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Is university education worth the investment? The expectations of upper secondary school seniors and the role of family background

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Abstract

This study assesses students' expectations about the profitability of the investment in university education. We consider Italy as a test case and provide fresh high-quality data on students' expectations concerning the costs, economic returns and chances of success of this investment. These are compared with data on the corresponding actual values. We find that the estimates provided by upper secondary school seniors are highly inaccurate, highly uncertain and systematically biased. Students overestimate the returns to university degrees, while they are over-pessimistic regarding university costs and drop-out risks. These results confirm previous studies on perceived university costs, but they challenge the dominant view that students can realistically forecast graduate earnings. We trace this discrepancy to two methodological shortcomings of several previous studies on expected graduate earnings. Moreover, we find that information barriers are not equally distributed among social groups. High-status students overestimate the economic returns to university more and they are more optimistic regarding their chances of success in Higher Education, even after allowing for their higher objective returns and chances of success. Our interpretation of the importance of information barriers focuses on the interaction between cognitive biases and institutional constraints.

Keywords: Educational inequality; Rational Action Theory; Students' expectations

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1 Introduction

Rational choice theory has gained a prominent position in educational stratification research, as well as in economic research on human capital investments. A core assumption of this approach is that students' decisions are driven by subjective expectations concerning economic returns to the investment in education, its costs and chances of success. Subjective expectations concerning these three key decision-making parameters lie at the heart of sociological and economic models of educational decisions. This raises the question of whether individuals do in fact have accurate expectations of the profitability of the investment in education.

A growing number of econometric studies have assessed students' estimates of graduate earnings, while unfortunately less attention has been paid to the other two decision-making parameters. As discussed below, the general consensus of current research is that students' estimates of graduate earnings are broadly accurate. In this article we argue that because of some methodological limitations of previous studies this conclusion may be premature, and we provide evidence that high school students overestimate graduate earnings to a significant extent. We consider Italy as a test case, and provide fresh high-quality data on students' expectations concerning the above three parameters. Our results indicate that students' estimates are highly inaccurate, systematically biased, and that they are characterised by widespread subjective uncertainty. We suggest that, taken together, these information barriers may cause an inefficient allocation of students between educational levels.

Furthermore, we argue that information biases are socially patterned. In particular, we claim that students from low-status groups are more pessimistic about the costs, the risks and the economic returns to the investment in education, even after allowing for the objective disadvantages that they face. This means that information barriers may also fuel social inequalities in access to university education. It may be noted in this regard that recent research on educational inequality suggests that, while rational choice models offer a number of valid predictions, they fall short in explaining the influence of family background on educational decisions (Stocké 2007; Van de Werfhorst and Hofstede 2007; Tolsma, Need, and de Jong 2010). However, before resorting too easily to culturalist theories, we may consider whether incorporating information barriers in rational choice models improves their heuristic power (Breen 1999).

We are interested in the role of misperceptions of the value of education for two reasons. Our first justification is theoretically-oriented. On the one hand, the standard formulation of human capital theory, which dominates among economists of education, assumes perfect information (Becker 1962). On the other hand, psychologists, sociologists and behavioural economists emphasize that individuals often have poor information and that they process it in highly simplified ways (Kahneman 2011; Breen, van de Werfhorst, and Jæger 2014). Hence, students may not respond to the actual costs or benefits of education, but rather to their own perceptions of these parameters, which can be inaccurate, biased and socially patterned. Our empirical investigation of cognitive constraints in educational decision-making provides a detailed test to adjudicate between these two alternative views, and it supports models of bounded rationality in educational research. Hence, our second and more pragmatic justification is that, if students misperceive the economic value of education, then providing them with better

information may be a feasible, cost-effective approach to reducing social inequalities in education and strengthening the match between education and the labour market. Information barriers may be an appealing target for educational policies. For instance, three recent randomised trials indicate that university enrolment rates are responsive to counselling initiatives that offer detailed information about the actual costs of university, and more so for working-class students (Loyalka, Song, Wei, Zhong and Rozelle 2013; Oreopulos and Dunn 2013; Bettinger, Long, Oreopoulos, and Sanbonmatsu 2009).

2 Theoretical framework and hypotheses

Following a standard rational choice formulation, when families decide about the amount and type of education for their children, they compare different options and select the one that yields the highest expected value, defined as time-discounted lifetime returns to each educational option minus the costs of completing it (Breen, van de Werfhorst, and Jæger 2014). In the case of university enrolment, returns involve the differential between future earnings afforded by the chosen field of study and earnings associated with an upper secondary diploma. Costs comprise both direct expenses and foregone earnings. Finally, if the risks of dropping out from Higher Education are non-negligible, they must be incorporated in the model.

