Investment in Education, Obesity and Health Behaviours

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Investment in Education, Obesity and Health Behaviours

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Abstract

This study reports new evidence on the association between educational outcomes for young adults in Italy (in terms of both schooling levels and type of education) and selected health behaviours (simultaneously taken). The results indicate the following: i) individuals who decide to stay at school longer also do things that improve their own health, such as not smoking, practicing physical activity, maintaining a normal body weight and low consumption of unhealthy food (snacks, cakes, etc.), thereby confirming complementarities between investment in education and health (Fuchs, 2004, Becker 2007); and ii) particularly for females, a positive association is observed between the choice of Sciences vs. Humanities, a normal body weight and the adoption of healthy behaviours (not smoking, practising physical activity, and consuming healthy food).

Keywords
Human capital; Education; Health Behaviour; Gender; Microeconometrics

JEL
J24; I21; I12; J16; C25
**Background**

According to economists, individuals rationally invest in human capital through education, training and health behaviours. While Schultz (1962) and Becker (1964) considered education, on-the-job training and health as types of human capital investments, Grossman modelled optimal investment in health to increase longevity (Grossman, 1972) and to distinguish between returns on investment in knowledge from returns on investment in health (Grossman, 2006). This difference arises because “investments in knowledge raise wage rates, while investments in health raise the total amount of time available for market and household production in a given year and prolong length of life” (Grossman, 2016, p.4). According to Grossman (2000), the observed positive correlation between health and schooling may be explained in one of three ways. First, increases in schooling may cause increases in health by improving allocative and productive efficiency. Second, better health may cause more schooling. Third, factors such as physical and mental ability and parental characteristics may influence both health and schooling in the same direction.

Through the years the literature has mainly focused on the first mechanism, even if in recent years reverse causality and the third factors have gained attention. As third factors influencing both health and schooling, Grossman (2000) noted physical and mental ability and parental characteristics, but addressed (2000, p.397) that the time preference hypothesis, first proposed by Fuchs in 1982, presents one challenge to the conclusion that the role of schooling is causal. In a recent paper, Grossman (2015) emphasizes that “many studies suggest that years of formal schooling completed is the most important correlate of good health. There is much less consensus as to whether this correlation reflects causality from more schooling to better health. The relationship may be traced in part to reverse causality and may also reflect omitted third variable that cause health and schooling to vary in the same direction”, concluding that it is necessary “to warrant more research on whether more schooling does in fact cause better health outcomes”.

Additionally, several empirical works (a review is in Suhrcke and de Paz Nieves, 2011) have focused on unhealthy behaviours (e.g., drinking, smoking, drug use, overeating) rather than on health since unhealthy lifestyles could affect education indirectly through the negative effects on health, such as producing sleep disorders, asthma, or by lowering physical energy, self-esteem, etc.). Furthermore, third factors, such as low preference for future, family background, and others, could affect both healthy behaviours and education. In their review of the evidence concerning the reverse causality mechanism from health (and healthy behaviours) on educational outcomes among children and adolescents in high-income countries, Suhrcke and de Paz Nieves (2011) conclude that:

a) most of the research is based in the United States (perhaps because more appropriate data are available);

b) there is a definite, negative association only between smoking and education and a positive association between physical exercise and academic performance, whereas the negative effect of drinking alcohol on educational outcomes is less definite; obesity and overweight are associated negatively with educational outcomes.

In the review by Suhrcke and de Paz Nieves (2011), the research, on the one hand, focuses mainly on the pairwise association between each health behaviour and educational outcome, while on the other hand it considers educational outcomes only in terms of short-term outcomes (i.e., scores)

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1. Recently, Galama and van Kippersluis (2015) presented a unified theory of human capital with both health capital and skill capital endogenously determined within the model.
2. In recent years, physical exercise and eating in particular have attracted growing interest because sedentary lifestyles and overeating/obesity are now quite widespread in our societies (Cawley, 2015).
3. Recently, evidence has been found for positive effects of additional sports activities on academic achievements (Lechner, 2016).
and long-term ones (i.e., schooling levels). In this way, some weaknesses could arise because smoking, drinking, physical exercise, eating etc. may be simultaneously determined by third factors on the one hand, and because the type of education is not accounted at all in educational attainment on the other hand. The last issue, however, is important in that investments in scientific studies increase individual probabilities of employment and earnings (Machin and Puhani, 2003; Buonanno and Pozzoli, 2009; Maestri, 2013; Eide and Showalter, 2016), whereas in the last decade a decreasing trend in enrolment in scientific programmes in most OECD countries has been observed; in addition, women continue to be reluctant to study math and science, as they were in the past (Schneeweis and Zweimuller, 2012), thereby raising the gender-gap perspective in the labour market. Fuchs (2004) emphasizes the role that the type of education – apart from the level of schooling achieved – could play in the education-health link; he observes that causality running from education to health could be problematic considering the analogy between the contribution of additional years of education to improved health and its contribution to increased earnings: "With respect to earnings, we know that college graduates who majored in science or engineering earn much more than humanities majors. [...] Are college graduates who majored in biology healthier than French literature majors? [...] Does the content of schooling matter at all? If not, what is it that schooling does to improve health?" (Fuchs, 2004, p. 656). This paper contributes to the debate on the relevance of the health-education link in many aspects. First, it provides new evidence for Italy and simultaneously considers the health behaviours (i.e., about drinking, smoking, physical exercise, eating) addressed in literature as the main correlates of education (Suhrcke and de Paz Nieves, 2011; Saint Onge and Krueger, 2017). Second, investment in education is viewed not only as the probability of attending university but also as the choice of the field of study (i.e., the choice between the Humanities and Science). More specifically, in line with the question raised by Fuchs (2004), and taking into account the role that the content of education could play in the relationship with education, we investigate whether students enrolled in scientific majors are "healthier" than those enrolled in humanities majors. Moreover, we investigate this in a gender perspective. The empirical analysis relies on two datasets: i) the microdata drawn from the Istat 2012 survey "Aspects of daily life", reporting individual levels of education and health behaviours; ii) survey data collected at the University of Salerno in the South of Italy) in 2013 and 2014, reporting the choice of the field of study, in addition to the selected health behaviours.

