DON'T DRINK AND… AVOID RISKY SEX OF YOUR PEERS: THE INFLUENCE OF ALCOHOL CONSUMPTION OF OPPOSITE-GENDER PEERS ON YOUTH RISKY SEXUAL BEHAVIOR

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Don't Drink and… Avoid Risky Sex of Your Peers: The Influence of Alcohol Consumption of Opposite-Gender Peers on Youth Risky Sexual Behavior

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Abstract

I estimate the effect of opposite-gender peer drinking on individual risky sexual behavior among Czech youth. The identification strategy relies on two main controls for individual and group-specific unobservables. First, younger schoolmates' sexual behavior is a control for school-specific attitudes toward sexual behavior. Second, pre-determined individual pre-secondary-school alcohol consumption is used to control for self-selection into schools of individuals with specific attitudes toward alcohol. As opposed to Waddell (2010), I find that female drinking affects the male propensity to have unprotected sex, while male drinking does not have such an effect on female behavior. This finding corresponds to the fact that females have usually older sexual partners than males.

Abstrakt

V tomto článku odhaduji efekt pití alkoholu vrstevníků opačného pohlaví na riskantní sexuální chování českých středoškoláků. Identifikační strategie v tomto článku je závislá na dvou hlavních proměnných kontrolující pro individuální a skupinové nepozorované charakteristiky. První je průměrné sexuální chování mladších spolužáků ze stejné školy, což má především kontrolovat pro nepozorovatelný přístup k sexuálnímu chování specifický pro různé školy. Druhá hlavní kontrolní proměnná je spotřeba alkoholu před vstupem na střední školu. Ta má kontrolovat především pro selekci studentů do jednotlivých středních škol. Na rozdíl od Waddella (2010) jsem zjistil, že pití žen zvyšuje pravděpobnost jejich spolužáků mít nechráněný sex, kdežto pití mužů tento efekt na ženy nemá. Toto zjištění koresponduje s tím, že ženy mají obvykle starší první sexuální partnery.

***JEL Classification*:** J13; I12
Keywords: Peer effects, Sexual behavior, Drinking

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1. Introduction

Risky sexual behavior leads to many negative social and health consequences, especially among the youth. Teenage pregnancy, for example, might affect educational attainment of young parents (Heckman and Masterov, 2004) and sexually transmitted diseases have long-term health consequences. These are the reasons behind public policies aiming at the reduction of risky sexual behavior among teenagers. Focusing on youth alcohol consumption is sometimes one of the means of these policies, as it is believed to be one of the triggers of risky sexual behavior (Cooper, 2006).

A vast amount of literature thus attempts to quantify the causal link between alcohol consumption and risky sexual behavior. There is a long debate over the proper strategy that should be used to identify the effect (Lucraz et al., 2009), and in fact, no consensus has been established. The difficulty in estimating the causal relationship between alcohol consumption and risky sexual behavior at the individual level reflects the complex nature of the underlying mechanism between these two activities. The main problem is individual sexual activity and alcohol consumption might both vary with some common unobserved attributes, for example, risk aversion or family background. Finding a proper instrument, which would break this simultaneity is extremely difficult, i.e. predict only individual alcohol consumption but not have a direct effect on sexual activity (Rashad and Kastner, 2004). However, without establishing the existence of this relationship and understanding the underlying mechanism, it remains difficult to form proper policy.

A new insight into the potential underlying mechanism is provided by Waddell (2010). He suggests that it may not just be one´s own drinking that influences one's own sexual behavior, but also opposite-gender peer drinking would also do so. As the sexual intercourse is of a bilateral nature, as Waddell points out, the role of opposite-gender peers can be very important. In the case of this relationship, there is less doubt about the way the causality goes.

Peer drinking and one's own sexual behavior do not suffer from the simultaneity stemming from one's own unobservables, as in the case with own sexual behavior and drinking. However, there are two other identification issues with estimating the effect of peers' drinking on own sexual behavior: the selection into the peer groups and the omitted variable problem (Kremer and Levy, 2008). The selection problem appears when individuals choose their own peers based on some unobserved characteristics, for example the attitude toward risky behavior. The omitted variable problem stems from the existence of other uncontrolled factors that might affect youth behavior, for example, school-specific policies toward alcohol consumption and sexual behavior.

Apart from these identification issues, one also needs to acknowledge that in the case of sexual behavior, peer effects might work differently for males and females. For example, Waddell documents that motivation for sexual activity and the general perception of sex differ substantially between females and males. Furthermore, Crochard et al. (2009) show that the average age of a first sexual partner differs substantially between genders: Females have much older partners than males. Thus, it can be expected that the relationship between peer drinking and one's own sexual behavior might be gender-specific, and the underlying mechanisms could also be different.

This paper explores the role of opposite-gender peer drinking in risky sexual behavior among close to 18-year-old Czech secondary school students, where peers are defined as classmates. The Czech Republic is generally an important case to study mainly because of the low proportion of condoms used during first sexual intercourse. Only 58.1 % of males use a condom compare to 88 % in France (Crochard et al., 2009).