Hence, we will consider three main sets of parameters: earnings associated with different fields of study and upper secondary qualifications; direct and indirect costs; the chances of completing university. These parameters display an individual-level variability associated with several characteristics. For instance, economic returns to university degrees may differ by gender, family background and area of residence. Therefore, information barriers refer to mismatches between the estimates provided by different profiles of individuals and the actual values of the three sets of choice parameters corresponding to these specific profiles.

For each parameter, an information bias occurs if the average difference between each student's subjective estimate and her actual value deviates significantly from zero. Hence, the first analytical dimension that we consider is the aggregate *correctness* of expectations about the value of education. Moreover, we assess whether family background affects the correctness of students' estimates. For instance, we want to learn whether students systematically under- or overestimate graduate earnings, and whether any bias differs between social groups. This first dimension is the main focus of this work and of previous studies, as systematic biases are the most straightforward belief-based mechanism that can drive under- or overinvestments in Higher Education, together with the related social inequalities (Morgan 2005). However, we also consider a second analytical dimension which involves the degree of *accuracy* of students' estimates. Even in the absence of systematic biases, individual-level estimates may be highly imprecise, if large errors in opposite directions cancel each other out. The accuracy of estimates may be less consequential for the aggregate patterns of university enrolment, but it is still highly relevant for an efficient allocation of students between educational levels. For instance, even if students neither over-estimate nor under-estimate their chances of succeeding in university on average, some high-ability students may fail to appreciate their own high chances of success, while some low-ability students may underestimate their risks of failure. Finally, we consider the *subjective confidence* that students attach to their own estimates, understood as the probabilistic evaluation that they are accurate. Previous research has largely disregarded the issue of the degree of subjective uncertainty

that may surround students' estimates. However, if the behavioural significance of expectations is contingent on the subjective confidence that individuals attach to them, this is a significant limitation (Wolter 2000).

There are good reasons to expect that students misperceive the profitability of the investment in education. Behavioural research on decision-making processes shows that individuals do not engage in elaborate processes of information-gathering. Instead, they tend to pick up the information more readily available in their social environment, with a limited understanding of its actual reliability and representativeness (Gilovich, Griffin, and Kahneman 2002). However, information regarding university education collected from informal sources such as parents, relatives and friends is anecdotal, unduly affected by idiosyncratic experiences, and poorly updated. Therefore, we expect estimates of the profitability of university education based on these informal sources to be highly inaccurate.

These cognitive limitations involve all social groups. However, different social environments are likely to provide students and parents with different information inputs, because of the socio-economic segregation of neighbourhoods, of occupational networks and of friendship relations, as well as the segregation associated with school tracking in secondary education. Hence, it can be argued that students from low-status groups enjoy fewer opportunities to meet people who have successfully completed university and who have accessed upper-class positions upon graduation (Erikson and Jonsson 1996). Hence, they may overestimate the difficulty of university education, and the connection between university education and gainful employment may be less evident and more uncertain for them. It is also less likely that their siblings and other relatives or friends can provide first-hand information on university costs, which are comparatively low in Italy. Moreover, if low-status groups are less inclined to go to university for a variety of reasons (e.g. liquidity constraints), cognitive dissonance may induce them to undervalue university education. In short, we expect that low-status groups are less optimistic as regards the costs, chances of success and economic value of university education.

So far, we have discussed the role of informal sources of information about university education. However, information barriers also depend on the availability of alternative more institutionalised sources of information. Following Perna's (2006) model of information gathering, we can identify three major layers of context that can modify the expectations originating from families and acquaintances: schools, universities and the broader societal context, with particular reference to the role of the mass media.

In Italy, school-based counselling takes place mainly when students are 19, that is, in the last year of upper secondary education. This educational level consists of three main streams: general pre-academic schools (*licei*), vocational schools (*istituti professionali*) and an intermediate stream (*istituti tecnici*) that provides a mix of theoretical knowledge and applied skills; each of these streams encompasses several curricula. All school streams afford access to university education (which virtually coincides with Higher Education) in any field of study, regardless of previous academic performance. Upper-class students are overrepresented in general schools, which have much higher university enrolment rates and deliver more information about university. However, school counselling provides only broad overviews of the contents of university courses, and very seldom offers detailed information on university costs or on the economic returns to college degrees. In the other two school streams, counselling is more vocationally-oriented, but still fails to provide transparent information on the economic prospects of upper secondary school leavers.

Universities are another important source of information for Italian students. However, because enrolment statistics affect funding from the Ministry of Education, they tend to attract students by conveying an idealized and optimistic picture of the economic prospects of tertiary graduates (Barone 2012). Moreover, following the reform implemented in 2001 under the so-called Bologna process, university education has moved from a one-tier structure of four or five-year courses to a two-tier system, articulated in a three-year first cycle and a second cycle of two years; some fields (e.g. medicine) have preserved the traditional one-tier structure. The reform has shortened the length of study required to obtain a university degree and has reduced the selectivity of academic studies, but it has also raised some concerns regarding the market value of bachelor degrees under the new regime (Cappellari and Lucifora 2009). Unfortunately, universities often fail to provide transparent information about the poor economic prospects offered by the new bachelor degrees.

