a natural extension of this present work.

APPENDIX

Table A.1: FIRST STAGE ESTIMATIONS

	Peer Group Alcohol abuse			Peer Group Truancy	
Variable	Parameter	Robust standard error	Variable	Parameter	Robust standard error
UnemploymentRate	0.029 ***	0.007	UnemploymentRate	0.149 ***	0.015
PerCapitalIncome	0.000	0.000	PerCapitalIncome	-0.034 ***	0.005
DeathPrevalence1[a]	0.001 ***	0.001	CentresChildEducationRate	0.000 ***	0.000
DeathPrevalence2[b]	0.197 ***	0.064	TrafficAccidentRate	-0.273 ***	0.033
SuicideRate	0.038 ***	0.013			
StateSchool	-0.054	0.044	StateSchool	-0.112 ***	0.033
PrivateSchool	0.064 **	0.032	PrivateSchool	-0.054 **	0.022
Class15	0.067 ***	0.007	Class15	0.010 **	0.004
Gender	-0.003	0.003	Gender	0.000	0.002
Age15	0.016 ***	0.004	Age15	-0.006 **	0.003
WithoutFather	-0.017 ***	0.006	WithoutFather	-0.005	0.003
PrimaryStudiesMother	0.005	0.007	PrimaryStudiesMother	-0.009 **	0.004
SecondaryStudiesMother	0.021 ***	0.006	SecondaryStudiesMother	-0.005	0.004
UniversityStudiesMother	0.018 ***	0.006	UniversityStudiesMother	-0.005	0.004
PrimaryStudiesFather	-0.008	0.006	PrimaryStudiesFather	0.003	0.004
SecondaryStudiesFather	-0.003	0.006	SecondaryStudiesFather	0.001	0.004
UniversityStudiesFather	-0.008	0.006	UniversityStudiesFather	-0.001	0.004
Membership	0.004	0.003	Membership	-0.005 **	0.002
ParentsSmoke	-0.004	0.003	ParentsSmoke	-0.002	0.002
AlcoholPrice	0.014	0.011	AlcoholPrice	-0.093 ***	0.012
Income	0.000	0.000	Income	0.000 **	0.000
IncomeSquared	-0.000	0.000	IncomeSquared	-0.000	0.000
InformationCampaigns	0.001	0.005	InformationCampaigns	0.000	0.003
Intercept	-2.156	1.457	Intercept	12.065 ***	1.426
Nº observ.	5453		Nº observ.	5453	
F-statistic	15.11		F-statistic	36.54	
(Prob > F = 0.0000)			(Prob > F = 0.0000)		

* significant at the 10% level. ** significant at the 5% level. *** significant at the 1% level. [a] Death prevalence associated with lung cancer, cirrhosis, and car accidents (per 100,000 inhabitants). [b] Death prevalence for alcoholic psychosis (per 100,000 inhabitants).

Source: Own elaboration.

Table A.2: ESTIMATION RESULTS (WITHOUT INSTRUMENTING PEER VARIABLES)