The remainder of this paper is organized as follows. Section 1 reviews previous main contributions in literature. Section 2 describes the data and the empirical model. Section 3 contains the results. Concluding remarks are reported in section 4.

1. Previous Studies on Selected Health Behaviours and Educational Outcomes

1.1 Empirical Studies

This section briefly reports the main results of previous studies focusing on the correlation between health behaviours and educational outcomes.

Drinking

The empirical evidence about the effect of alcohol drinking on educational attainment offers mixed results. Several studies (Dee and Evans, 1997; Koch and Ribar, 2001) suggest that the effect of

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4 Academic performance(GPA or grades, grade repetition, truancy) is the shorter term educational indicator, while educational attainment(level or years of education achieved, dropping out, college enrolment) is the longer term indicator(Suhrcke and de Paz Nieves, 2011).
alcohol is small and sensitive to the model specification, while others find that a significant effect. Yamada et al. (1996) show that increases in the incidence of frequent drinking, liquor and wine consumption (and frequent marijuana use) significantly reduce the probability of high school graduation. Chatterji and De Simone (2005) find that binge or frequent drinking among 15-to 16-year-old students lowers the probability of graduating or being enrolled in high school four years later by at least 11 percent. Carrell et al. (2011) report that drinking negatively affects academic performance, particularly for the highest performing students. De Simone and Wolaver (2005) emphasize that drinking not involving binge drinking has no detrimental impact on academic performance of high school students. Finally, Balsa et al.(2011) find some interesting gender differences in that only for males does alcohol consumption have a small negative effect on GPA (whereas for females, alcohol use only significantly increases the probability of encountering difficulties in school).

Smoking
The evidence on the association between smoking and education shows a negative correlation between them. In the US, Cook and Hutchinson (2006) find that smoking in grade 11 is a powerful predictor of dropping out of high school and college, while Ding et al.(2006) report that adolescent smokers have lower GPAs. In Oregon and California, Ellickson, Tucker and Klein(2001) find that early smokers, compared with non-smokers, face a greater risk of low academic achievement. Finally, according to Collins (2007), teen smoking is a significant predictor of academic performance in the U.K.

Physical exercise
In their review of the research concerning the impact of physical activity on educational outcomes, Taras and Potts-Datema (2005) report evidence of short-term improvement in academic achievement but the evidence in the long term is less clear. From a gender perspective, Carlson et al. (2008), using US panel national data, observe a small but significant benefit in mathematics and reading only for girls; Rees and Sabia(2010) provide only limited evidence that sports participation leads to enhanced academic performance. Recently, Lechner (2016) reports significant evidence for positive effects of additional sports activities on academic achievements of children and young adults (Barron, Ewing and Waddell, 2000; Eide and Ronan, 2001;Trudeau and Sheperd, 2005; Pfeifer and Cornelissen, 2010; Stevenson, 2010). Knaus, Lechner and Reimers (2016) use German data on school children to show that more sports is beneficial for cognitive skills (as measured by grades in math and German, for example), but that there are gender differences about some non-cognitive skills (e.g., girls improve peer relations while boys experience an increase in behaviour and peer problems.

Eating/Overeating
Let's consider previous works focusing on the impact of obesity on schooling and human capital (Truong and Sturm, 2011). Some studies in the US conclude that overweight and obese children aged 5-12 (Kaestner and Grossman, 2008, 2009) and teens (Kaestner, Grossman and Yarnoff 2009, 2011) have levels of attainment that are approximately the same as those who have an average weight. Other studies report instead that the relationship between obesity and educational achievement is negative (Taras and Potts-Datema, 2005) and that gender differences exist. In line with the results reported by Datar, Sturm, and Magnabosco (2004), the negative association between body weight and educational attainment is stronger for boys than for girls (Cawley and Spiess, 2008) in children ages 2-3; in older children (Wendt and Kinsey, 2009), adolescents and young adults (Sabia, 2007; Crosnoe, 2007), the association is stronger for young women than for young men. Following Sabia's work (2007), other studies have discovered a significant negative relationship between weight and education (Barone and O'Higgins, 2010, in terms of higher early school leaving; von Hippel and Lynch, 2014; Lu, Chou, and Lin, 2014).Using survey data from
second-year university students in Salerno, Barone and Nese (2014, 2016) identify a significant negative relationship between body weight and academic performance, particularly for female students, with overweight/obese females less likely than those of average weight to pursue scientific studies.

1.2 Main Insights in the Literature and Our Aim

The main issues emerging in the literature can be summarized as follows.

i) Complementarities among healthy/unhealthy behaviours

According to Fuchs (1982), an analysis of the health-education link could consider the role of time preferences. In this respect, Becker and Mulligan (1997) show that the incentive to invest in raising discount rates is positively related to the magnitude of expected future utilities so that richer persons tend to discount the future less. Becker (2007), following Becker and Mulligan (1997), models complementarities between health and schooling so that more educated persons discount the future less (because education raises wealth) and resources spent earlier - perhaps in childhood - such as time, money and energy on what he calls "imagination capital" help to reduce how much future utilities are discounted in decision-making; thus, persons who are also healthier both invest more in education and in lowering their discount rates on future utility. As a result, as suggested by Fuchs (2004), individuals with lower rates of time discount are more likely to stay in school longer and do the things that contribute to better health. These individuals, for example, do not drink (or drink moderately), do not smoke (or smoke moderately), exercise, eat moderately (and look at the quality of foods), and behave looking at the future (i.e., controlling weight, eating fruits and vegetables instead of cakes, eating home food instead of snacks). Hence, in the health-education link it could be fruitful to examine different health behaviours simultaneously. Among them, in recent years two health behaviours in particular (physical exercise and eating) have become of great interest for policymakers because sedentary lifestyles and overeating/obesity are now quite widespread in our societies with many attempts having been made to counteract them (Cawley, 2015).

