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# Adolescent sexual behaviour and academic performance of Italian students

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## Abstract

This article estimates the effect of sexual activity during adolescence on academic performance of high school students in Italy. We exploit a sample of university students drawn from the two waves (2000 and 2017) of the SELFY survey. The survey collects information on sexual behaviours during adolescence and on the grade obtained at the high school final examination, as well as on a number of family-related variables. Overall, results suggest a negative relationship between sexual activity and the grade obtained in the high school final examination supporting the idea that health and education consequences of sexual activities among adolescents merit public policy efforts. To deal with the potential influence of unobserved characteristics at individual and family level, we also pursue an instrumental variables approach. As instruments, we use three questions as proxy of erotophobia-erotophilia personality trait. This extension of the analysis confirms the results of the baseline models.

**Keywords:** Adolescence, Sexual behaviours, Education

## Introduction

Adolescents' romantic interactions may have an impact on educational and labour market outcomes. Such interactions are potentially as important, to teens and young adults, as relationships with friends and family. Adolescence is the period of transition between childhood and adulthood in which many physical, cognitive, social, and emotional changes happen characterized by increasing interest in romantic and sexual relationships.

In Italy, the liberalization of sexual behaviour, characterized by the decline of sexual orientation associated with the family and procreation and the affirmation of an hedonistic model based on individuals' sexual pleasure, occurred many years later than central northern Europe. According to the literature, age at first sexual intercourse decreased notably, especially for women, starting with the post war generations (Caltabiano 2008) while the percentage of individuals who had their first sexual intercourse before their 16th birthday has increased over time (De Rose and Dalla Zuanna 2013). Specifically, by the age of 16, an average of 26% of boys and 22% of girls interviewed in 2010 reported being sexually active, whereas smaller percentages were recorded for previous birth cohorts[1].

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[1]As an example, for the 1967–1976 cohorts, the percentages of adolescents who made the transition to sexual activity before their 16th birthday were 17.1% and 13.2% for men and women, respectively (De Rose and Dalla Zuanna 2013).

However, the path followed by Italian adolescents concerning age at first intercourse is not in line with Western countries who experienced a sharper reduction in the age at sexual debut. In fact, a distinctive feature of Italy is that age at first sex has never reached particularly low levels since young Italian adults tend to postpone their first sexual intercourse compared to their peers in Western countries. Differences in sexual behaviour across countries may rely on cultural and economic background with Italy considered a more traditional country, characterized by long-standing family structures and high attachment to religious and social norms, especially in the South (Gabrielli and Borgoni 2007).

Since the decrease of age at sexual initiation may lead to many negative educational and health consequences, adolescents' sexual risk behaviour has become an important social concern. Although the link between early sexual behaviour and increased health risks, such as sexually transmitted diseases, is well established also in Italy (Panatto et al. 2012), much less attention has been given to understanding the relationship between early age at sexual intercourse and educational attainment. Despite of youth sexual behaviour is viewed as part of normal development, the problems and risks associated with early sexual behaviour, the "'risky deviance'", are largely emphasized (Zimmer-Gembeck and Helfand 2008). The vulnerability of adolescents, who are less equipped than adults to cope with complex emotional process linked with sexual intercourse, could lead, in turn, to reduce educational achievements.

Prior studies observed that early sexual activity increases the likelihood to have more frequent sexual encounters (Kahn et al. 2002) and romantic partners (Sandfort et al. 2008) which may negatively impact on academic achievements since these activities are time consuming. On the other hand, "refraining from having sex as a teenager may impart important psychological and emotional benefits that, in turn, lead to increased human capital accumulation" (Sabia and Rees 2009). However, this body of literature has provided insights into how sexual activity can affect educational attainment prevalently in the USA and the UK contexts where very low ages at first sex are recorded (Johnson et al. 1994). There has been little research investigating consequences of adolescents' sexual behaviour in Italy. The current study is the first attempt to explore the relationship between sexual activity during adolescence and academic performance in Italy.

More specifically, we contribute to this literature exploring whether being sexually active during adolescence and the timing of the first sexual intercourse have an impact on academic performance of teens in Italy. We use a sample of university students drawn from the two waves (2000 and 2017) of Sexual and Emotional Life of Youths (SELFY). The survey collects information on sexual behaviours during adolescence and on the grade achieved in the high school final examination, as well as on a number of family-related variables. Ordinary least square (OLS) estimates suggest that the early age at first intercourse has a negative effect on high school results achieved at the final examination, whereas remaining abstinent until age 19 was associated with an increase in the probability to obtain a higher mark. This relationship, however, could be due to unobserved characteristics at individual and family level. In an effort to deal with the potential influence of these unobservables, we pursue an instrumental variables approach that confirms the main results. We use a set of IV that include proxies of psychological attitude towards sexuality. This result is consistent with the argument that romantic involvements are time consuming and can impose substantial emotional costs on adolescents affecting their

human capital accumulation process. We also find evidence that students with relatively better grades suffer the greatest consequences of an earl sexual activity.