Furthermore, previous research reports that upper secondary school seniors and their families often lack the knowledge and skills to navigate increasingly complex university bureaucracies. Hence, they fail to understand actual tuition levels, financial aid opportunities and the admission process (Ikenberry and Hartle 1998; Horn, Chen, and Chapman 2003). When information material on these matters is made available, it is often presented in a bureaucratic jargon, which is particularly hard for poorly-educated families. Universities present some information about fees and grants on their websites but, because tuition levels and eligibility criteria are based on complex calculations, students must typically apply to university before knowing the financial commitment required to pursue university education.

The mass media are another relevant, though often confusing, source of information. In recent years they have stressed the poor employability prospects of both upper secondary and tertiary graduates in the country. At the same time, although university fees are still comparatively low in Italy, the mass media emphasize the growing costs of university education and the related shortages of tertiary graduates in international comparisons. Unfortunately, employer surveys reveal quite a different picture, and point to an excess supply of graduates, particularly in the Humanities and the Social Sciences (Centro Studi Unioncamere 2013).

It should be noted that while in the US and in some other Anglo-Saxon countries income returns to university education have increased in recent decades (and the issue is therefore whether families have updated their information on this upward trend), in other western countries this trend is not apparent (Crivellaro 2013). Indeed, economic returns to tertiary degrees have declined in Italy over the past two decades, as a result of the expansion of tertiary degrees, particularly after the above-mentioned university reform, in a context in which skilled jobs stagnate (Naticchioni, Ricci, and Rustichelli 2010; Ballarino and Scherer 2010). However, as scholars have only recently begun to detect this trend of credential inflation, there is little reason to expect that families have updated their information more rapidly. Hence, while families may be expected to underestimate the economic value of university degrees in some Anglo-Saxon countries (Usher 2005), we are likely to detect the opposite pattern in Italy and in other European countries. The information inputs coming from Italian universities should strengthen this bias.

On the whole, the institutional sources of information provide students with scant, poor-quality signals of the profitability of university education. Hence, they do little to correct the inaccuracies in information coming from informal sources. Quite on the contrary, we argue that the biased signals coming from universities and the mass media

lead students to overestimate the economic returns to university education, its difficulty and costs.

Finally, regarding the degree of subjective uncertainty surrounding students' estimates, this should be a function of the number of "observations" available to each student and of the coherence among these observations (Morgan 2005). Because informal and institutional sources of information provide students with scant unreliable signals that may not be coherent, we expect that subjective uncertainty over the profitability of university education is widespread. Moreover, uncertainty should be lower among high-status students, as their social environment provides them with more first-hand information.

To summarise, we expect that: students overestimate the economic returns to university education, as well as its costs and drop-out risks (hypothesis 1); their estimates display high levels of inaccuracy and of uncertainty (hypotheses 2a and 2b); and c) students from high-status groups are both systematically more optimistic and more confident in providing these estimates (hypothesis 3).

3 Measurement of students' expectations in previous research

Considering the pivotal role of expectations in the choice process, we might expect them to have been extensively investigated. However, economists have proven somewhat reluctant to collect these subjective data. The dominant view is that because survey respondents have no incentive to answer carefully the reliability of their answers is questionable. Indeed, this can be a serious problem. However, the most common solution to this problem is to replace data on subjective expectations with data on actual values (e.g. the actual returns to university education), on the basis of untested assumptions concerning the correctness and accuracy of subjective expectations. As Manski (1993, p. 59) argues, "having chosen to make assumptions rather than to investigate expectations formation, economists do not know how youth infer the returns to schooling […]. Without an understanding of expectations, it is not possible to interpret schooling behaviour or to measure the objective returns to schooling". In a similar vein, Stocké (2007, p. 508) argues that for the purpose of explaining educational inequalities sociologists have mainly focused on "factors which may be regarded as objective antecedent conditions of beliefs […]. For instance, the observed association between economic resources and educational outcomes may actually not be the consequence of perceived costs, but could well be due to class-specific norms and values, which are correlated with wealth".

Following Manski's plea, in recent years economists have increasingly begun to collect data on subjective expectations of the returns to schooling. The standard practice is to assess students' (or parents') estimates against objective data, extrapolated from external sources, such as census data or graduate surveys concerning previous cohorts. The assumption is that students' beliefs should be driven by the experience of recent cohorts, and that students cannot be expected to embrace sophisticated hypotheses about future trends that may affect earnings differentials.

Here, we refer to studies that elicit *numerical* information about the *monetary* value of university degrees from students. This numerical format is important, because only if we ask students to provide exact numbers can we then compare their estimates with actual data to assess the extent to which students' perceptions are correct or biased. Although monetary benefits and costs certainly do not exhaust the full range of costs and

benefits of the investment in university education, they are highly salient to students when comparing the value of different educational options. Moreover, money is the most straightforward metric to assess benefits against costs.