The identification strategy employed in my paper builds on Waddell (2010), and on the large literature, that uses school and grade fixed effects to capture the source of selection bias that results from sorting into schools and classes. In my analysis, the selection problem is

mitigated by two main controls. The first one is younger schoolmate sexual behavior, which should capture the school-specific level of risky sexual behavior. In particular, two years younger, same gender schoolmates are used in order to avoid the endogeneity driven by possible current social interactions between schoolmates. The second key control is individual, pre-secondary school drinking (up to 15 years of age), which should capture pre-determined unobservables related to drinking.[1]

My findings suggest that the male propensity to have unprotected sex increases with their female peers' drinking, while male drinking does not affect their female classmates' propensity to have unprotected sex. In the baseline specification, drinking is defined as reporting getting drunk in the last 30 days. These findings are opposite to those Waddell (2010) reports for the US, where male drinking is a significant predictor of female sexual behavior. My results are, however, in line with the higher average age of a first sexual partner for females such that these partners most likely do not come from the females' class. My findings are also supported by several robustness checks. First, I estimate an instrumental variable model, in which the current drinking of opposite gender peers is instrumented by pre-secondary school peer drinking. Second, I use an alternative definition of alcohol drinking. As opposed to reporting getting drunk in the last 30 days, the alternative specification employs the definition of alcohol drinking as at least 3 times in the last 30 days. All the alternative specifications confirm the original results: Female drinking affects their classmates' sexual activity.

2. Literature Review and Estimation Issues

The recent literature on peer effects studies many youth outcomes: mainly on educational achievement (Kremer and Lavy, 2008), smoking and alcohol consumption

[1] A similar approach is used in Pertold (2009).

(Lundborg, 2006), and also sexual behavior (Duncan et al., 2005 and Jaccarr et al., 2005). Peer effects in risky sexual behavior have been, however, estimated only in a framework where peers' sexual behavior affects individual propensity to have unprotected sex with no direct link to alcohol consumption.[2] The relationship between peers' alcohol consumption and own sexual behavior has been examined only in Waddell (2010).

All papers that estimate peer effects, deal with three key identification issues: group selection, omitted variable problems, and the reflection problem. The first problem arises when the conditions, under which a peer group is created, are not random and individuals self-select into a group based on their unobserved characteristics. The omitted variable problem appears when other uncontrolled parallel events affect both the left- and right-hand-side variable. The reflection problem arises when peer and individual behavior can affect each other, and peer behavior is an aggregation of individual behavior.[3] Similarly to Waddell (2010), this problem is not directly addressed in this paper as it is improbable that opposite-gender sexual activity predicts individual risky drinking.[4]

To study the selection and omitted variable problems in an econometric setting, the following specification leads to the estimation of the effect of peers' drinking on individual risky behavior:

[2] The consumption of alcohol is relatively easy to target by public policy; thus, I do not consider peer sexual activity as the key variable of interest. To estimate peer effects in sexual behavior one needs to employ an identification strategy that deals with the reflection problem as described below. Pertold (2009) estimates smoking classmate peer effects and solves the reflection problem using information about pre-secondary school smoking and the re-sorting of students from primary to secondary schools. Such a strategy is, however, not feasible in the case of sexual activity as I do not observe when exactly individuals have had unprotected sex.

[3] The reflection problem is in fact an application of simultaneity, when a researcher does not observe who influences whom in a group and peer behavior is simultaneously changing with individual behavior (Manski, 1995).

[4] The problem of simultaneity can arise if individual sexual behavior predetermines peer drinking. For example, having unprotected sex can lead to peers' drinking due to psychological problems. To avoid this problem, one needs to find an instrument that predicts current drinking but is not directly correlated with individual sexual behavior. I propose pre-secondary school drinking as an instrument for current drinking. As it is described in Pertold (2009), Czech students at the age of 15 are re-sorted from primary schools, located usually in their neighborhood, into many different secondary schools and classes within a school. Therefore, classmates have usually little chance to affect each others' behavior before the enrollment into secondary schools. Pre-secondary school peer drinking should be properly excluded from the baseline regression that is presented below.

(1) $$sex_{ics} = \alpha_0 + \alpha_1 \overline{peerdrink}_{cs} + \alpha_2 \overline{X}_{cs} + \alpha_3 X_{ics} + \varepsilon_{ics}$$

Where sex_{ics} is a latent variable that is linked to the binary outcome of an individual *i* in class *c* and school *s* having unprotected sex, and $\overline{peerdrink}_{cs}$ refers to opposite-gender peer drinking. To estimate α_1, one needs to control not just for individual characteristics (X_{ics}) that drive individual sexual behavior, but also for the average of other peer characteristics ($\overline{X}_{cs}$). The effect of other peer characteristics, referred to Manski (1995) as the contextual effect, can be characterized as a vector of peer pre-determined characteristics that may affect individual behavior. For example, an individual may be affected by the knowledge of her peers about health consequences of risky sexual behavior.