## Background

Social scientists have extensively examined the relationships between adolescents' sexual behaviour and educational attainment in the USA and the United Kingdom contexts. Billy et al. (1988) found that sexual debut was associated with a decline in the value placed on academic achievement for white adolescent females and a decline in academic grades for white males. In another longitudinal study, Schvaneveldt et al. (2001) showed that adolescents who made the transition to sexual activity experienced a decline in academic performance and educational aspirations compared with adolescents who had not yet become sexually active. As Zimmer-Gembeck and Helfand (2008) evidenced in their review of adolescent sexual behaviours, initiating sexual intercourse at a young age may be linked to lower grades and other school-related behaviour problems. Moreover, adolescents who experienced first sexual intercourse in the age interval 16–18 did not seem to have school performance problems or lowered educational aspirations that were, instead, found among adolescents who had first intercourse earlier in time. Using a sample of female 22 to 24 years of age from the US National Longitudinal Study of Adolescents Health, Sabia and Rees (2008) found that delaying age at first intercourse increased the probability that females graduate in high school and reduced the risk of exhibiting the symptoms of depression. More recently, Sabia and Rees (2012) found also a negative effect of the number of partners on years of schooling and the probability of attending college. Each additional sex partner was associated with an 0.1 decline in years of schooling. On the other hand, studies that extended the analysis to boys did not find any relevant relation (Sabia and Rees 2008; 2011). McCarthy and Grodsky (2011) pointed out that adolescents who have had sex only with partners with whom they were not romantically involved were at greater risk of reducing educational plans, aspirations, and grades with respect to abstainers and adolescents who have had sex only with stable partners. That said, it seems likely that early age at sexual intercourse and number of partners could affect negatively educational attainment and academic performances.

There are a number of reasons why early initiation of sexual activity might lead directly to lower levels of academic achievements. Evidence suggests that the typical teenager spends a bulk of time thinking about or in the company of the opposite sex (Richards et al. 1998) and he/she is subjected to emotional turmoil, possibly subtracting time from academic pursuits (Rector and Johnson 2005). Moreover, sexual intercourse at young age can distract adolescents to school achievements through unintended health consequences of becoming sexually active, such as the higher risk of unplanned pregnancies, abortion, and sexually transmitted diseases (Rector et al. 2003). Other risk behaviours associated with early sexual intercourse are substance use and greater affiliation with deviant peers, which could lead to develop minor deviance (Bingham and Crockett 1996; Rees et al. 2001). Research on adolescent sexual activity found that teenagers involved in romantic relationships were more likely to experience depression than those who did not become romantically involved. However, some studies evidenced sex differences in depression during adolescence since females experienced a larger increase in depression—and a greater decline in happiness—than males in response to romantic involvement (Joyner and Udry 2000). Hallfors et al. (2005) found that adolescence females who experienced

sex with multiple partners were more likely to be depressed than their counterparts who remained sexually abstinent. However, boys engaged in sexual activity with multiple partners showed no significant increase in depression. A possible explanation of the link between poor mental health and young age at first sexual intercourse may rely on the fact that individuals who initiate early may not be adequately prepared for negative health potential consequences, such as unintended pregnancies or sexually transmitted diseases, and neither have the emotional skills and maturity to cope with romantic relationship breakup (Larson et al. 1999; O'Donnell et al. 2001; Meier 2003). The observed associations suggest that adolescents who engage in sexual intercourse at young ages and have multiple partners might undergo negative social and health changes which, in turn, may lead to reduced interest in academic achievement.

## Empirical strategy

### Data and sample selection

The aim of this study is to provide evidence concerning possible effects of being sexually active during adolescence on academic performance of late adolescents in Italy. Data are drawn from the SELFY survey that was carried out in the first half of 2017 in 28 Italian universities with the aim of drawing an updated picture of sexual and emotional opinions and behaviours among about 8000 Italian university students attending Italian undergraduate courses in Economics and Statistics[2]. SELFY is an update of a survey carried out in 2000 in which information on sexual behaviours of about 5000 students were collected using the same national sampling procedure[3] and the same data collection technique. Students were invited to complete the questionnaire anonymously during a compulsory course and returned it immediately to the researcher sealed in an envelope. All the questionnaires were then mailed to the directors of the survey for data entry. Evidence suggests that self-administered survey questionnaires with no interference of researchers are the better solution for dealing with sensitive topics such as drug taking and sexual behaviours (Bowling 2005; Buzzi 1998). The rigorous process adopted to collect information which guarantee the anonymity and confidentiality of students responses "resulted in a practical non-existence of refusals to fill in the questionnaire in class, in both in the surveys 2000 and 2017" (Dalla Zuanna et al. 2019). The very low number of refusals is an important advantage of SELFY if compared with other typologies of surveys—face-to-face or CATI interviews—for which refusals are at least 20–30%, both in Italy and elsewhere (see, e.g. Bajos and Spira (1993)).

The analytic sample used in the current study comprises 12,443 students (48.19% men) on the basis of complete cases of the outcome (1.2% of non-response answer).

To exploit differences based on gender and time in the relationship between sexual activity and educational outcome, two interaction terms were added in the model. The

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[2]According to Caltabiano et al. (2006), "the Faculties of Economics and Statistics were chosen because they both have a very high percentage of students attending lessons regularly. In addition, the numbers of males and females are more balanced in these faculties, and it was easy for the research team to have successful contacts with academic authorities."
[3]The surveys are representative for students of Economics and Statistic in Italian public universities (the sample plan is described in detail in Crisafulli and Dalla Zuanna (2004) and Dalla Zuanna et al. (2019)). It is important to underline that the sampling method is not probabilistic since in each region, universities and courses have been chosen according to the collaboration of the professors of the above courses. However, as stated by Caltabiano (2005), "as this criterion should not be reasonably connected to the variables collected by the survey (i.e. the sexual behaviour of students), it could be seen as a multi-stage cluster sample, where—within each region—universities (first stage unit) and some university courses (second stage unit) are randomly sampled and all attending students (third stage unit) are interviewed". Students attending private universities in Italy are not included in the surveys since they represent a minority strongly selected by different skills and high income households.

large sample size of SELFY for both years, 2000 and 2017, was an important advantage if we consider that previous researches carried out in Italy on sexual experiences were usually based on smaller samples. The focus of the survey is on sexual and emotional life of respondent, asking questions on first intercourse determinants and on intercourse and sentimental relationship event history, along with personal, social, and family information.