Overall, we have been able to map 16 published studies conducted since 1980 in various countries to assess the perceived economic value of university degrees. Their detailed features and results are reported in the appendix (table A1). Here, we will focus on their main results and methodological issues. It can be noted that most of these studies focus on students, rather than on their parents, but, when data on the perceptions of both are available, they reveal similar patterns. Some studies only consider expected graduate earnings, but the majority contrast them with earnings from upper secondary diplomas, as should be done if one is to gauge the perceived *returns* to tertiary degrees. Following human capital theory, several studies consider both initial earnings and earnings later in the career. Most typically, they detect highly similar patterns for different career stages. These studies usually elicit estimates from students concerning their own prospective earnings (individualised estimates), rather than earnings of the "average student" (generalised estimates). Indeed, the former solution is preferable because individualised estimates are more consequential for actual decisions, but it can be noted in table A1 that studies based on generalised beliefs do not systematically differ in their conclusions.

The majority of these studies (11 out of 16) find that students are able to estimate wage returns to university degrees in a broadly realistic way – a conclusion that sounds quite reassuring for human capital theory. When misperceptions occur, they are of minor entity, on average. Indeed there is widespread consensus among economists of education that students can forecast their future salaries reasonably well (Webbink and Hartog 2004; Attanasio and Kaufman 2009). However, three observations are in order. First, current studies focus on the correctness of students' estimates and pay little attention, if any, to their accuracy. However, as argued above, subjective estimates may be correct on average because large errors in opposite directions cancel out. Second, the vast majority of these studies are based on small samples of just a few hundred students, typically from a single university. Hence, the external validity of their results is questionable. Our third, and most important, concern is that 11 studies out of 16 survey university students, with a strong over-representation of students of Economics. Instead data should be collected among upper secondary school seniors, who have to decide whether to go to university. In other words, these studies assume that the views of university students are representative of the views of upper secondary school seniors and that no information updating occurs during university years. However, university students are likely to collect better information about graduate earnings, either through work experiences or simply as part of their curriculum (e.g. students of Economics may learn about human capital theory).

Only 8 studies out of 16 consider whether students' estimates differ by social background, and these studies report mixed results (table A1). Unfortunately, none of them report the extent to which actual returns to education differ by social background. Therefore, it remains unclear whether any differential in earnings expectations reflects actual differences or different perceptions.

As regards the perceived costs, we could find only four previous studies. They survey upper secondary school students or their parents, and they all report that university costs are considerably overestimated. There are also some indications that better educated parents are better informed. Because three of these four studies were conducted in the United States, it is unclear whether their conclusions can be generalised to other

countries. Moreover, most of these studies only consider forecasts of tuition fees and disregard living expenses.
Finally, in the relatively large literature on self-confidence and on the perceived difficulty of university education (Dunning, Heat, and Suls 2004), we could not find any study assessing subjective numerical estimates of the chances of succeeding at university against actual values. On the whole, we can conclude that the available empirical evidence on students' knowledge about university and its variations by family background is lacking in several respects.

4 Data and variables

Our data come from a survey of the project "Family background, beliefs about education and participation in Higher Education", which was fielded in October 2013. This study is based on a stratified random sample of 62 Italian schools (9,159 students) located in four Italian provinces (Milan, Bologna, Vicenza, Salerno). The strata are defined by the province and the track of the school. All the upper secondary school seniors in each school had to fill in a paper-and-pencil questionnaire during school hours under the supervision of a trained interviewer. Only four schools in the initial sample refused to collaborate in the project and had to be replaced; the student response rate was 99%.

The study collected data on students' beliefs about university education, along with detailed information concerning their family resources and educational background. Unfortunately, only students could be surveyed but not their parents. As discussed in the previous section, there is evidence that parents and children tend to hold similar views on the economic profitability of university degrees. All students were asked the following questions, regardless of their intentions of going to university:

- *preferred fields of study*: "should you continue to university education, which field of study would you choose? You may indicate up to three options";
- *expected chances of success*: "what chance of completing each of your preferred fields do you think you have? Please give a number between 0 (no chance at all) and 100 (sure to achieve the degree)";
- *expected earnings with a university degree*: "What might your net monthly income from full-time employment be four years after earning a degree (bachelor or single-tier degree) in each of your preferred fields?";
- *expected earnings with an upper secondary diploma*: "should you not continue to university education, what might your net monthly income from full-time employment be four years after completing upper secondary education?".

Moreover, respondents were surveyed on the *confidence attached to their earnings expectations*:

- "To what extent do you feel confident about your forecasts of earnings with university degrees (very confident, quite confident, quite unconfident, very unconfident)? To what extent do you feel confident about your forecasts of earnings with your upper secondary diploma?" (same answer options)[1].