Variable	Alcohol abuse			Variable	Truancy		
	Parameter		Robust standard error		Parameter		Robust standard error
AlcoholPeer	1.881	***	0.072	TruancyPeer	1.008	***	0.118
StateSchool	0.030		0.022	StateSchool	0.005		0.035
PrivateSchool	-0.073		0.067	PrivateSchool	0.112		0.102
Class15	-0.025		0.024	Class15	-0.105	***	0.039
Gender	0.000		0.039	Gender	-0.053		0.040
Age15	0.200	***	0.037	Age15	0.121	***	0.040
WithoutFather	0.240	***	0.060	WithoutFather	0.271	***	0.060
PrimaryStudiesMother	-0.046		0.077	PrimaryStudiesMother	0.076		0.074
SecondaryStudiesMother	-0.083		0.070	SecondaryStudiesMother	0.021		0.069
UniversityStudiesMother	-0.055		0.076	UniversityStudiesMother	-0.002		0.073
PrimaryStudiesFather	0.031		0.074	PrimaryStudiesFather	0.031		0.072
SecondaryStudiesFather	0.039		0.070	SecondaryStudiesFather	0.003		0.069
UniversityStudiesFather	0.028		0.071	UniversityStudiesFather	-0.042		0.067
Membership	-0.115	***	0.038	Membership	-0.098	***	0.038
ParentsSmoke	0.099	***	0.036	ParentsSmoke	0.108	***	0.035
AlcoholPrice	-0.013	***	0.004	AlcoholPrice	0.015	**	0.006
Income	0.013	***	0.002	Income	0.010	***	0.002
IncomeSquared	-0.000	***	0.000	IncomeSquared	-0.000	*	0.000
InformationCampaigns	-0.142	***	0.044	InformationCampaigns	-0.191	***	0.049
Intercept	0.099		0.380	Intercept	-2.192	***	0.643
Correlation coefficient	0.125	***	0.022				
Nº observ.	5453						
Log. Likel.	-6851.80						

* significant at the 10% level. ** significant at the 5% level. *** significant at the 1% level.

Source: Own elaboration.

Table A.3: Estimation results (without peer variables)

Variable	Alcohol abuse			Truancy		
	Parameter		Robust standard error	Parameter		Robust standard error
StateSchool	0.082		0.050	0.041		0.044
PrivateSchool	-0.057		0.152	0.153		0.128
Class15	0.102	*	0.055	-0.088	*	0.050
Gender	0.007		0.040	-0.056		0.040
Age15	0.188	***	0.049	0.111	**	0.045
WithoutFather	0.178	***	0.059	0.284	***	0.059
PrimaryStudiesMother	-0.061		0.076	0.084		0.073
SecondaryStudiesMother	-0.066		0.068	0.029		0.068
UniversityStudiesMother	-0.040		0.074	-0.002		0.072
PrimaryStudiesFather	0.036		0.075	0.034		0.072
SecondaryStudiesFather	0.052		0.069	-0.009		0.069
UniversityStudiesFather	0.047		0.070	-0.049		0.067
Membership	-0.116	***	0.037	-0.109	***	0.038
ParentsSmoke	0.093	***	0.036	0.111	***	0.035
AlcoholPrice	-0.025	***	0.009	0.023	***	0.008
Income	0.012	***	0.002	0.011	***	0.002
IncomeSquared	0.000	***	0.000	0.000	**	0.000
InformationCampaigns	-0.182	***	0.049	-0.205	***	0.052
Intercept	2.041	**	0.879	-2.651	***	0.832
Correlation coefficient	0.114	***	0.022			
N° observ.	5453					
Log. Likel.	-7152.31					

* significant at the 10% level. ** significant at the 5% level. *** significant at the 1% level.

Source: Own elaboration.

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RESUMEN

El objetivo de este trabajo es examinar los factores que afectan al abuso de alcohol y al absentismo escolar entre los adolescentes. Proponemos una formulación teórica en la cual el abuso de alcohol y el absentismo aparecen como demandas derivadas que dependen de variables personales, familiares y de grupos de iguales, y también introducimos efectos individuales inobservados que pueden influir sobre ambas conductas. Empíricamente, nuestro trabajo desarrolla un análisis en el que, tras controlar la existencia de factores individuales inobservados que afectan a ambas decisiones, contrastamos las influencias de los grupos de iguales. Nuestros resultados muestran evidencia de que el abuso de alcohol y el absentismo comparten factores inobservados que afectan ambas decisiones, y confirman la existencia de influencias significativas de los grupos de iguales sobre estas dos conductas de riesgo.

Palabras clave: iguales, factores inobservados, conductas de riesgo, alcohol, absentismo escolar, probit bivariante.

Clasificación JEL: I10, I12, I20, I21.