The main disadvantage of using this kind of data concern the characteristics of the sample made by university students who represent a "selected" group to study the effects of sexual behaviour—in terms of early first sexual intercourse and abstinence—on academic performance in high school. Indeed, one caution regarding university students is that they are not representative of all young people who live in the sample country. Some studies on the sexual life of students show that university students seem to delay their first sexual intercourse with respect their counterparts who work (Carella et al. 2004; Kontula 2004), especially if they live with parents that have great educational aspirations (Castiglioni 2004; Rosina and Rivellini 2004). The negative relationship between education and early sexual debut could be attributed to the fact that more educated students may perceive early sexual activity as a distraction from academic activities since they spend more time and invest more family's resources to their study. Higher levels of education could be more protective towards early sexual activity which lead to adverse future consequences, like pregnancies and sexual diseases, while less educated young adults may be less informed about the consequences of such behaviour.

To overcome the problem of representativeness and validate results obtained by using SELFY surveys, Dalla Zuanna et al. (2019) compared the sexual behaviour of 2000 and 2017 students' samples, in terms of their first sexual intercourse before 16 years, with identical indicators obtained by Barbagli et al. (2010), which referred to a national representative sample of people aged 20–24 in 2006. Their results showed that the proportions of university students or graduates who declared they experienced their first sexual intercourse before their 16th birthday in 2000 were in line with the tertiary educated and university students in the nationally representative 2006 research. They also found that the sexual life of university students, both males and females, seems to be delayed and less intense than the average of their less educated peers[4].

Despite these limitations, we preferred using SELFY data since it is the only one available for Italy which provides updated information on sexual behaviour and academic outcomes on young university students[5].

SELFY data has significant advantages such as the high number of interviews, an important characteristic considering the content dealing with the intimate sphere of the respondent, and a very low number of refusals. More importantly, the possibility to compare results between the two cross-sectional surveys conducted in 2000 and 2017—identical in the data collection technique and sampling procedure of university

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[4]In particular, among males, university students or graduates who declared they experienced their first sexual intercourse before their 16th birthday,were 12% in the national sample in 2006 and 12.5% in 2000 SELFY sample. They found similar proportions among female university students that had their first sexual intercourse before the age of 16 surveyed in 2006 and 2000, respectively 12.3% and 9.1%. In 2017, the same indicator had risen to 18.6% for males and 18.9% for females, which were much lower with respect to less educated people interviewed in 2006, as 29.6% of the male respondents and 27.5% of female with fewer than 10 years of schooling had had their first sexual intercourse before the age of 16 (Dalla Zuanna et al. 2019). Other studies on sexual behaviour of Italian young people confirmed these results (Poscia et al. 2015; Panatto et al. 2012).

[5]In Italy, only few and outdated surveys on selected groups of population, or at a local level, are available (Buzzi 1998; Barbagli 2001; Castiglioni and Dalla Zuanna 1997; Crisafulli and Dalla Zuanna 2004). The last representative National Survey on Italian Sexuality was held in 2006 (Barbagli et al. 2010).

students—is an important improvement to understand changes in adolescents' sexual behaviour of Italians.

### Model specifications and estimation

We specify two different models and estimate them by means of OLS and IV regressions:

$$S_i = \alpha + \beta_1 A_i + \beta_2 gender_i + \beta_3 survey + \beta_4 A_i * gender_i + \beta_5 A_i * survey_i + \boldsymbol{\beta'}_2 \mathbf{X}_i + \epsilon_i. \quad (1)$$

$$S_i = \alpha + \beta_1 E_i + \beta_2 gender_i + \beta_3 survey + \beta_4 E_i * gender_i + \beta_5 E_i * survey_i + \boldsymbol{\beta'}_2 \mathbf{X}_i + \epsilon_i. \quad (2)$$

where $S_i$ refers to standardized high school final grade reported by individuals $i$, $A_i$ is a dummy variable equal to 1 if the respondent $i$ had no sexual experience by the age of 19, and $E_i$ is indicating early sexual debut. $gender_i$ is a dummy variable taking value 1 if the respondent is a man and 0 if is a woman while $survey_i$ corresponds to 1 if the respondent was surveyed in 2017 and 0 if in 2000. $\mathbf{X}_i$ refers to a vector of individual characteristics presented below as covariates, and $\epsilon_i$ is a i.i.d. error term.

Overall, we test the hypothesis that respondents being sexually active during the adolescence will achieve lower high school final grade.

*Academic performance:* It is measured as the high school final examination score. However, since students interviewed in 2000 and in 2017 were judged with a different examination system, this variable has been standardized in order to make meaningful comparisons between the two cohorts of individuals and with other empirical studies ($S_i$ in Eqs. 1 and 2)[6].

*Sexual activity in the adolescence:* Two measures of sexuality before age 19 were constructed from self-reported information on age at first intercourse based on participants response to the following question: "How old were you the first time you had a sexual intercourse?".

The first measure of sexual activity during adolescence consists of abstinence and it has been defined as a dummy variable taking value 1 if respondents reported refrained from having sexual intercourse until at least the age of 19 and equal to 0 otherwise– $A_i$ in Eq. (1).

Then, as second measure, we used early age at first intercourse– $E_i$ in Eq. (2). More specifically, this variable has been dichotomized according to whether respondents reported to have had (or not) sex for the first time before age 15.