ii) Gender differences in educational outcomes

Some differences between genders have been observed in the educational outcomes; Castillo et al. (2011) find that boys are more impatient than girls; Angrist and Lavy (2009) find that an incentive programme in Israel that paid students based on their performance on university entrance exams had a greater effect on girls; Angrist et al. (2009) find that girls were more responsive in a study of the effect of financial incentives on college achievement. Recently, Sabia and Rees (2015), taking into account the role played by psychological factors, find that body weight leads to decreased self-esteem among female but not among male students: hence, they argue that during late adolescence physicality plays different roles in academic achievement according to gender.

iii) Gender differences in the choice of field of study

The type of education is not considered at all in the notion of educational attainment, thus neglecting what has happened during the last 20 years: a decreasing trend in enrolment in scientific programmes in most OECD countries (OECD, 2012), notwithstanding the fact that investment in scientific studies is important to increase individual probabilities of employment and earnings (Machin and Puhani, 2003; Buonanno and Pozzoli, 2009; Maestri, 2013; Eide and

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5Several authors emphasize instead the role of the individual locus of control in determining healthy behaviours (Wallston and Wallston, 1978; Gale et al., 2008; Natareth et al., 2016); more specifically, external locus of control is associated with negative health outcomes, whereas internal locus of control is associated with favorable outcomes.
Showalter, 2016). In addition, women continue to be reluctant to study math and science (Schneeweis and Zweimuller, 2012), raising the gender-gap perspective in the labour market.

In the empirical literature, some weaknesses emerge. In particular, omitted variable bias, reverse causality and measurement errors represent the main difficulties in identifying a causal effect of health (or health behaviours) on education but, unfortunately, the availability of adequate data limits the possibility of addressing such problems.\(^6\) Hence, many of the works listed above rely on single equation regressions that focus on pair wise association between a single observed health behaviour and education, with the result that the coefficient estimated on the selected lifestyle could be biased. Moreover, previous works consider investment in education only in terms of years of education (and scores reported), thus neglecting the importance of the type of education chosen.

This paper contributes to the debate with respect to different aspects. In particular, it analyses the link between education, health conditions and several health behaviours (i.e., about drinking, smoking, physical exercise, eating, etc.) simultaneously for Italy. Furthermore, it considers education not only as years of schooling but also as the choice of the field of study at the age of 18 (i.e., the choice between the Humanities and Science). More specifically, in line with the question raised by Fuchs (2004), it investigates whether students enrolled in scientific majors are “healthier” than those enrolled in humanities majors due to differences in the rates of time discount, within gender and between genders.

2. Methods

Since the work of Sabia (2007) the most frequently used method in the literature investigating the relationship between body weight and education is the estimation of an OLS equation (or the estimation of a dichotomous choice model), where the dependent variable is a measure of educational attainment, while the correlates include the indicator of body weight. The main dependent variables are years of education achieved or the probability of dropping out.

This study focuses on the relationship between body weight, health behaviors and educational attainment in terms of the choice to go to college and in terms of the choice between humanities and sciences.

Thus, we firstly estimate a probit model in which the individual choice of undertaking university is analysed as follows:

\[
P_i^* = \beta_1 x_i + \beta_2 B_i + \beta_3 w_i + \eta_i
\]  

(1)

What we observe is \(P_i\), (such that \(P_i = 1\) if \(P_i^*>0\), 0 otherwise), which is a binary indicator equal to 1 if the individual is graduated or enrolled at university, 0 otherwise; \(\eta_i\) is the stochastic component.

The set of explanatory variables \((x)\) includes age, region of residence, any chronic disease, family background, and cultural interests. Family background, considered as a “third factor” influencing both education and lifestyles (Grossman, 2000), is represented by two variables: i) the degree of satisfaction with the family economic conditions, and ii) number of books in the house. Cultural interests are proxied by the number of visits in the previous year to museums, cinema, and the theatre. The variables capturing healthy behaviours \((w)\) include: the habit of weight control,

\(^6\) A growing number of works, however, adopt different econometric techniques (fixed effects estimates, instrumental variables, etc.) relying on panel data, observations on sibling pairs: a review is in Suhrcke and de Paz Nieves (2011). More lately, authors who provided evidence of causality in the link healthy behaviours- education are Balsa et al.(2011), Lechner (2016), Hippel and Lynch (2014), Lu, Chou, & Lin (2014) provided evidence of causality in the link healthy behaviors- education.
physical exercise, no smoking, no drinking alcohol, and the consumption of healthy foods. Finally, we control for body weight (B).

Second, this work investigates the relationship between health behaviours and educational attainment in terms of the choice of field of study. The latent probit model is:

$$H_i^* = \delta_1 z_i + \delta_2 BMI_i + \delta_3 y_i + v_i$$  \hspace{1cm} (2)

The observed variable is $H_i$ ($H_i = 1$ if $H_i^* > 0$, 0 otherwise), a binary indicator equal to 1 when the individual chooses the Humanities (vs. Sciences) and 0 otherwise; $z$ is a vector of explanatory variables (i.e., age, family background, chronic diseases, etc.) other than body mass index (BMI) and health behaviours $y$ (i.e., weight control, physical exercise, smoking and home food); $v_i$ is the stochastic component.