The most important assumption behind the unbiased estimation of specification (1) is the error term is uncorrelated with the key explanatory variable $\overline{peerdrink}_{cs}$ and there is no reverse causality between peer drinking and sexual behavior. Similarly to Waddell (2010), I assume the latter problem is of little importance; however, I provide results from an instrumental variable that should capture this estimation as a robustness check. The problem of group selection on unobserved characteristics requires more attention. If the make up of a peer group is not fully randomized, the self-selection of peers on unobserved preferences toward drinking and risky sexual behavior is possible, and the estimated effect would consequently be biased. The omitted variable problem can arise, for example, when schools have different approaches toward teaching students about the use of contraceptives. Not controlling for these factors also leads to a correlation between the error term and the key explanatory variable ($\overline{peerdrink}_{cs}$).

The literature provides no any ideal solution to these problems. The most reliable approach is to randomize the assignment of individuals to their peers. Kremer and Levy

(2008) summarize results from various experiments that were organized usually at US colleges, where freshmen were randomly assigned to their roommates. This type of experiment is not usable for my research question. First, many secondary schooling systems, including the Czech one, are usually organized using an admission process that necessarily includes some type of selection. Second, the environment of college dormitories does not allow for an examination of the effect of opposite-gender behavior on one's own as roommates are of the same gender.

The papers that examine student behavior at secondary schools therefore usually employ school and grade-fixed effects to capture school-specific unobservables. The remaining variation in peers is thus supposed to be random (Lundbork, 2006; Waddell, 2010). However, even this approach does not necessarily lead to unbiased estimates. There is evidence that students within a cohort might be non-randomly assigned even to classes (Urquiola and Verhoogen, 2007).

I employ an identification strategy that is in a similar spirit to the fixed effects approach, but which reflects the limitation of the data and the nature of the Czech schooling system. The details are provided in the next section.

Another important issue in the estimation of peer effects is the actual definition of a peer group. The development psychology literature, for example, relies mostly on self-reported friends as the relevant peer group (Jaccard et al., 2005). While self-reported friends are probably the most relevant peer group, there are problems with this approach. Most importantly, it is very likely that even after controlling for individual time-constant characteristics, the selection problem is still an issue as the creation of a peer group can be based on an unobserved expectation about future behavior. It is also well known that teenagers often project their own behavior on their peers, which can cause a measurement bias.

Another stream of literature uses a class or a cohort at one school as a peer group (Lundbork, 2008). This approach might suffer from an imprecise definition of a peer group, which does not necessarily reflect reality, as students might be affected by other friends outside school. On the other hand, students often cannot fully control who is in their class, which diminishes the problem of group self-selection. The second advantage of this definition is that policy interventions can target a class or a school as a unit. Understanding the mechanism of peer effects within a class provides good background for designing such policies, and I therefore adopt the class peer-group approach.

3. Identification Strategy and the Econometric Specification

The solution I propose for the self-selection and omitted variable problems reflects the nature of the Czech secondary schooling system and the available information in my data. Students in the sample are in the third year of secondary school (aged 17.8 on average). However, the available data also contains first year students (aged 16.2) for each school. Since it is extremely unlikely for third-year and first-year students of the same gender to have sexual intercourse, the first-year same gender students' sexual behavior can be employed to control for school-specific, risky-sex attitudes. This variable should capture the selection problem of some schools potentially attracting students with specific pre-secondary school experiences with risky sex. In order not to confound the selection effect with any potential interaction between first-year and third-year students, I employ the risky sexual behavior of the same gender. Thus regressions that estimate the effect of male drinking on female sexual behavior control for the first-year-female sexual behavior in the same school.

The second approach I employ to mitigate the selection problem is to control for the available information about pre-secondary-school drinking. According to the official statistics, Czech youth have their first experience with drinking at a very early age, most of

them at a primary school, i.e. before the age of 15 (ESPAD, 2003). The data make it possible to track the self-reported histories of alcohol use, so they allow me to control for the selection of students into secondary schools based on pre-secondary school drinking.

The final econometric specification (2) also contains individual's current drinking, similar to Waddell (2010). Controlling for this variable allows me to interpret the peer drinking coefficient as corresponding to the effect of a peer's alcohol use on individual sexual behavior in addition to that of one's own drinking. I therefore estimate the following specification:

$$(2)\quad femsex_{ics} = \alpha_0 + \alpha_1 \overline{maledrink}_{cs} + \alpha_2 drink_{ics} + \alpha_4 \overline{youngfemsex}_{s} + \alpha_5 \overline{X}_{cs} + \alpha_5 X_{ics} + \varepsilon_{ics}$$

where $\overline{maledrink}_{cs}$ is the share of male classmates that report drunkenness in the last 30 days, $drink_{ics}$ stands for current and pre-secondary school drinking, $\overline{youngfemsex}_{s}$ represents the school-specific risky-sex attitudes approximated by the prevalence of risky sexual behavior among younger females at a given school *s*, and $\overline{X}_{cs}$ is a vector of peer variables that indicate the level of human capital and the share of complete families in a given class *c*. Finally, X_{ics} is a vector of individual-specific variables including family background, human capital, and the self-reported perception of the riskiness of smoking, taking as a proxy for the general perception of riskiness.