*Covariates:* In both specifications, we control for a set $\mathbf{X}_i$ of individual and family characteristics. Specifically, individual characteristics included students test scores at the end of the first stage of secondary school (around age 13) to control for academic performance before the period under analysis and whether participants were often doing volunteering or sport at ages 14–18 to control for lifestyle and the use of leisure time. Family background variables included parents' marital status (in couple *vs* divorced), parents' educational level (high school diploma or a university degree), and parents' employment status during the students' high school period. To control for heterogeneity in schools

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[6]In Italy, the upper secondary education system offers general, technical, and vocational education. The overall length of studies at upper secondary level is 5 years (from 14 to 19 years of age). At the end of upper secondary school, students take a State examination. The final result of the State examination is expressed as a mark out of one hundred. The pass mark is 60 out of 100 points for students sampled in 2017 SELFY survey, while for students interviewed in 2000, the final result of the State examination was expressed as a mark out of 60. For the latter, the pass mark was 36.

quality, $\mathbf{X}_i$ includes whether participants were born in the South of Italy and whether respondents were grown up in a big city (with more than 50,000 inhabitants).

Even if information on individual characteristics and family background available in the SELFY survey are rich and we can control for a number of important variables, OLS estimates may suffer of endogeneity due to individual or family level characteristics that are difficult to measure. Moreover, the explanatory variables used in models (1) and (2) may suffer of measurement error due to self-reporting of sexual activity. In order to address those potential sources of endogeneity, we implement an IV approach similar to that proposed by Sabia and Rees (2008, 2011, 2012) and Mangiavacchi and Piccoli (2018). This approach requires the identification of a vector of instruments $\mathbf{Z}_i$ that are correlated with the two different explanatory variables on sexual activity but uncorrelated with the error term in Eqs. (1) and (2). $\beta'_1$ can be obtained using a two stage least square estimation, where the first stages are defined as

$$A_i = \alpha + \boldsymbol{\gamma'}_1 \mathbf{X}_i + \boldsymbol{\gamma'}_2 \mathbf{Z}_i + v_i. \tag{3}$$

$$E_i = \alpha + \boldsymbol{\gamma'}_1 \mathbf{X}_i + \boldsymbol{\gamma'}_2 \mathbf{Z}_i + v_i. \tag{4}$$

2SLS produce consistent estimates of the effect of sexual activity on academic performance under the assumption that strong and exogenous instruments in vector $\mathbf{Z}_i$ are available.

The main equations, or second stages become:

$$S_i = \alpha + \beta_1 \hat{A}_i + \beta'_2 \mathbf{X}_i + \epsilon_i. \tag{5}$$

$$S_i = \alpha + \beta_1 \hat{E}_i + \beta'_2 \mathbf{X}_i + \epsilon_i. \tag{6}$$

where the independent variables on sexual activity are predicted from the first stages (3) to (6).

The instrument set chosen for the analysis is based on the idea that sexual activity is strongly influenced by the psychological attitude towards sexuality. In the psychological literature, Fisher et al. (1988) proposed a scale for a personality trait broadly used to assess sex-related emotions and attitude that fits particularly well with the objectives of this study, the erotophobic-erotophilic. Formally, it measure the disposition to respond to sexual cues along a negative-positive dimension of affect and evaluation, or the individual's variability to openness-closeness to sex and sexuality. Consequences of erotophobia-erotophilia involve avoidance versus approach responses to sexuality in a wide range of situations. According to this literature, such personality trait is a good predictor of sexual activity, including abstinence and having the first intercourse at an earlier age. At the same time, there are no reasons to think that erotophobia-erotophilia itself should be related to academic performances if not through the channels already explored in the literature, i.e. through a reduction in study time and concentration due to sexual activity.

Although in the questionnaire there is no explicit objective of measuring erotophobia-erotophilia, some questions can be used to approximate such personality trait. The available questions are as follows: (i) *having had sex without emotional involvement*, (ii) *having had sex with someone without being in relationship with and without using the condom*, and (iii) *having cheated the partner*. According to the psychological literature, all

of them correlate strongly with the erotophobia-erotophilia index and are thus used as a proxy for this index in the current study.

As detailed in "Results" section, these instruments are very strong predictors of all the measure of sexual activities. The *F* statistics for weak instruments ranges between 26 and 46, well above the Stock-Yogo weak ID test critical values 5% maximal IV relative bias. The test of instruments' validity, the Sargan-Hansen overidentification test, also performs well, allowing not to reject the null of joint validity of the instruments for all endogenous variables.

## Results

### Descriptive statistics

Since one of the aim of this study is to explore differences by gender and time, Table 1 lists some descriptive statistics for these sub-samples[7].

Concerning the final grade obtained at the end of the high school, descriptive statistics show that girls report higher grades compared with boys in both years (2000 and 2017). We observe that high school final grades slightly decreased in 17 years of around 1.5 point in mean, whereas almost no differences have been found in comparing grades at the end of the first cycle of secondary school (around age 13) between 2000 and 2017's cohorts of students.

Descriptive statistics on explanatory variables highlight a clear pattern of anticipation of the sexual debut between 2000 and 2017. The prevalence of students who had sex for the first time before age 15 increased of 7 percentage points in the full sample (6% in 2000 and 13% in 2017). Although this increase was mainly driven by girls, who reported a boost of about 8 percentage points, the percentage of boys reporting an early sexual debut is also significantly increased over time (+ 5 percentage points).

This pattern has also been confirmed by the relevant decrease in the prevalence of abstinence before age 19, which, in mean, declined from 45% in 2000 to 29% in 2017. Specifically, the proportion of girls who refrained from having sexual intercourse until the age of 19 decreased of about 18 percentage points whereas, among boys, the level of abstinence was reduced of about 14 percentage points in 17 years.

Concerning covariates, we note that the prevalence of divorced families significantly increased over time (from 3 to 11%) as well as the prevalence of parents with at least a high school diploma (46% of mothers and 49% of fathers in 2000 vs 67% and 62% in 2017), whereas those of unemployed mothers decreased from 45 to 34%. Moreover, whereas being involved in volunteering activities has been mostly reported by girls—with almost the same prevalence in both the periods (10 % *vs* 7%)—having done sport between 14 and 18 years old has been mostly reported by men with a gender gap of around 20 percentage points in either the survey periods.