The set of explanatory variables includes the following variables: Parents’ schooling level, as a proxy of parental characteristics; Homework help, revealing the importance awarded by parents to educational achievement (this indicates whether and to what extent parents have helped respondents with homework); Tales, capturing parental interest in the child’s development that could have influenced the child’s future learning (this indicates whether respondents’ parents usually had read tales for them during their infancy). Finally, Attending courses, Upper secondary school’s score and Liceo are considered as proxies of individual ability and motivations to study (i.e., a liceo indicates a stronger orientation to tertiary education whereas a diploma for technicians and accountants is more skills-oriented).

2.1 The Data

The estimate of equation 1) is based on Istat microdata drawn from the 2012 survey “Aspects of daily life”. This is a large annual sample survey that focuses on the resident population in Italy. We selected a sub-sample of young adults aged 19-34 and, after removing the observations that lack the main variables, the final sample includes approximately 1,250 females and 1,150 males. The main statistics are reported in Table 1.

The analysis of the choice of field of studies (equation 2) is based on cross-section data collected at the University of Salerno at the beginning of the first-term academic courses in two different years: October–November 2013, and October–November 2014. The questionnaires were most frequently distributed before the lectures started in the classrooms in which second-year courses were taught. A distinct feature of our sample is that the recruited students were enrolled in different courses of study: sociology, arts, foreign languages, primary teacher education, computer science, management engineering, civil engineering, mechanical engineering, pharmacy and herbal sciences.

The questionnaire included 50 questions and addressed (1) individual demographic characteristics and family background, (2) past studies, (3) current studies and finally (4) health indicators (any illness; height and body weight) and healthy/unhealthy behaviours (weight control, consumption of snacks and cakes). The questionnaires were completed anonymously. Few students refused to complete the questionnaire (fewer than 20), and in total, 2,200 questionnaires were collected. After

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7 The Italian National Institute of Statistics.
8 In a few cases, we distributed the questionnaire during the lecture break.
9 Unfortunately, we have no information on the socio-demographic and physical characteristics of the students who did not attend. We tried to address this issue by recruiting students who attended main courses at the beginning of the second academic year (when the rate of attendance is still high). Typically, students who do not attend lectures are those who are less motivated, with a lack of positive academic results. Thus, one could argue that their exclusion from the sample might bias downwards the relationship between BMI and academic achievement. However, we are confident that the sample selection issue is not relevant to our aim because i) we primarily focus on gender differences and ii) the probability of withdrawing from the university (or of not attending lectures) should not be affected by gender differences (as confirmed in data collected from different courses of study).
excluding observations with ‘missing’ values for the explanatory variables\textsuperscript{10}, the final sample included approximately 2,000 students, most of whom (approximately 80\%) were second-year students. The sample used to estimate Equation 2 is described in Table 2.

3. Results and Discussion

3.1 Evidence on ISTAT Data: The Decision to Go to College

Equation 1 is estimated separately for women and for men, and the results are reported, respectively, in Table 3 and Table 4.

Since in Italy people complete tertiary education when they are 27 years old\textsuperscript{11} on average (Almalaurea, 2016), we first focus on a subsample of people aged 19-29 years; then - taking into account the fact that people do not become obese or change their habits suddenly, but that such changes take time to develop - we also select a larger sample that includes people aged 19-34 years.\textsuperscript{12}

The estimates in columns I and IV (both in Table 3 and Table 4) confirm that family cultural background and economic conditions, rather than individual cultural interests, motivate individual decisions to go to college; the presence of chronic diseases (affecting only 8\% of the sample) does not significantly matter.

Let us now consider the impact of body weight and unhealthy behaviours. Columns II and V report only the coefficients estimated for each variable when this is included in the baseline model (in columns I and IV, respectively): the comparison with the complete specification of the model in columns III and VI highlights the importance of any complementarities existing among the different health behaviours (including body weight) in evaluating the association between health and education.

With respect to the huge literature on obesity, the most interesting result in columns II and IV is the estimated coefficient on "body weight", negative and statistically significant at least at the 5\% level only for females.

However, taking into account the literature about the education-health link (i.e., Grossman, 2015), one must be cautious in interpreting such an estimate causally because of a likely endogeneity bias: the coefficient on body weight might be biased in cases of reverse causality (i.e., investment in education might affect being overweight) or if unmeasured characteristics influenced both body weight and academic performance. Individuals with lower rates of time discount, for example, are more likely to stay in school longer and do the things that contribute to better health (Fuchs, 2004; Becker, 2007). Unfortunately, in the absence of convincing instruments, we abandoned the possibility of testing for endogeneity.

However, we use several explanatory variables to reduce the risk that the coefficient on body weight could pick up the effect of some other variables influencing investment in education (even if these explanatory variables may be endogenous as well). In this regard, let us consider the correlation between the probability of going to college and individual lifestyles simultaneously taken in columns III and VI (smoking, unhealthy food, alcohol, and physical exercise). Interestingly, the

\textsuperscript{10} We have investigated the presence of sample selection bias by regression of the probability of no response on variables reported for the entire sample: gender, age, and the presence of the professor in class during questionnaire administration (e.g., at the beginning of the lesson or during the break). We did not find significant evidence of self-selection bias (the results available upon request).

\textsuperscript{11} In 2013, the lowest proportions of those aged 30 to 34 having completed tertiary education were observed in Italy (22.4\%); and one of highest proportions (17\%) of early leavers from education and training(17\%), defined as population aged 18-24 who had at most lower secondary education and were currently not in further education or training was observed in all EU member states (Eurostat, 2014).

\textsuperscript{12} Moreover, many people go on to postgraduate studies.
coefficient on "body weight" remains substantially unaffected for females, whereas the impact for males becomes even weaker.

Let us now consider the estimated coefficients on the selected health behaviours in columns III and VI: these\textsuperscript{13} indicate that individuals (both females and males) who invest more in education are also more likely to adopt healthy lifestyles in that they are more likely to not smoke, to practice physical exercise and to consume healthy food.