A similar specification can be formulated for males. The only difference is the key explanatory variable: female drinking behavior in a class.

$$(3)\quad malesex_{ics} = \alpha_0 + \alpha_1 \overline{femdrink}_{cs} + \alpha_2 drink_{ics} + \alpha_4 \overline{youngmalesex}_{s} + \alpha_5 \overline{X}_{cs} + \alpha_5 X_{ics} + \varepsilon_{ics}$$

4. Data Description and Risky Sexual Behavior of the Czech Youth

The data come from the European School Survey of Alcohol and Other Drugs (ESPAD). This survey primarily consists of 16-year-old secondary school students very often from the first grade of secondary schools in 26 European countries who were asked about their tobacco, alcohol, and drug consumption and also about their sexual life. The key sex-life questions are whether the respondent had unprotected sex and whether s/he had sex that they eventually regretted. The survey was collected in four waves: 1995, 1999, 2003, and 2007. The Czech sample also records similar information for third-year students. Unfortunately, it is not possible to track at which age students had a particular sexual experience. The database also includes information about the education of parents, the existence of siblings, the use of spare time, the type of school, the perceived riskiness of smoking, the average GPA, a measure of self-esteem, and the number of family members.

For the purpose of the estimation, I pool data from 1999 and 2003. The sample from 1995 does not contain information about third-year students, which is used in the estimation, and data from 2007 are not available yet. The sample employed for the estimation consists of 1,851 third-year male students and 2,807 female students from 208 classes with at least a 10% share of each gender, covering altogether 208 schools in 1999 and 2003. In each school, I also observe one class of first-year students. The average age of the third-year students is 17.8 for males and females, which corresponds to the median age at which young people usually start with their sexual life (Crochard et al., 2009). The mean age of the first-year students' age is 16.2.

The two questions regarding sexual risky behavior contain information about unprotected sex and regretted sex. The first question is more relevant from a policy perspective because unprotected sex can have many negative social and individual consequences. Thirty percent of the sample answer that they had unprotected sex and, as

shown in Table 2, one can observe significant differences across the three main types of Czech secondary schools: academic, vocational and apprenticeship.[5] Experiencing unprotected sex is reported by 17% of the male students in 1999 from academic schools, which is less than half of the share among apprentices. The share of students reporting unprotected sex is on average twice as high for third-year students than for first-year students. On the other hand, one can observe nearly no differences across males and females within a school type and practically no change over time.

Significant differences across types of schools suggest that selection into schools plays an important role. As described in the previous section, the main variables that I use to control for school-specific sexual behavior are first-year student sexual behavior and the third-year students' own pre-determined individual drinking behavior prior to joining their current secondary school.

The ESPAD data do not contain complete information about the sexual life of students. In particular, there is no information about the time they had their first unprotected sex, which would be important for identifying the proportion of students that experienced first sex before their enrollment into a secondary school. Crochard et al. (2009) present recent statistics about the age at sexual debut. Table 1 shows the age of sexual debut as closely corresponding to the median age of the third year students in the ESPAD data (17.9). This means that approximately 50% of the sample most likely had their first sexual intercourse at

[5] Academic and vocational schools usually provide four-year secondary programs, and students take a school-leaving exam (the 'Maturita') at the end of these programs. The 'Maturita' is a pre-requisite for tertiary education and obligatory for all students at vocational and academic schools (Jurajda, 2005). Apprenticeship programs do not lead to 'Maturita', and apprentices do not apply to colleges and universities but usually become blue-collar workers. As Munich (2004) points out, apprenticeship programs usually draw pupils from the lower end of the ability distribution. The main difference between academic and vocational schools is in their curriculum. Academic schools provide a general education that prepares graduates for college and university studies. Vocational schools provide an education focused on various fields: technical, business, pedagogical, and healthcare. Their graduates are expected to be ready to enter the labor market as well as colleges in their particular field.

the time of the survey and less than 25% had intercourse before enrollment into a secondary school.

The second important finding presented in Crochard et al. (2009) is the gender difference in the median age of the first sexual partner. Females report having a first sexual partner 2 years older than their own age (17) or the age of the males' first partner (17), which can be considered as a shortcoming of my definition of a peer group. As the ESPAD sample consists of classes with the same mean age of females and males, males have a higher chance to have a first sexual partner of the same age or younger. Females prefer an older partner for first sexual intercourse, who, given the age composition of the class, is less likely to come from their class. As the 25^{th} percentile of the female partners' age (17) is approximately equal to the median age of the males' first sexual partner (17), it is possible to expect that the effect of classmate female drinking on the males' risky sexual behavior should be twice as stronger as the same effect of females on males. The relevant peer group of potential sexual partners for females is thus more likely older than their classmates.