The distribution of proxies used to measure psychological attitude towards sexuality have been also listed. More specifically, we note an increase of about 10 percentage points in the prevalence of students reporting having had sex without emotional involvement and of about 13 percentage points in reporting to have had unprotected sex without being in a relationship between 2000 and 2017. However, the prevalence of surveyed students

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[7]Since the variability across variables does not justify the choice to use sub samples, we conducted analyses on the full sample of students (*N* = 12,443). Descriptive statistics for the full sample are available in the Appendix (Table 5).

**Table 1** Descriptive statistics

| Variables | 2000 | | | 2017 | | |
|---|---|---|---|---|---|---|
| | **Full sample** | **Boys** | **Girls** | **Full sample** | **Boys** | **Girls** |
| | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| *Outcome variable* | | | | | | |
| High school final mark | 82.95 (12.21) | 79.65 (12.35) | 85.27 (11.56) | 81.42 (11.45) | 78.92 (11.23) | 84.16 (11.05) |
| *Explanatory variables* | | | | | | |
| Abstinence | 0.45 (0.49) | 0.41 (0.49) | 0.48 (0.49) | 0.29 (0.45) | 0.27 (0.44) | 0.30 (0.46) |
| Early age at 1st sex | 0.06 (0.24) | 0.08 (0.28) | 0.05 (0.21) | 0.13 (0.34) | 0.13 (0.34) | 0.13 (0.34) |
| *Covariates* | | | | | | |
| Mark before secondary school | 8.24 (1.17) | 8.04 (1.18) | 8.39 (1.14) | 8.29 (1.10) | 8.13 (1.10) | 8.46 (1.07) |
| He/she was doing volunteering | 0.10 (0.30) | 0.07 (0.27) | 0.11 (0.32) | 0.09 (0.28) | 0.07 (0.26) | 0.10 (0.30) |
| He/she was doing sport | 0.68 (0.46) | 0.80 (0.39) | 0.59 (0.49) | 0.78 (0.42) | 0.84 (0.36) | 0.66 (0.47) |
| Mother has at least high school degree | 0.46 (0.49) | 0.53 (0.49) | 0.41 (0.49) | 0.67 (0.46) | 0.70 (0.44) | 0.61 (0.48) |
| Father has at least high school degree | 0.49 (0.49) | 0.56 (0.49) | 0.44 (0.49) | 0.62 (0.48) | 0.67 (0.49) | 0.57 (0.49) |
| Father unemployed | 0.06 (0.25) | 0.06 (0.25) | 0.06 (0.25) | 0.05 (0.23) | 0.05 (0.23) | 0.05 (0.23) |
| Mother unemployed | 0.45 (0.49) | 0.42 (0.49) | 0.47 (0.49) | 0.34 (0.47) | 0.32 (0.46) | 0.35 (0.47) |
| Parents worked as a white collar | 0.56 (0.49) | 0.64 (0.47) | 0.56 (0.49) | 0.59 (0.49) | 0.62 (0.48) | 0.55 (0.49) |
| Divorce | 0.03 (0.19) | 0.04 (0.20) | 0.03 (0.18) | 0.11 (0.32) | 0.12 (0.32) | 0.10 (0.31) |
| Born in the South of Italy | 0.34 (0.47) | 0.31 (0.46) | 0.36 (0.48) | 0.44 (0.49) | 0.42 (0.49) | 0.46 (0.49) |
| Living in a district (more 50000 habitans) | 0.36 (0.48) | 0.41 (0.49) | 0.32 (0.47) | 0.39 (0.48) | 0.43 (0.49) | 0.34 (0.47) |
| *Instrumental variables (IV)* | | | | | | |
| Had sex without emotional involvement | 0.28 (0.65) | 0.49 (0.50) | 0.12 (0.33) | 0.39 (0.48) | 0.52 (0.49) | 0.24 (0.43) |
| Having cheated the partner | 0.18 (0.38) | 0.27 (0.44) | 0.11 (0.31) | 0.18 (0.38) | 0.24 (0.42) | 0.11 (0.32) |
| Had sex without being in relationship and without using the condom | 0.21 (0.41) | 0.27 (0.44) | 0.17 (0.38) | 0.34 (0.47) | 0.38 (0.48) | 0.29 (0.45) |
| *Observations* | 4,716 | 1,948 | 2,768 | 7,727 | 4,048 | 3,679 |

reporting to have ever cheated the partner was the same in the two observed period (about 18%), although mostly reported by boys.

### OLS and IV estimates

OLS estimates of models (1) and (2) presented in Tables 2 and 3 indicate that sexual activity before age 19 significantly predicts final mark of high school. More specifically, results show that not having had sex before age 19 increased high school final examination score by 1.41 points for the first cohort of students ($\beta$ = 0.120; *p* value < 0.001)[8].

However, although men tend to report lower high school final scores ($\beta$ = − 0.346; *p* value < 0.001), this effect is significantly stronger on men. Indeed, the interaction term indicates that men who were abstinent form having sex until age of 19 increased their final examination score of about 2.90 points (interaction $\beta$ = 0.126; *p* value < 0.001; 0.120+ 0.126 = 0.246).

We also found that being surveyed in 2017 increased, in mean, the final score of about 1 point but refrained from having sex before age 19 for those enrolled in the study in 2017 increased the final mark only of about 0.68 points (interaction $\beta$ = − 0.062; *p* value < 0.1; − 0.062+0.120 = 0.058).