Overall, the coefficients on the selected lifestyles are slightly biased upwards when these are considered separately: among females, the inclusion of the other correlates weakens the impact of both smoking and physical exercise (in particular, the average marginal effect of physical exercise decreases from 0.021 in column II to 0.016 in column III); among males, the coefficient on alcohol, statistically significant in column II, does not matter in column III (the average marginal effect decreases from 0.025 to 0.013) whereas the marginal effect of smoking decreases from 0.052 to 0.043\textsuperscript{14}.

Evidently, individual lifestyles are complementary in describing individual attitudes to invest in health. In turn, investment in health is correlated with investment in education: consistent with the arguments above (in particular, Fuchs, 2004), our evidence confirms that individuals who stay in school longer also do things that contribute to better health. Moreover, an interesting gender difference emerges with respect to body weight, suggesting that, in line with Sabia and Rees (2015), physicality plays different roles according to gender during late adolescence.

3.2 Evidence from the University of Salerno: The Choice of Field of Study

The results for the sample of students in Salerno are reported in Table 5. As before, the results in columns IV and VIII refer to the full specification of the model, whereas in columns II and VII, body weight and the selected health behaviours are considered separately. For females, the results reveal a positive and statistically significant correlation between the choice of scientific studies, normal body weight and the adoption of healthy lifestyles (in terms of the practice of physical exercise, the consumption of healthy food and not smoking). However, the coefficient on body weight becomes weaker when physical exercise is simultaneously observed; analogously, from the results in columns III and IV, a slight correlation emerges between "smoking" and "healthy food".

Overall, assuming that scientific studies imply higher effort\textsuperscript{15} but more remunerative carriers (Machin and Puhani, 2003; Buonanno and Pozzoli, 2009; Maestri, 2013; Eide and Showalter, 2016), we could conclude that those who invest more in education also invest more in health.

In columns V and IX, controlling for ability and motivation to study, we find that the field of study is no longer significantly correlated with body weight, nor yet with smoking! In this regard one could argue that: i) obesity and the habit of smoking are mainly the result of past bad choices; ii) a low attitude to schooling has also determined low scores in the past scholastic career.

We report different results for males in that we observe a positive but weak relationship between body weight and the choice of humanities in this case; considering the variables capturing lifestyles, however, a strong correlation emerges with respect to the consumption of healthy food\textsuperscript{16}.

\textsuperscript{13} An inspection of the log-likelihood reveals that the inclusion of lifestyles simultaneously significantly increases the explanatory power of the model.

\textsuperscript{14} The average marginal effect (AME) of "Unhealthy food" decreases from 0.014 to 0.011, the AME of Physical exercise, from 0.020 to 0.017, the AME of BMI from 0.024 to 0.019.

\textsuperscript{15} Since higher risks of dropping out are observed (Buonanno and Pozzoli, 2009; Maestri, 2013).

\textsuperscript{16} In this regard, it is important to note that the sample of males is smaller than the sample of females and only the 19% of male students are enrolled in humanities: this could determine a lower variability among the observations of the different characteristics and health behaviours.
4. Conclusions

The literature on the health-education link has focused on i) complementarities among health behaviours and health, particularly in the US (Fuchs, 2004; Becker, 2007; Grossman 2015) and on ii) gender differences (Sabia and Rees, 2007).

This study contributes to this literature by reporting new evidence for young adults in Italy about the association between education, body weight and selected healthy behaviours (simultaneously taken). Our results indicate a positive association between the probability of going to college and doing the things that improve one’s health, such as not smoking, practicing physical activity, and maintaining a normal body weight; a novelty concerns the finding of a strong negative relationship between the consumption of unhealthy food (snacks, cakes, etc.) and the probability of going to college.

In line with the question raised by Fuchs (2004), emphasizing the role of the type of study in the education-health link, this work also focuses on the choice between Humanities and Sciences, taking into account that scientific disciplines imply higher returns in the labour market, even if at the cost of greater effort. We report, especially for females, a positive association between the choice of Sciences vs Humanities, a normal body weight and the adoption of healthy behaviours (e.g., not smoking, practising physical activity, consuming healthy food), thus confirming that those who invest more in education also invest more in health. The gender difference, observed with respect to the impact of body weight, confirms that during late adolescence physicality likely plays different roles in the academic achievement by gender.

An open problem concerns the identification of the causal effect of obesity and healthy behaviours on education, leading to concerns about the possible endogeneity problems. However, with the strong positive relation identified between healthy behaviours and education, we would hope that this paper might serve as a stimulus for further work in this direction, especially in European countries given the abundance of evidence that already exists for the US. Overall, the results from the literature exploring the likelihood that, at the individual level, investment in health would lead to better educational outcomes are such that health, education and family policies (Cunha et al., 2006) could be considered as having an important role to increase human capital and productivity.
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OECD (2012). University graduates by field of study, OECD Database.