[1] Because students had to fill in paper-and-pencil questionnaires, we could not use the computer-based technique developed by Dominitz and Manski (1994) to elicit probabilistic evaluations of the plausibility of different ranges of earnings estimates. Therefore, we gave them the above qualitative answer options.

The research team carried out extensive pre-testing to make sure that students could correctly understand these questions[2]. The time window of four years after graduation for earnings ensures comparability with our data sources for the objective estimates: two surveys carried out by the Italian statistical office (Istat) on upper secondary school leavers' employment and study pathways (*Indagine sui percorsi di studio e di lavoro dei diplomati*) and on university graduate employment (*Indagine sull'inserimento professionale dei laureati*), both carried out in 2011 among students who qualified four years before from either upper secondary school or university. These data sources contain reliable information on net monthly earnings of upper secondary school leavers and university graduates who left education. The 2007 university graduation cohort is one of the first representative cohorts of "new" bachelor and master graduates, after the university reform implemented in 2001. This means that, although it would be important to also consider (perceived and actual) earnings at later career stages, this was unfeasible. As the new graduates are at the beginning of their careers, there are no data on their occupational situation at later stages.

The Istat survey on upper secondary school leavers also contains information on the situation of students who continued to university. Therefore, it can be used to compute objective predictions for dropout risks four years after completing upper secondary school. Because in Italy university dropouts occur almost entirely in the first or second year (Cingano and Cipollone 2003), right-censoring is unlikely to be a major issue.

As regards *expected university costs*, students were invited to provide estimates for each of the following four main cost entries:

- "Should you decide to continue to university education, how much do you think you would pay for university fees every year? And how much for study materials? Please try to provide an estimate even if you have never thought about it". The same formulation was used to elicit estimates about food and transportation costs, but on a monthly basis to facilitate students.

Regarding information on university costs, no country-level survey is available in Italy. Moreover, two important cost entries, namely tuition fees and transportation costs, vary significantly from one university to another and from one municipality to another. Therefore, in order to collect accurate data to be compared with the estimates of the students from the four provinces, we collected administrative data and we proceeded as follows. First, the students in our survey were asked to indicate their preferred university in case they continue to Higher Education. Then, for tuition fees, we collected the relevant information from the website of the specific university where each respondent planned to go. For each university, we recorded the tuition fees to be paid for 24 different student profiles, defined on the basis of the three main indicators used by Italian universities to assess the economic situation of students: family net income, number of siblings, and ownership of the house of residence. As the same information is collected in our student questionnaires, we can impute to each student her expected tuition fees[3]. Similarly, for food expenses we consulted the websites of university cafeterias, which

[2] We decided to only focus on estimates concerning bachelor (or one-tier) degrees, because surveying students also about the distinctions between bachelor and master degrees seemed too cognitively demanding.

[3] The schools did not allow us to directly ask students their family income. Therefore, we had to impute it using the Italian data from the EU-SILC 2012 study for families with at least one university-age member. We used the following variables to predict income: employment situation – 3-digit Isco title of current (or last) job and education of both parents; ownership and number of rooms of the house of residence; a set of six items indicating material deprivation relating to basic needs, such as buying food or clothes; number of family income earners; geographical area.

report the costs of standard meal packages for students[4]. For transportation costs, we mapped the cheapest transport solutions (bus/metro/train) to reach each university. Then, we consulted the websites of transportation companies to record the monthly costs of each solution. Finally, for study materials (books and booklets), we could rely on three independent sources of local data collected between 2006 and 2011. As their estimates displayed reasonable agreement, we simply averaged them and adjusted for inflation.
In sum, we have detailed and highly comparable data regarding both subjective estimates and objective values of the costs, economic benefits and chances of success of the investment in university education. In the next section, we present some descriptives for the subjective estimates and we explain how we computed the objective estimates from the above data sources. Then we compare the two sets of values.