With regard to the second measure of sexual activity, although the results do not show a statistically significant effect of having had a sexual debut by the age of 15 on the final grade in general, it has a significant impact for boys. Indeed, early sexual debut for boys decreased, on average, the high school score by about 1.86 points (interaction $\beta$ = − 0.131; *p* value < 0.01; − 0.131+ (− 0.027) = − 0.158). The effect of early sexual debut on school grade does not differ for the two cohorts of students.

Concerning the association between final score and possible confounders, we found that—as expected—the final grade obtained at the end of the first cycle of secondary school is positively associated with diploma's final grade. We also found that being strongly involved in sportive activities was negatively associated with education attainment as well as parents' divorce[9]. In addition, we found that having both parents employed as white collars during high school period was negatively associated with the high school final mark. More specifically, being the child of white collars employed parents decreased by about 0.09 standard deviations of the final grade obtained at the end of the high school.

Finally, being born in the South of Italy and having a mother who was unemployed during the high school period were positively associated with standardized final grade. The positive effect of being born in the South of Italy is probably due to a selection effect into University enrolment since better students from those attending vocational high school and those living in the South enrol at University.

Overall, these results are in line with those provided by Sabia and Rees (2012, 2011), suggesting that sexual activity in young ages may play an important role for young's educational attainment and thus on human capital accumulation. Explanations of the educational disadvantage due to sexual activity mainly arise from prior works that mostly

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[8]The estimated effects of explanatory variables have been reported in tables expressed in terms of $\beta$ coefficients and standard errors. However, since the dependent variable is standardized, marginal effects of each independent variable have been calculated by multiplying the coefficient by the standard deviation of the outcome variable ($\beta * \sigma_y$).
[9]See Pasqualini et al. (2018) for a comprehensive evaluation of the impact of family structure on adolescent risky behaviours.

**Table 2** Sexual abstinence and mark at high school—all students

|  | OLS | |
| --- | --- | --- |
|  | Coef. | SE |
| Sexual abstinence | 0.120*** | (0.030) |
| Gender: man (ref. woman) | − 0.346*** | (0.021) |
| Survey: 2017 (ref. 2000) | 0.073*** | (0.022) |
| No sexual relations before 19 years old * man (interaction) | 0.126*** | (0.034) |
| No sexual relations before 19 years old * 2017 (interaction) | − 0.062* | (0.035) |
| Mark of low-secondary school | 0.313*** | (0.007) |
| He/she was doing volunteering often when she/he was 14–18 | 0.026 | (0.028) |
| He/she was doing sport often when she/he was 14–18 | − 0.102*** | (0.019) |
| Mother has at least high school degree | 0.001 | (0.020) |
| Father has at least high school degree | − 0.030 | (0.020) |
| Mother and father were white collar during high school period | − 0.091*** | (0.019) |
| Father unemployed during high school period | − 0.003 | (0.035) |
| Mother unemployed during high school period | 0.038** | (0.018) |
| Divorce | − 0.046 | (0.029) |
| Born in the South of Italy | 0.108*** | (0.017) |
| Living in a district with more than 50,000 habitans (school time) | − 0.045*** | (0.017) |
| Observations | 12,443 | |

Significance levels as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

attributed this effect on psychological well being (Rector et al. 2003) and on depression symptoms (Hallfors et al. 2005). However, these studies suggested a stronger effect on educational attainment for females arguing that girls are expected to be more susceptible to stress resulting from the transition to sexual maturity (Hallfors et al. 2005; Sabia and Rees 2012) and that males are less likely to suffer adverse psychological consequences from engaging in sexual intercourse at an early ages (Sabia and Rees 2011). In addition, prior evidence suggested that the transition to become sexually active is

**Table 3** Early age at first intercourse and mark at high school—all students

|  | OLS | |
| --- | --- | --- |
|  | Coef. | SE |
| Early age at first intercourse | − 0.027 | (0.060) |
| Gender: man (ref. woman) | − 0.288*** | (0.018) |
| Survey: 2017 (ref. 2000) | 0.035* | (0.018) |
| Early age at first intercourse * man (interaction) | − 0.131** | (0.052) |
| Early age at first intercourse * 2017 (interaction) | 0.001 | (0.061) |
| Mark of low-secondary school | 0.314*** | (0.007) |
| He/she was doing volunteering often when she/he was 14–18 | 0.028 | (0.028) |
| He/she was doing sport often when she/he was 14–18 | − 0.120*** | (0.019) |
| Mother has at least high school degree | 0.000 | (0.020) |
| Father has at least high school degree | − 0.032 | (0.020) |
| Mother and father were white collar during high school period | − 0.095*** | (0.019) |
| Father unemployed during high school period | 0.005 | (0.035) |
| Mother unemployed during high school period | 0.043** | (0.018) |
| Divorce | − 0.051* | (0.029) |
| Born in the South of Italy | 0.107*** | (0.017) |
| Living in a district with more than 50000 habitans (school time) | − 0.048*** | (0.017) |
| Observations | 12,443 | |

Significance levels as follows: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

more detrimental for females' academic career since their share of the cost due to—for example—unintended pregnancies is much higher than that one paid by their male partners (Sabia and Rees 2008; 2011).

Interestingly, our findings show opposite evidence by suggesting a shift in the paradigm which affirmed that transition to sexual maturity would be more stressful for females.

Ordinary least square estimates presented above suggested a negative effect of sexual activity on the high school final examination grade. Even if the information on individual characteristics and family background available in the SELFY survey are rich and we can control for a number of important variables, estimates may suffer of endogeneity due to individual or family level characteristics that are difficult to measure. Moreover, the explanatory variables used in models (1) and (2) may suffer from measurement error due to self-reporting of sexual activity. In order to address those potential sources of endogenity, we apply an instrumental variables approach similar to that proposed by Sabia and Rees (2008, 2011, 2012).