Descriptive statistics of all variables are presented in Table 4. The generally lower proportion of apprenticeships in the sample is given by the exclusion of the highly gender-segregated classes, which are typical for these types of schools. Males and females do not differ strongly in terms of their average age, perceived riskiness of smoking one cigarette, parental education, and the completeness of family. However, a significant difference between males and females appears in the prevalence of drinking. About 57% of males reported drunkenness during the last 30 days, while females report drunkenness in 41% of the cases. This suggests that heavy alcohol consumption, while more present among young men, is a common activity for both genders. A similar gender difference also exists for pre-secondary-school drinking, and gender differences also exist in the reported GPA and sport activity.

5. Results

The estimated results based on OLS regressions are summarized in Table 5, which show a marginal effect of opposite-gender peer group drinking on the probability of having unprotected sex for the third-year students (α_1 from equations 2 and 3). Standard errors are clustered at the class level. The table compares the results for males and females, and each line refers to a single specification with control variables specified in the first column.

The first line thus presents the effect from a regression with only one explanatory variable: opposite-gender peer drinking. The estimates are positive and statistically significant, and they are larger for males. The first set of additional controls introduced in row (2) of Table 5 captures individual risk averseness and risk attitude as reflected in one's own smoking and school type dummies. The risk attitude is approximated by the perception of smoking and whether an individual is actually a current smoker. Controlling for these characteristics causes a drop in the estimated coefficient from 0.265 to 0.131 for males and from 0.157 to 0.101 for females. In row (3), I further control for individual human capital characteristics, age, and family characteristics including the completeness of family and parental education. The estimated effect drops further for females and males by approximately the same rate.

Specification (4) contains additional variables that characterize present and past individual drinking. Adding these covariates is the key step in identifying the effect of peer drinking on individual sexual behavior. If the association between peer drinking and individual sexual activity is driven mainly by a selection of drinkers into secondary schools, controlling for pre-secondary school drinking should mitigate the resulting biases in the estimation of α_1. The estimates of peer effects, however, remain significant and decrease by about ten percent for both females and males.

The results in row 5 are from a regression controlling for other peer characteristics: the completeness of family, smoking of siblings, education of parents and the type of school. All of these variables are supposed to capture other confounding factors related to unobserved factors affecting prevalence of drinking and risky sexual behavior within a class. The estimated coefficient drops even further to 0.112 for males and 0.074 for females.

The last control that is added into the analysis is younger schoolmate sexual behavior within the same gender. The idea behind this covariate is to control for the school-specific level of risky sexual attitudes. The estimated effects of male drinking on female sexual behavior become insignificant, while female drinking is still statistically significantly affecting male behavior. The estimated coefficient, 0.112, is approximately twice as large as that estimated by Waddell (2010). An increase in female peer drinking by one standard deviation causes an 11 percentage point increase in an individual's propensity to have unprotected sex.

The presented findings rely on a single definition of drinking: reporting drunkenness within the last 30 days. However, this measure of drinking is not the only possible one. Waddall (2010) uses for example the number of occasions during which alcohol was used. I provide several robustness checks that are presented in Table 6.

The first line presents the results from the original specification shown as specification (6) of Table 5. The first alternative specification uses pre-secondary school peer drinking as an instrument for the current drinking of peer. This specification is supposed to capture the potential simultaneity between peers drinking and sexual behavior, as the first sexual experience comes usually after the enrollment into secondary schools. The main result is fairly similar to that based on the original approach: Female drinking predicts male sexual behavior. However, the estimated coefficient on male drinking is now larger, albeit with corresponding larger standard errors. The third line contains results from a regression in

which pre-secondary school drinking is used to proxy individual attitude toward drinking. This alternative definition estimates the effect of pre-determined peer alcohol drinking that is not affected by current social interactions. On the other hand, it can be contaminated by measurement error. The last alternative definition of drinking is to consume alcohol in the last 30 days at least 3 times. The estimated effect is again significant for the effect of female peer drinking on male sexual behavior, while male peer drinking remains insignificant as a predictor of female sexual behavior.

My finding is in line with the general description of sexual behavior of Czech youth provided in Crochard et al. (2009), who point out that female young adults have on average an older first sexual partner compare to males. The results are in line with the probability that males have twice as much higher probability to have partner among their classmates than females. Thus, it is less likely that female sexual behavior would be affected by their classmates drinking.

6. Conclusions

In this paper, I estimate the effect of opposite-gender peer drinking on individual risky sexual behavior of Czech secondary-school students. The main finding is that female drinking within the same class significantly affects the male probability to have unprotected sex, while male drinking does not affect female risky sexual behavior. The size of the estimated effect means that an increase in female peers drinking by one standard deviation causes an 11 percentage point increase in an individual's propensity to have unprotected sex..