### Tables Appendix

#### Panel a: Females

<table>
<thead>
<tr>
<th></th>
<th>age 19-34</th>
<th></th>
<th></th>
<th>age 19-29</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Mean (std)</td>
<td>Min.</td>
<td>Max.</td>
<td>Mean (std dev)</td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>18</td>
<td>8.03 (0.833)</td>
<td>7</td>
<td>9</td>
<td>7.478 (0.499)</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Body weight</td>
<td>2.114 (0.615)</td>
<td>1</td>
<td>4</td>
<td>2.067 (0.592)</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Family econ. problems</td>
<td>2.823 (0.779)</td>
<td>1</td>
<td>4</td>
<td>2.817 (0.787)</td>
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<td>4</td>
</tr>
<tr>
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<td>3.122 (1.064)</td>
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<td>Physical Exercise</td>
<td>1.596 (1.385)</td>
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<td>5</td>
<td>1.673 (1.377)</td>
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<tr>
<td>Smoking</td>
<td>0.552 (0.822)</td>
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<td>3</td>
<td>0.517 (0.816)</td>
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</tr>
<tr>
<td>Alcohol</td>
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<td>6</td>
<td>0.356 (0.671)</td>
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<tr>
<td>Cultural interests</td>
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<td>16</td>
<td>5.406 (2.186)</td>
<td>3</td>
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<tr>
<td>Unhealthy food</td>
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<td>16</td>
<td>4.372 (2.123)</td>
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<tr>
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#### Panel b: Males

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<tr>
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<th>age 19-29</th>
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<tr>
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<td>7.489 (0.500)</td>
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<td>2.307 (0.568)</td>
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<td>Family econ. problems</td>
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<tr>
<td>Books in family</td>
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<td>4.391 (1.919)</td>
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<td>Weight control</td>
<td>1.480 (1.079)</td>
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<td>5</td>
<td>1.553 (1.087)</td>
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<tr>
<td>Physical Exercise</td>
<td>1.886 (1.352)</td>
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<td>5</td>
<td>2.007 (1.317)</td>
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<tr>
<td>Smoking</td>
<td>0.887 (0.922)</td>
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<td>3</td>
<td>0.828 (0.913)</td>
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<td>3</td>
</tr>
<tr>
<td>Alcohol</td>
<td>0.787 (0.932)</td>
<td>1</td>
<td>3</td>
<td>3.809 (0.966)</td>
<td>1</td>
<td>6</td>
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<tr>
<td>Cultural interests</td>
<td>5.055 (1.905)</td>
<td>3</td>
<td>15</td>
<td>5.211 (1.873)</td>
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<td>15</td>
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<td>Unhealthy food</td>
<td>4.924 (2.184)</td>
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<td>5.094 (2.167)</td>
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</table>

**Table 1** Summary statistics-data drawn from Istat survey "Aspects of daily life", 2012

**Legend**  
**Age**: classes of age (18/19=7; 20/24=8; 25/29=9; 30/34=10).  
**Body weight**: 1= underweight; 2= normal weight; 3= overweight; 4= obese.  
**Family econ. problems**: degree of satisfaction about family economic conditions (it ranges from 1 to 4: 1= very satisfied; 4= not satisfied at all).  
**Books**: number of books in the house: 1= no books; 2= 1/10; 3= 11/25; 4= 26/50; 5= 51/100; 6= 101/200; 7= 201/400; 8= more than 400.  
**Weight control**: frequency of controlling weight (1= every day; 5= never).  
**Physical Exercise**: how often he/she exercises (it ranges from 1 to 4: 1= never; 4= very often).  
**Smoking**: 1= he/she has never smoked; 3= he/she smokes.  
**Alcohol**: consumption of spirits (it varies from 1 to 6: 1= no consumption of spirits; 6= more than 40ml every day).  
**Cultural interests**: number of visits, respectively, to museums, cinema and theatre in the last year (with each variable ranging from 0 to 8: 0 never, 8 more than 12 visits) plus the number of books read in the last year (the number of books is deflated by 10 such that the index varies from 0 to 9).  
**Unhealthy food** (snacks, cakes and sodas): consumption of snacks (from 1 to 5: 1 indicates "never", 5 indicates "more than once by day"), of cakes (from 1 to 5: 1 indicates "never", 5 indicates "more than once by day"), of sodas (from 1 to 5: 1 indicates "never", 6 indicates "more than 1 lt by day").  
**Ill**: dummy variable equal to 1 if affected by chronic disease.
<table>
<thead>
<tr>
<th></th>
<th>I- Females</th>
<th>II-Males</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body mass index</strong></td>
<td>Mean (std dev)</td>
<td>Min.</td>
</tr>
<tr>
<td></td>
<td>21.817 (0.090)</td>
<td>14.69</td>
</tr>
<tr>
<td><strong>Parents’ education</strong></td>
<td>2.724 (0.019)</td>
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</tr>
<tr>
<td><strong>Age</strong></td>
<td>20.762 (0.060)</td>
<td>18</td>
</tr>
<tr>
<td><strong>Attending courses</strong></td>
<td>3.555 (0.016)</td>
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</tr>
<tr>
<td><strong>Upper second. school’s score</strong></td>
<td>82.718 (0.298)</td>
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</tr>
<tr>
<td><strong>Smoking</strong></td>
<td>4.356 (1.028)</td>
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</tr>
<tr>
<td><strong>Tales</strong></td>
<td>0.410 (0.492)</td>
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</tr>
<tr>
<td><strong>Homework help</strong></td>
<td>0.436 (0.496)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Humansities</strong></td>
<td>67.00</td>
<td>0</td>
</tr>
<tr>
<td><strong>Physical exercise</strong></td>
<td>33.23</td>
<td>0</td>
</tr>
<tr>
<td><strong>Liceo</strong></td>
<td>62.84</td>
<td>0</td>
</tr>
<tr>
<td><strong>Ill</strong></td>
<td>16.27</td>
<td>0</td>
</tr>
<tr>
<td><strong>Healthy food</strong></td>
<td>65.47</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 2** Summary statistics - data drawn from the survey at the University of Salerno