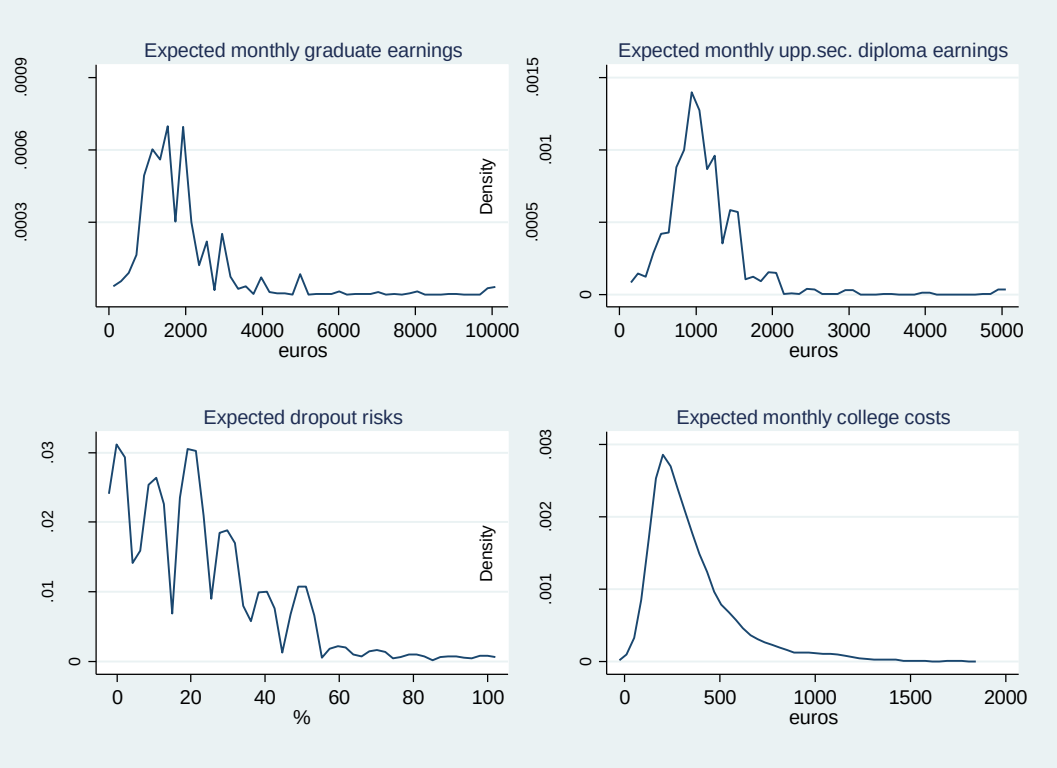
5 Descriptives and analytical strategy

Figure 1 reports the subjective estimates provided by the students regarding the profitability of university education. As can be seen, most estimates of net monthly graduate earnings four years after graduation range between 1,500 and 3,000 euros, with a significant tail of larger values up to 10,000 euros. Estimates of earnings associated with an upper secondary qualification are lower and less disperse: most of them fall within the 700-2,000€ income bracket, again with a long upper tail. On the contrary, subjective estimates of drop-out risks (the complement to 100 of probabilities of success) are extremely disperse, as they cover the full range of values between 0 and 100. Substantial numbers of Italian students forecast a relatively high risk of failure, that is, a probability of dropping out between 20% and 50%. Finally, the estimates of university costs vary considerably, as students report values between 100 and 1,000 euros per month, again with a significant upper tail.

In order to gauge whether the estimates by the students are correct and accurate, we must assess them against the corresponding objective values, understood as the best predictions for each student profile that can be inferred from the best data available to the researchers. In particular, the two above-described Istat surveys are the most updated, representative, high-quality data sources that can be used to predict earnings and drop-out risks. As regards college costs, thanks to the huge data collection effort described in section 3, reliable information on university cost entries across different provinces is available for the first time in Italy.

[4]We do not consider accommodation costs because most Italian students attend universities located in the province or region where they live. Therefore, only a small minority of them live in university campuses or rent private flats.

Figure 1 – The distribution of subjective estimates of earnings, costs and drop-out risks



We use these data to estimate the objective values corresponding to each student profile in our survey. In particular, we build a predictive model using the relevant data source for each choice parameter. For instance, for graduate earnings we use the Istat survey on university graduate employment to predict graduate earnings as a function of a detailed set of variables. Because information on the same variables is available in our student survey, we can use this predictive model to impute the graduate earnings expected for each student[5]. The two models for earnings with university degrees or with upper secondary diplomas incorporate an extensive list of predictors: a) *socio-demographic information:* gender, province of residence, age, country of birth, parental education (primary, lower secondary, upper secondary, tertiary degree) and parental occupation (managers and professionals, skilled white collars, routine white collars, self-employed workers, skilled and unskilled manual workers); b) *school background information*: upper secondary track and detailed curriculum (e.g. for the general track we differentiate between scientific, classical and foreign language curricula), and four measures of school performance (marks in lower secondary and in upper secondary education, school year repetitions, conditional advancements to next grades); c) *information about university studies* (only for graduate earnings): field of study, type of study programme (bachelor vs. one-tier track), matriculation year, work experiences during university studies[6]. Of course, this set of predictors is incomplete (for instance, we lack information about academic motivation). Nevertheless, it marks a significant

[5] Because of the time gap between our student survey (2013) and the Istat surveys (2011), the objective predictions based on latter are adjusted for inflation in 2013.

[6] We tested interactions between social origins (or gender) and field of study/school performance, but they are not statistically significant, despite the large sample size of the Istat data.

improvement over previous studies, which simply compared students' estimates with the average graduate salary (or which only disaggregated it by sex and field of study).

For the predictive model of drop-out risks, we use the same socio-demographic and school background variables listed above, together with a dummy variable that refers to geographical mobility across regions during university years. For university costs, we rely on detailed administrative data to directly impute university costs for each student. Therefore, we do not need to estimate any predictive model. The results of the predictive models are interesting in themselves, but they lie outside the scope of this article. It suffices to mention here that they are aligned with the results of previous studies based on the same data (Triventi and Trivellato 2015)[7].