The policy implication of this analysis is that by reducing alcohol consumption among 18-year-old females, there would also be a substantial reduction in their male classmates' probability to have unprotected sex. On the other hand, female sexual behavior is less likely to be affected by male classmates consuming alcohol, even thought it could be affected by

drinking of older males who are not observable. Results in Table 4 are consistent with possibly same peer effects for males and females, considering the fact that females have twice as much larger probability to have an older partner. It might be therefore important to target anti-drinking policies on females at a younger age. It is also necessary to highlight that the type of secondary school the student attends is a very important determinant of risky sexual behavior.

The identification strategy I employ deals with the selection problem and the omitted variable biases using various controls including the individual pre-determined pre-secondary school consumption of alcohol and the sexual behavior of younger schoolmates. The pre-secondary school consumption of alcohol mainly captures individual pre-determined unobservables related to the consumption of alcohol. Younger schoolmate sexual behavior serves as a control for school-specific attitudes toward risky sexual behavior. This identification strategy is different from that of Waddell (2010) and of many other papers that use school- and grade-fixed effects to deal with the problems of self-selection and omitted variables. The advantage of my approach is that it allows for a peer effect estimation in the absence of multiple-class information using data that contain only classes from different cohorts of students. Moreover while the fixed effects approach relied on within-school variation in peer drinking, my identification employs the part of variation in peer drinking across schools that is not driven by group selection.

My results contradict the findings in Waddell (2010), who implies that male drinking affects female sexual behavior based on employing the school-fixed-effect strategy. One explanation why my findings might differ from those in Waddell (2010) is that female teenagers in the US are more likely to have a sexual partner from their own class or cohort compared to the Czech females. There is, however, little of such evidence. In the US, 73% females between 17 and 19 have a sexual partner in the same age group or up to 3 years older

(Kaiser Family Foundation, 2005). More precise statistics is available for African Americans The mean age difference between sexual partners among them teenagers is approximately two years (Bauermeister, 2009), which is the same difference as in the case of Czech female teenagers. There is also no direct evidence that the choice of the first sexual partner is different or that the general attitude toward sex is different. The difference in the findings may be related to the different sources of variation employed in the estimation and, thus, remains a topic for the further research.

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Appendix

Table 1: The Age of sexual debut and of a first sexual partner

	Age at sexual debut		Age of first sexual partner	
	Median	25^{th} – 75^{th} perc.	Median	25^{th} – 75^{th} perc.
Male	17	16-18	17	16-18
Female	17	16-18	19	17-20

Note: Different age for of first sexual partner means that females usually have a more experienced first partner, whereas partners of males are on average in the same age.
Source: Crochard et al. (2009)

Table 2: Unprotected sex and drinking behavior among third- and first-year students

	Unprotected sex*				Drinking**			
	1999		2003		1999		2003	
	Male	Female	Male	Female	Male	Female	Male	Female
	Third-year students (mean age 17.8)							
Academic s.	17	14	20	21	54	33	53	37
Vocational s.	30	24	36	30	54	37	58	39
Apprenticeship	47	34	43	37	63	53	62	53
	First-year students (mean age 16.2)							
Academic s.	11	8	6	8	40	27	31	25
Vocational s.	15	17	14	18	45	31	44	36
Apprenticeship	23	28	24	35	55	41	54	53

Note: * The share (in %) of those who report that they ever had unprotected sex.
** The share (in %) of those who report that they had been drunk in the last 30 days.

Table 3: Pre-secondary school drinking of third-year students (in %)

	1999		2003	
	Male	Female	Male	Female
Academic	21	17	27	18
Vocational	26	19	29	22
Apprenticeship	34	24	36	23

Note: A drinker is defined as someone reporting drunkenness prior to joining a secondary school.

Table 4: Descriptive statistics for third-year students, pooled 1999 and 2003 data

	Male		Female	
Variable	mean	st.dev.	mean	st.dev.
Having unprotected sex	0.27	0.45	0.30	0.46
Current drinking	0.57	0.49	0.41	0.49
Share of pre-sec. school drinkers	0.29	0.45	0.20	0.40
Share of females in class	0.52	0.20	0.66	0.17
Quality of family relationship (1low-5high)*	2.03	0.91	2.22	1.03
Smokers	0.46	0.50	0.46	0.50
Year dummy (2003)	0.58	0.49	0.62	0.49
Academic school	0.35	0.48	0.39	0.49
Vocational schools	0.37	0.48	0.38	0.48
Apprenticeship	0.28	0.45	0.24	0.42
GPA12	0.31	0.46	0.48	0.50
GPA34	0.54	0.50	0.43	0.50
GPA56	0.13	0.33	0.07	0.25
GPA78	0.01	0.08	0.00	0.04
Completeness of family	0.80	0.40	0.78	0.41
Parents - college degree	0.30	0.46	0.25	0.43
Parents - high school	0.28	0.45	0.25	0.43
Age	17.87	0.47	17.88	0.45
Perceived riskiness of 1 cigarette(1 low-5 high)*	2.09	0.88	2.03	0.78
Daily sport	0.38	0.49	0.20	0.40
Observations		1851		2807
Classes		208		208

*The regression analysis includes dummies for each level of the perceived riskiness of cigarettes and quality of the family relationship.