Legend:  
*Body mass index*: weight/(height in cm)^2;  
*homework help*: variable ranging from 1 to 5 if he/she received help with homework by his/her parents or someone else in the family (1=every day; 5=never);  
*tales*: variable ranging from 1 to 5 if his/her parents or someone else in the family told him/her fairy tales (1=every day; 5=never);  
*attending courses*: varying from 1 (usually) to 5 (never), the variable indicates whether the student usually attended courses in the previous academic years;  
*upper schooling’s score*: score reported at the upper secondary school diploma (ranging from 60/100 to 100/100);  
*humaneities*: dummy equal to 1 if he/she is enrolled in a humanities discipline (sociology, arts and philosophy, school of education), 0 otherwise (computer sciences, engineering, chemistry);  
*parents’ education*: average parents’ schooling level (1=none; 2=primary school; 3= secondary school; 4=university degree);  
*liceo*: dummy equal to 1 if he/she attended a liceo, equal to 0 otherwise;  
*ill*: dummy equal to one if he/she suffers from chronic diseases that makes more difficult to study, equal to 0 otherwise;  
*weight control*: variable ranging from 1 to 3 if he/she controls his/her weight, respectively, never, sometimes, very often;  
*healthy food*: dummy equal to 1 if he/she consumes home food at lunch time at the University (instead of food from vending machines);  
*smoking*: variable ranging from 1 to 5 according to the number of cigarettes smoked (1=no smoker; 5=strong smoker);  
*physical exercise*: dummy equal to 1 if he/she practices gym.
### Table 3: Probability of being graduated or enrolled at University - Females (ISTAT data)

<table>
<thead>
<tr>
<th>Ind. Variables&lt;sup&gt;a)&lt;/sup&gt;</th>
<th>Age 19-34&lt;sup&gt;b)&lt;/sup&gt;</th>
<th>Age 19-34&lt;sup&gt;c)&lt;/sup&gt;</th>
<th>Age 19-29&lt;sup&gt;d)&lt;/sup&gt;</th>
<th>Age 19-29&lt;sup&gt;e)&lt;/sup&gt;</th>
<th>Age 19-29&lt;sup&gt;f)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>-0.044 (0.153)</td>
<td>0.044 (0.151)</td>
<td>-0.202 (0.207)</td>
<td>-0.027 (0.206)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.144*** (0.049)</td>
<td>-0.128** (0.050)</td>
<td>-0.009 (0.100)</td>
<td>0.023 (0.102)</td>
<td></td>
</tr>
<tr>
<td>Fam. econ. prob</td>
<td>-0.199*** (0.054)</td>
<td>-0.184*** (0.055)</td>
<td>-0.206*** (0.067)</td>
<td>-0.189*** (0.067)</td>
<td></td>
</tr>
<tr>
<td>Books</td>
<td>0.239*** (0.025)</td>
<td>0.233*** (0.025)</td>
<td>0.281*** (0.030)</td>
<td>0.278*** (0.030)</td>
<td></td>
</tr>
<tr>
<td>Cultural interests</td>
<td>0.189*** (0.023)</td>
<td>0.174*** (0.023)</td>
<td>0.168*** (0.027)</td>
<td>0.150*** (0.028)</td>
<td></td>
</tr>
<tr>
<td>Physical Exercise</td>
<td>0.072** (0.031)</td>
<td>0.059* (0.031)</td>
<td>0.072* (0.039)</td>
<td>0.057* (0.039)</td>
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</tr>
<tr>
<td>Smoking</td>
<td>-0.121** (0.052)</td>
<td>-0.115** (0.053)</td>
<td>-0.117* (0.065)</td>
<td>-0.113* (0.066)</td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>0.045 (0.066)</td>
<td>0.089* (0.066)</td>
<td>0.045 (0.081)</td>
<td>0.114 (0.082)</td>
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</tr>
<tr>
<td>Weight Control</td>
<td>-0.039 (0.037)</td>
<td>-0.028 (0.038)</td>
<td>-0.058 (0.048)</td>
<td>-0.046 (0.048)</td>
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</tr>
<tr>
<td>Unhealthy food</td>
<td>-0.062** (0.020)</td>
<td>-0.060** (0.020)</td>
<td>-0.068*** (0.025)</td>
<td>-0.065** (0.025)</td>
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<tr>
<td>Body weight</td>
<td>-0.19*** (0.069)</td>
<td>-0.191*** (0.069)</td>
<td>-0.237*** (0.090)</td>
<td>-0.249** (0.090)</td>
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<td>n. obs.</td>
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<tr>
<td>Wald χ²</td>
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<td>286.29</td>
<td>190.18</td>
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<tr>
<td>Pseudo R²</td>
<td>0.23</td>
<td>0.25</td>
<td>0.23</td>
<td>0.25</td>
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Legend: a) constant and regional dummies are included; see the legend in Table 1. b) each reported coefficient has been estimated on the relative variable included in the baseline specification in column I. c) each reported coefficient has been estimated on the relative variable included in the baseline specification in column IV; * statistically significant at 10% level; **statistically significant at 5% level; ***statistically significant at 1% level; robust standard errors.
<table>
<thead>
<tr>
<th>Ind. Variables</th>
<th>Age 19-34</th>
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<th>Age 19-34</th>
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<td>III</td>
<td>IV</td>
<td>V</td>
<td>VI</td>
</tr>
<tr>
<td>III</td>
<td>-0.264 (0.164)</td>
<td>-0.275* (0.167)</td>
<td>-0.240 (0.220)</td>
<td>-0.181 (0.228)</td>
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<tr>
<td>Age</td>
<td>-0.115** (0.057)</td>
<td>-0.108* (0.058)</td>
<td>-0.113 (0.113)</td>
<td>-0.097 (0.118)</td>
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<tr>
<td>Fam. econ. prob.</td>
<td>-0.177*** (0.059)</td>
<td>-0.162** (0.061)</td>
<td>-0.154*** (0.073)</td>
<td>-0.148** (0.176)</td>
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</tr>
<tr>
<td>Books</td>
<td>0.286*** (0.030)</td>
<td>0.278*** (0.029)</td>
<td>0.285*** (0.035)</td>
<td>0.273*** (0.036)</td>
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</tr>
<tr>
<td>Cultural interests</td>
<td>0.183*** (0.027)</td>
<td>0.172*** (0.026)</td>
<td>0.221*** (0.038)</td>
<td>0.206*** (0.079)</td>
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</tr>
<tr>
<td>Physical Exercise</td>
<td>0.087*** (0.037)</td>
<td>0.076** (0.038)</td>
<td>0.135*** (0.047)</td>
<td>0.127** (0.049)</td>
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</tr>
<tr>
<td>Smoking</td>
<td>-0.227*** (0.05)</td>
<td>-0.191*** (0.054)</td>
<td>-0.225*** (0.064)</td>
<td>-0.177*** (0.066)</td>
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<tr>
<td>Alcohol</td>
<td>-0.105** (0.050)</td>
<td>-0.056 (0.053)</td>
<td>-0.069 (0.058)</td>
<td>-0.018 (0.062)</td>
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<tr>
<td>Weight control</td>
<td>-0.021 (0.045)</td>
<td>-0.007 (0.045)</td>
<td>-0.006 (0.055)</td>
<td>0.021 (0.055)</td>
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<tr>
<td>Unhealthy food</td>
<td>-0.059** (0.02)</td>
<td>-0.050** (0.023)</td>
<td>-0.734** (0.027)</td>
<td>-0.071** (0.029)</td>
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<tr>
<td>Body weight</td>
<td>-0.100* (0.081)</td>
<td>-0.087 (0.084)</td>
<td>-0.178* (0.106)</td>
<td>-0.171* (0.112)</td>
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</tr>
</tbody>
</table>