Following this procedure, for each student we obtain a set of objective predictions to be compared with her subjective estimates in order to assess information biases. Let us start with graduate earnings. Table 1 shows that on average students expect to earn 1,903 euros with a university degree in their preferred field, while the average of the objective predictions amounts to 1,445 euros. Hence, the mean deviation between subjective and objective estimates is 458 euros, which is a huge gap relative to the actual mean of 1,445 euros (+32%). Previous studies concluding that students' estimates are realistic report average biases below 10%. Unsurprisingly, the confidence interval shows that this strong overestimate is statistically different from zero. Moreover, extending the analysis to the second or third field of study indicated by the students leaves the results virtually unchanged: the mean deviation is 472 euros, rather than 458. We know from Figure 1 that one respondent in ten (8%) expects high earnings (between 3,000 and 10,000 euros), but if we inspect the Istat data on actual graduate earnings four years after graduation, we do not find any trace of this upper tail. When we compute the median (rather than the mean) difference between the two sets of values, subjective overestimates are reduced to 163 euros. If we project this moderate gap over a career of 35 years, it is apparent that it is still far from negligible (around +70,000 euros). In sum, the majority of upper secondary school students moderately overestimate graduate earnings, and a significant minority of them display a very strong upward bias. In the next section we will assess whether these biases differ by family background.

As discussed above, when computing mean or median deviations, individual-level overestimates and underestimates tend to cancel out. This is of course unproblematic if we want to detect the presence of any systematic bias. However, even if subjective estimates were correct on average, this could hide a substantial degree of inaccuracy of individual-level forecasts. Therefore, we also compute the average of the absolute values of the deviations between subjective and objective estimates. This average amounts to 746 euros, which means that subjective estimates are considerably inaccurate. As the mean objective prediction of graduate earnings is 1,445 euros, a gap of 746 euros implies that students over- or underestimate graduate earnings by 51% on average.

[7] In particular, previous school performance and upper secondary branch affect earnings with high school diplomas. Regarding graduate earnings, we detect significant differences by field of study and type of study programme. Gender and province of residence are significant predictors of earnings, whereas the overall influence of family background is largely mediated by school- and university-level variables. However, social origins display a direct effect on drop-out risks, including when controlling for the effects of school performance and of upper secondary branch. Girls and students from Northern provinces are less at risk of dropping out.

The second row of table 1 shows that students slightly overestimate their future earnings with upper secondary school diplomas. The mean and median deviations are respectively 96 and 25 euros. However, we again find that subjective estimates are highly inaccurate: the mean of the deviations in absolute value is 319 euros.

Table 1 – Subjective and objective values for graduate earnings, upper secondary school diploma earnings, costs of attending university and drop-out risks

	Mean subjective estimate	Mean objective prediction	Mean deviation and confidence interval	Mean deviation (2nd and 3rd field)	Median deviation	Mean of deviations in absolute value
Monthly earnings with a tertiary degree	1,903	1,445	458 [395 - 521]	472	163	746
Monthly earnings with an upper secondary school diploma	1,101	1,005	96 [62 - 131]	-	25	319
Monthly university costs	349	202	147 [135 - 160]	-	96	181
Drop-out risks	21	16.8	4.2 [2.6-5.8]	9.1	2.7	14.6

Because students overestimate graduate earnings more than earnings with upper secondary school diplomas, they overestimate returns to university education. It is possible that when forecasting graduate earnings for a given field of study students use a simple availability heuristic (Kahneman and Twersky 2001), that is, they associate each field, for instance Law (or Economics), with a restricted set of stereotypical jobs, such as lawyer, judge, notary (or manager, broker, etc.). They may fail to appreciate that, due to the ongoing credential inflation of university degrees, significant numbers of graduates in law or economics nowadays achieve only white-collar positions in Italy. As discussed in section 2, the weaknesses of school guidance activities and the biased information inputs coming from universities and the mass media do little to remedy this state of affairs.

If economic returns to university degrees are overestimated, students may overinvest in university education. However, Table 1 shows that, in line with our hypotheses and with previous research, university costs are overestimated, too. The mean (median) deviation is 147 (96) euros per month. Relative to the mean objective value (202 euros), this implies an overestimate of 73%. The values reported in the North American literature are even higher, as they fall between 175% and 200% (see table A1 in the appendix). The degree of imprecision of students' estimates is again noticeable: the mean mismatch amounts to 181 euros.

Students also overestimate the difficulty of completing university. The mean difference between subjective and objective estimates is 4.2 percentage points. As the actual average drop-out risk is 16.8%, this is a significant gap (+25%), and the imprecision of students' forecasts is again very high. On the whole, these results indicate that students' beliefs are systematically biased and highly inaccurate. University education is perceived as over-rewarding, but also as more expensive and difficult than it actually is.