Table 4 provides evidence regarding the relevance of the instruments (first stage) and IV estimations for the coefficient of variables related to sexual activity (second stage).

Having had sex without emotional involvement is positively related to early age at first intercourse, while is negatively related to abstinence before age 19. Reporting to have cheated the partner is also positively related with early age at first intercourse, while it is negatively related with abstinence. Finally, having had sex with someone without being in a relationship with and without using condoms is a good predictor for abstinence and early age at first sex. Rows (7) and (8) of the Table 4 list the weak instrument (*F* statistic) and the overidentification (Hansen *J* statistic) tests. The large *F* statistic, ranging between 25.60 and 45.95, largely meets the relevance standards proposed by Bound et al. (1995) and Staiger and Stock (1994), suggesting that the instruments are jointly significant predictors of sexual activity variables. The second stage estimates are consistent with OLS results, showing a statistically significant association both with sexual abstinence and early sexual intercourse.

**Table 4** Sexual activity and mark at high school—all students

| | IV | |
|---|---|---|
| | Sexual abstinence | Early age at first intercourse |
| | **Second stage** | |
| IV coeff | 1.966*** | − 1.388*** |
| IV SE | (0.449) | (0.310) |
| | **First stage** | |
| Having had sex without emotional involvement | − 0.083*** | 0.115*** |
| | (0.016) | (0.020) |
| Having cheated the partner | − 0.047*** | 0.082*** |
| | (0.018) | (0.026) |
| Having had sex with someone without being | | |
| in relationship with and without using the condom | − 0.052*** | 0.042** |
| | (0.016) | (0.019) |
| | **Tests** | |
| *F* test of excluded instruments | 25.60 | 45.95 |
| Hansen *J* statistic | 1.95 (*p*>0.1) | 4.73 (*p*>0.1) |
| Observations | 12,443 | 12,443 |

Significance levels as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Finally, in order to test possible mechanisms explaining the association between sexual activity and educational performance, we replicated main analyses by introducing three interaction terms that specifically look at the moderating effect of mark at low-secondary school and leisure activities (volunteering and sport). Results, listed in the Appendix (Tables 6, 7 and 8), show that having had sexual experience at early age may interfere with the human capital accumulation process during the teen period. The interaction between low secondary school mark and early sexual debut is indeed negative and statistically significant, suggesting that students with relatively better grades may suffer the greatest consequences of an early sexual activity. Meanwhile, results did not provide any statistically significant evidence with regard to the moderating effect of leisure activities.

## Discussion and conclusions

Prior studies exploring consequences of adolescents' sexual involvement on education and on labour market outcomes mainly argued that early romantic engagements are time consuming and can impose substantial emotional costs on youths, especially if females. According to existing studies, sexually active adolescents are significantly less likely to invest in their own education (Ohannessian and Crockett 1993) and to graduate (Sabia and Rees 2008; 2012) not just because their involvement into more immediately rewarding activities may take time away from academic pursuits (Ohannessian and Crockett 1993), but also because of psychological distress due to inadequate emotional maturity (Rector et al. 2003; Hallfors et al. 2005; Joyner and Udry 2000) and to unintended health consequences that likely lead them to school dropout (Sabia and Rees 2008; 2012). This is the first attempt to look at the effect of early sexual debut on academic performance among Italians by analysing data from the two cohorts of university students (2000 and 2017) interviewed by the SELFY survey.

Overall, our results are in line with those provided by Sabia and Rees (2012, 2011), suggesting that sexual activity in young ages may play an important role in the adolescents' academic performance and, thus, on their investment in education as well as on assessing their long run formation of human capital. However, although studies conducted on US adolescents have showed that early sexual debut and abstinence from having sex were powerful determinants of educational success for girls but not for boys, our estimates show that retaining from having sex until age of 19 and higher ages at first sexual intercourse were stronger predictors of successful human capital development for boys.

Finally, this paper checked the robustness of findings by implementing an instrumental variable approach that used proxies of psychological attitudes toward sex, to deal with the potential influence of unobserved characteristics at individual and family level. IV findings vastly confirmed the main results.

We further explore potential moderating effects of sexual activity on education due to individuals' characteristics, such as their prior educational performance and timing spent in leisure activities. Our results elucidated that sexual experience at early age may interfere with the human capital accumulation process during the teen period as the interaction between low secondary school mark and early sexual debut was negative and statistically significant. This interesting finding suggests that students with relatively better grades may suffer the greatest consequences of an earl sexual activity. Further studies should deeply explore it.

Some specific limitations have to be acknowledged. By study design, the sample is selected and so data are not representative of the entire Italian youth population. Moreover, since respondents were enrolled at university when interviews were made and no information on university marks were available, educational performance has been defined only on the base of high school final mark. The findings of this study must be interpreted cautiously bearing in mind that our sample does not include less educated respondents that are usually more likely to experience different and more at risk patterns of sexual behaviours during their adolescence. However, as suggested by Caltabiano (2005), "results refer to a particular subgroup of the population, but the direction of the selection is well-known, if these characteristics are kept in mind". This implies that our results could be considered as a conservative estimate of the effects of being sexually active during adolescence on academic performance for representative samples of late adolescents in Italy.

Exploring potential consequences of early sexual activity of adolescents on educational performance might help educators and health-care providers in better identify specific strategies aiming at dealing with psychological distress and depression among sexually active adolescents as well as of reducing drop-outs from school due to undesired health consequences of becoming sexually active. Further research should deeply investigate possible long-term consequences of this recognized disparity in educational performances by exploring—whether is possible—specific patterns of explanations.