n. obs. | 1152 | 1152 | 753 | 753 | 753
L. L. | -479.85 | -465.768 | -331.834 | -318.600 |           |
Wald χ² | 206.32 | 239.73 | 151.47 | 187.02 |           |
Pseudo R² | 0.25 | 0.27 | 0.26 | 0.35 |           |

**Table 4** Probability of being graduated or enrolled at University- Males (ISTAT data)

Legend a) constant and regional dummies are included; see the legend in Table 1. b) each reported coefficient has been estimated on the relative variable included in the baseline specification in column I. c) each reported coefficient has been estimated on the relative variable included in the baseline specification in column IV; * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level; robust standard errors.
<table>
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<tr>
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<th>Coeff. (std err.)</th>
<th>Coeff. (std err.)</th>
<th>Coeff. (std err.)</th>
<th>Coeff. (std err.)</th>
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</thead>
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<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
<td>V</td>
<td>VI</td>
</tr>
<tr>
<td>Parents' education</td>
<td>-0.235*** (0.056)</td>
<td>-0.213*** (0.057)</td>
<td>-0.223*** (0.057)</td>
<td>-0.182*** (0.058)</td>
<td>-0.004 (0.077)</td>
<td>-0.013 (0.082)</td>
</tr>
<tr>
<td>Tales</td>
<td>0.159** (0.076)</td>
<td>0.161** (0.077)</td>
<td>0.161** (0.077)</td>
<td>0.176** (0.078)</td>
<td>-0.009 (0.137)</td>
<td>0.0005 (0.141)</td>
</tr>
<tr>
<td>Homework help</td>
<td>0.121*(0.075)</td>
<td>0.128* (0.076)</td>
<td>0.120 (0.077)</td>
<td>0.089 (0.078)</td>
<td>0.189* (0.112)</td>
<td>0.197* (0.115)</td>
</tr>
<tr>
<td>Attending courses</td>
<td>-0.428*** (0.077)</td>
<td>-0.413*** (0.078)</td>
<td>-0.399*** (0.078)</td>
<td>-0.328*** (0.077)</td>
<td>-0.495*** (0.083)</td>
<td>-0.456*** (0.088)</td>
</tr>
<tr>
<td>Illness</td>
<td>-0.119 (0.099)</td>
<td>-0.153 (0.101)</td>
<td>-0.153* (0.101)</td>
<td>-0.159 (0.101)</td>
<td>0.014 (0.149)</td>
<td>-0.049 (0.158)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.049*** (0.017)</td>
<td>-0.047*** (0.017)</td>
<td>-0.049*** (0.017)</td>
<td>-0.064*** (0.018)</td>
<td>0.012 (0.027)</td>
<td>0.017 (0.028)</td>
</tr>
<tr>
<td>Upper school's score</td>
<td>0.22*** (0.037)</td>
<td>0.22*** (0.037)</td>
<td>-0.015*** (0.005)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body mass index</td>
<td>0.023*** (0.012)</td>
<td>0.022* (0.012)</td>
<td>0.020* (0.012)</td>
<td>0.016 (0.012)</td>
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</tr>
<tr>
<td>Physical exercise</td>
<td>-0.209** (0.081)</td>
<td>-0.179*** (0.079)</td>
<td>-0.174** (0.079)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight control</td>
<td>-0.019 (0.060)</td>
<td>-0.022 (0.060)</td>
<td>-0.019 (0.060)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Smoke</td>
<td>0.067* (0.037)</td>
<td>0.077** (0.037)</td>
<td>0.067* (0.037)</td>
<td>0.030 (0.038)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy food</td>
<td>-0.128** (0.059)</td>
<td>-0.147** (0.058)</td>
<td>-0.147** (0.058)</td>
<td></td>
<td></td>
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</tr>
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<td>806</td>
<td>806</td>
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<tr>
<td>Wald test</td>
<td>56.68</td>
<td>69.10</td>
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<td>41.27</td>
<td>57.51</td>
<td>64.39</td>
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Table 5: Probit estimates of enrollment in Humanities - data from the University of Salerno

Legend: a) constant is included; b) each reported coefficient has been estimated on the relative variable included in the baseline specification in column I. c) each reported coefficient has been estimated on the relative variable included in the baseline specification in column VI; *statistically significant at 10% level; **statistically significant at 5% level; ***statistically significant at 1% level; robust standard errors.
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