Table 5: The effects of female and male peer drinking on individual sexual risky behavior (third-year students)

		Female	Male
	Controls	Male peer drinking	Female peer drinking
(1)		0.157***	0.265***
		(0.052)	(0.062)
(2)	(1) + perception of risk, cig. smoking, school type	0.101***	0.131***
		(0.043)	(0.055)
(3)	(2) + human capital, family characteristics, age	0.095***	0.111***
		(0.039)	(0.055)
(4)	(3) + own present and past drinking	0.080***	0.103***
		(0.038)	(0.053)
(5)	(4) + other peers characteristics	0.074**	0.112**
		(0.036)	(0.056)
(6)	(5) + % younger students' risky sex. behavior	0.058	0.118**
		(0.041)	(0.056)
	Observations	2807	1851
	Classes	208	208

Note: Results come from LPM, all errors are clustered on class level.
The Sample contains only classes with more than 10% of opposite-gender peers. Peer drinking is defined as experiencing drunkenness in the last 30 days

Table 6: The alternative definitions of opposite gender peer drinking (results presented only from the final model)

		Females	Males
	Alternative specification of peer drinking	Male peer drinking	Female peer drinking
(1)	Drunkenness in the last 30 days (original specification)	0.058 (0.041)	0.118** (0.056)
(2)	Drunkenness in the last 30 days instrumented by pre-secondary school drinking	0.115 (0.11)	0.119* (0.062)
(3)	Pre-secondary school experience with drunkenness	0.062 (0.042)	0.083* (0.045)
(4)	Current drinking defined as 5 times in last 30 days	-0.031 (0.039)	0.080* (0.049)

Note: The results come from LPM, all errors are clustered on class level.
The sample contains only classes with more than 10% of opposite gender peers.
All specifications contain controls that are included in model 6 in Table 5.

Table 7: Full results of the effects of female peer drinking on the individual sexual riskiness of males
(third-year students)

Specification	1	2	3	4	5	6
% of female drinkers	0.265***	0.131**	0.113*	0.103*	0.112**	0.118**
	(0.063)	(0.057)	(0.058)	(0.058)	(0.056)	(0.056)
Current smoker		0.183***	0.176***	0.114***	0.102***	0.116***
		(0.0202)	(0.0211)	(0.0225)	(0.0224)	(0.0225)
Academic school		-0.102***	-0.107***	-0.107***	-0.0578	-0.0634
		(0.0317)	(0.0333)	(0.0328)	(0.0471)	(0.0485)
Vocational school		-0.0141	-0.0246	-0.0227	0.0114	-0.00157
		(0.0323)	(0.0329)	(0.0330)	(0.0350)	(0.0363)
Perception of riskiness of smoking=2		-0.0170	-0.0148	-0.00743	-0.007	-0.00145
		(0.0379)	(0.0379)	(0.0379)	(0.039)	(0.0397)
Perception of riskiness of smoking=3		0.000484	0.0241	0.0272	0.023	0.0270
		(0.0382)	(0.0400)	(0.0399)	(0.040)	(0.0407)
Perception of riskiness of smoking=4		-0.0552	-0.00726	-0.00328	-0.0008	0.000471
		(0.0360)	(0.0433)	(0.0436)	(0.0442)	(0.0439)
Perception of riskiness of smoking=5		-0.0354	-0.0382	-0.0254	-0.0102	-0.0184
		(0.0724)	(0.0743)	(0.0741)	(0.0763)	(0.0771)
Year dummy (2003)			0.0219	0.0177	0.0114	0.00819
			(0.0317)	(0.0318)	(0.0309)	(0.0312)
GPA 34			0.0462**	0.0407**	0.0393*	0.0416**
			(0.0210)	(0.0207)	(0.0209)	(0.0209)
GPA 56			0.0976**	0.0850**	0.0886**	0.103***
			(0.0382)	(0.0365)	(0.0365)	(0.0376)
GPA 78			-0.0694	-0.0846	-0.123	-0.106
			(0.0989)	(0.0914)	(0.104)	(0.111)
Parents-college degree			0.0485*	0.0466*	0.0532**	0.0529**
			(0.0259)	(0.0256)	(0.0253)	(0.0259)
Parents-high school			0.0153	0.0138	0.0203	0.0138
			(0.0224)	(0.0225)	(0.0224)	(0.0221)
Age			0.0552**	0.0545**	0.0548**	0.0569**
			(0.0260)	(0.0253)	(0.0264)	(0.0264)
Current drinker				0.110***	0.110***	0.131***
				(0.0197)	(0.0195)	(0.0191)
Pre-secondary school drinking				0.111***	0.106***	0.106***
				(0.0259)	(0.026)	(0.026)
Share of females in class					0.00909	-0.0101
					(0.0610)	(0.0615)
Quality of family relationship					0.0213**	0.0216**
					(0.00985)	(0.00981)
Completeness of family					-0.0536**	-0.0587**
					(0.0248)	(0.0251)
% smokers among siblings					-0.0895	-0.0617
					(0.0944)	(0.0963)
% sport daily					-0.0387	-0.0290
					(0.0994)	(0.102)
% parental college degree					-0.0611	-0.0533