## Appendix

**Table 5** Descriptive statistics

| Variables | Mean (St. dev) | Min–max |
| --- | --- | --- |
| Outcome variable | | |
| High school final mark | 82.00 (11.77) | 60–100 |
| Explanatory variables | | |
| Sexual abstinence | 0.35 (0.47) | 0–1 |
| Early age at first intercourse | 0.10 (0.31) | 0–1 |
| Covariates | | |
| Mark before secondary school (terza media) | 8.27 (1.12) | 6–10 |
| He/she was doing volunteering often when she/he was 14–18 | 0.09 (0.29) | 0–1 |
| He/she was doing sport often when she/he was 14–18 | 0.73 (0.44) | 0–1 |
| Mother has at least high school degree | 0.59 (0.49) | 0–1 |
| Father has at least high school degree | 0.57 (0.49) | 0–1 |
| Father unemployed during high school period | 0.06 (0.23) | 0–1 |
| Mother unemployed during high school period | 0.38 (0.48) | 0–1 |
| Parents worked as a white collar during high school period | 0.59 (0.49) | 0–1 |
| Divorce | 0.08 (0.28) | 0–1 |
| Born in the South of Italy | 0.40 (0.49) | 0–1 |
| Living in a district with more than 50000 habitans (school time) | 0.38 (0.48) | 0–1 |
| Instrumental variables (IV) | | |
| Having had sex without emotional involvement | 0.36 (0.48) | 0–1 |
| Having had sex with someone | | |
| without being in relationship with and without using the condom | 0.30 (0.45) | 0–1 |
| Having cheated the partner | 0.18 (0.38) | 0–1 |

Source: SELFY (2000 and 2017)
*N* = 12,443

**Table 6** Sexual abstinence and mark at high school: heterogeneity of respondent's characteristics—all students

|  | OLS | | | |
|---|---|---|---|---|
|  | Coef. | SE | Coef. | SE |
| Sexual abstinence | 0.036 | (0.126) | 0.171*** | (0.032) |
| Gender: man (ref. (woman) | − 0.303*** | (0.017) | − 0.303*** | (0.017) |
| Survey: 2017 (ref. 2000) | 0.051*** | (0.018) | 0.051*** | (0.018) |
| Mark low-secondary school | 0.309*** | (0.009) | 0.313*** | (0.007) |
| He/she was doing volunteering often when she/he was 14–18 | 0.026 | (0.028) | 0.026 | (0.034) |
| He/she was doing sport often when she/he was 14–18 | − 0.102*** | (0.019) | − 0.085*** | (0.025) |
| Sexual abstinence * Mark low-secondary school (interaction) | 0.013 | (0.015) | | |
| Sexual abstinence * He/she was doing volunteering often when she/he was 14–18 (interaction) | | | 0.001 | (0.057) |
| Sexual abstinence * He/she was doing sport often when she/he was 14–18 (interaction) | | | − 0.041 | (0.037) |
| Observations | 12,443 | | 12,443 | |

Significance levels as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

**Table 7** Early age at first intercourse and mark at high school: heterogeneity of respondent's characteristics—all students

|  | OLS | | | |
|---|---|---|---|---|
|  | Coef. | SE | Coef. | SE |
| Early age at first intercourse | 0.282 | (0.190) | − 0.149** | (0.058) |
| Gender: man (ref. (woman) | − 0.304*** | (0.017) | − 0.303*** | (0.017) |
| Survey: 2017 (ref. 2000) | 0.038** | (0.018) | 0.038** | (0.018) |
| Mark low-secondary school | 0.320*** | (0.008) | 0.315*** | (0.007) |
| He/she was doing volunteering often when she/he was 14–18 | 0.028 | (0.028) | 0.034 | (0.029) |
| He/she was doing sport often when she/he was 14–18 | − 0.119*** | (0.019) | − 0.126*** | (0.020) |
| Early age at first intercourse* Mark low-secondary school (interaction) | − 0.046** | (0.023) | | |
| Early age at first intercourse* He/she was doing volunteering often when she/he was 14–18 (interaction) | | | − 0.052 | (0.086) |
| Early age at first intercourse * He/she was doing sport often when she/he was 14–18 (interaction) | | | 0.074 | (0.065) |
| Observations | 12,443 | | 12,443 | |

Significance levels as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

**Table 8** Sexual activity and mark at high school—all students

| | IV—sexual abstinence | | IV—early age at first intercourse | |
|---|---|---|---|---|
| | M1 | M2 | M1 | M2 |
| **Second stage** | | | | |
| IV coeff | − 3.083* | 2.011*** | 0.699 | − 1.195*** |
| IV SE | (1.774) | (0.500) | (0.920) | (0.266) |
| **First stage** | | | | |
| Having had sex without | | | | |
| emotional involvement | − 0.083*** | − 0.083*** | 0.115*** | 0.115*** |
| | (0.016) | (0.016) | (0.020) | (0.020) |
| Having cheated the partner | − 0.047*** | − 0.047*** | 0.082*** | 0.082*** |
| | (0.018) | (0.018) | (0.026) | (0.026) |
| Having had sex with someone without being in relationship with and without using the condom | − 0.052*** | − 0.052*** | 0.042** | 0.042** |
| | (0.016) | (0.016) | (0.019) | (0.019) |
| **Tests** | | | | |
| *F* test of excluded instruments: | 37.65 | 25.88 | 67.99 | 45.58 |
| Hansen *J* statistic: | 2.33 ($p>0.1$) | 7.59 ($p>0.1$) | 11.33 ($p<0.05$) | 8.44 ($p>0.1$) |
| Observations | 12,443 | 12,443 | 12,443 | 12,443 |

Significance levels as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. M1: interaction with mark at low-secondary school; M2: interaction with leisure activities

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## Publisher's Note