					(0.0744)	(0.0749)
% complete family					-0.219**	-0.245**
					(0.0970)	(0.103)
% unprotected sex of younger sch.						-0.0181
						(0.0907)
Constant	0.167***	0.196***	-0.866*	-0.913**	-0.726	-0.726
	(0.0251)	(0.0523)	(0.470)	(0.461)	(0.484)	(0.484)
Observations	1851	1851	1851	1851	1851	1851
R-squared	0.014	0.075	0.086	0.117	0.127	0.117
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Tabel 7: Full results of the effects of male peer drinking on the individual sexual riskiness of females (third year students)

Specification	1	2	3	4	5	6
% of male drinkers	0.157***	0.101**	0.0951**	0.0803**	0.0741**	0.0584
	(0.052)	(0.0393)	(0.0373)	(0.0358)	(0.0364)	(0.0409)
Current smoker		0.216***	0.210***	0.151***	0.142***	0.147***
		(0.0171)	(0.0168)	(0.0171)	(0.0171)	(0.0174)
Academic school		-0.178***	-0.144***	-0.142***	-0.099***	-0.095***
		(0.0245)	(0.0260)	(0.0253)	(0.0331)	(0.0360)
Vocational school		-0.0517**	-0.0379	-0.0356	-0.00533	-0.00861
		(0.0259)	(0.0243)	(0.0239)	(0.0252)	(0.0270)
Perception of riskiness of smoking=2		0.0486**	0.0535**	0.0616***	0.0646***	0.0671***
		(0.0226)	(0.0223)	(0.0223)	(0.0217)	(0.0217)
Perception of riskiness of smoking=3		0.0610**	0.0847***	0.0821**	0.0763**	0.0794**
		(0.0290)	(0.0315)	(0.0316)	(0.0301)	(0.0306)
Perception of riskiness of smoking=4		-0.000	0.052	0.0682*	0.0638*	0.0660*
		(0.0270)	(0.037)	(0.036)	(0.035)	(0.035)
Perception of riskiness of smoking=5		0.0808	0.0984	0.116	0.115	0.0948
		(0.0717)	(0.0743)	(0.0760)	(0.0767)	(0.0760)
Year dummy (2003)			-0.00175	-0.00400	-0.00478	-0.00389
			(0.0316)	(0.0305)	(0.0295)	(0.0300)
GPA 34			0.0445**	0.0389**	0.0328*	0.0290*
			(0.0173)	(0.0170)	(0.0169)	(0.0172)
GPA 56			0.0930**	0.0791**	0.0584	0.0515
			(0.0382)	(0.0374)	(0.0368)	(0.0371)
GPA 78			-0.137	-0.0982	-0.118	-0.126
			(0.222)	(0.223)	(0.221)	(0.214)
Parents-college degree			-0.0313	-0.0380*	-0.0346	-0.0297
			(0.0212)	(0.0210)	(0.0217)	(0.0222)
Parents-high school			-0.0109	-0.00767	-0.00488	-0.00373
			(0.0216)	(0.0214)	(0.0219)	(0.0224)
Age			0.0918***	0.0983***	0.0944***	0.0959***
			(0.0228)	(0.0224)	(0.0223)	(0.0227)
Current drinker				0.0630***	0.0596***	0.0577***
				(0.0181)	(0.0180)	(0.0182)
Pre-secondary school drinking				0.184***	0.178***	0.175***
				(0.0226)	(0.0230)	(0.0235)
Share of females in class					-0.0860	-0.0862
					(0.0602)	(0.0613)
Quality of family relationship					0.0297***	0.0300***
					(0.00832)	(0.00849)
Completeness of family					-0.0571**	-0.0579**
					(0.0225)	(0.0229)
% smokers among siblings					-0.0707	-0.0318
					(0.0815)	(0.0799)
% sport daily					-0.164**	-0.182**
					(0.0757)	(0.0764)
% parental college degree					-0.0125	-0.0213
					(0.0582)	(0.0585)
% complete family					-0.0992	-0.124
					(0.0913)	(0.0909)

% unprotected sex of younger sch.						0.0356
						(0.0546)
Constant	0.210***	0.204***	-1.483***	-1.631***	-1.395***	-1.406***
	(0.0280)	(0.0366)	(0.404)	(0.396)	(0.393)	(0.399)
Observations	2807	2807	2807	2807	2807	2807
R-squared	0.006	0.104	0.114	0.145	0.156	0.157
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

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