Are students aware that they may be wrong? In Table 2 we inspect the confidence that students attach to their earnings estimates. As can be seen, only a small minority of them (3.2%) are very confident about their estimates of graduate earnings, and six students in ten feel quite or very unconfident. Similar considerations hold for the

estimates of upper secondary school diploma earnings. Contrary to our expectations, differences by family background in the levels of subjective confidence are of minor importance.

Table 2: Confidence attached to the subjective forecasts by parental education (%)

	Forecasts of graduate earnings				Forecasts of upper secondary school diploma earnings			
	Primary or less	Secondary diploma	Tertiary degree	Total	Primary or less	Secondary diploma	Tertiary degree	Total
Very Confident	4.1	2.8	3.6	3.2	6.4	5.8	6.5	6
Quite confident	32.7	33.6	34.1	33.6	39.1	34.7	26.9	33.7
Quite unconfident	48.7	48.5	44.1	47.4	42.5	43.8	44.0	43.6
Very unconfident	14.6	15.0	18.3	15.8	12.1	15.7	22.6	16.7
Total	100	100	100	100	100	100	100	100

On the whole, students are poorly informed about the economic value of university education, and they seem aware of their lack of knowledge. Family background does not affect subjective uncertainty (nor the degree of imprecision, result available upon request). In the next section we focus on the systematic biases that we have detected and we assess whether they are distributed differentially among social groups.

6 Multivariate results

This section presents an OLS regression analysis of the determinants of subjective expectations about the profitability of university education. We consider four sets of models covering expectations of earnings with an upper secondary diploma, with a tertiary degree, costs and drop-out risks. In each model, we control for the relevant objective estimate and its quadratic term to account for differences in beliefs that reflect the actual prospects of each student; we centre the values of objective estimates to their mean to aid the interpretability of results. Our main purpose is to assess whether, allowing for these objective differences, we can detect any influence of social origins. We use two standard indicators of family background: parental education and parental occupation. The latter is measured with the International Socio-Economic Index (ISEI), which varies from 11.7 to 89 in our sample (Ganzeboom and Treiman 1996). We apply the dominance criterion, which selects the highest level of education and of socio-economic status in the family. Our control variables are gender, province of residence, immigrant status, upper secondary track and curriculum, three detailed measures of school performance, intended tertiary field of study and programme type[8]. Standard errors are clustered to allow for response correlation among students from the same school.

For each outcome, we present a first model incorporating only social origins together with controls for socio-demographic variables. Next, we add education-based variables in a second model. Let us start with the first set of models. If we

[8] In Italy, law and architecture are typically long one-tier courses, but there is a growing minority of bachelor courses too. To capture this difference, we differentiate between long and short courses. Veterinary science and medicine are always long courses (five to six years).

inspect the first row in Table 3, we find that objective estimates are positively associated with subjective estimates (although for upper secondary school diploma earnings the effects are not statistically significant). This means that students' expectations are responsive to the objective conditions that drive their actual prospects. However, the quadratic terms in the second row indicate that these relationships are nonlinear (cubic terms are not included because they are never significant). For graduate earnings and university costs, the positive quadratic terms point to an exponential relationship: subjective expectations grow more steeply for individuals with higher earnings prospects and with higher actual costs. For instance, this means that students who prefer the most rewarding fields not only enjoy an objective advantage, but tend to overestimate their earnings prospects more than students with lower earnings prospects. Similarly, university costs are exponentially inflated. Instead, for the two other choice parameters, the negative quadratic terms point to steeper growth when the actual values are lower. The general pattern of overestimation of actual values that we have reported in Table 1 is captured by the high positive coefficients for the intercept term.

Moving to the influence of family background, the coefficients differ depending on the specific choice parameter considered. After allowing for objective differences, children of tertiary graduates overestimate their future earnings with a university degree more than students from low-educated families (+156 euros, Model 1) and slightly underestimate earnings associated with upper secondary school diplomas (-41 euros, M3). In other words, they overestimate the actual returns to university education more. As for the perceived costs (M5) and drop-out risks (M7), we do not detect any significant difference by parental education. At the same time, the occupational status of the family displays a strong negative association with expected drop-out risks, indicating that high-status students are more optimistic about their chances of succeeding in university (on top of their higher previous academic performance). While it seems difficult to provide a substantive interpretation for the different results concerning the two indicators of social origins, on the whole these models indicate that students from a privileged background hold more optimistic views of the profitability of investments in university education, even after allowing for their objectively higher payoffs. These students regard university as a safer and more rewarding investment than it actually is for them.

Let us briefly comment on some control variables. Boys are overconfident as regards their earnings prospects (on top of their actual advantages), but they also seem over-troubled about their actual risks of dropping out. Because the number of foreign-born students in our sample is low, their coefficients display high sample uncertainty, but they point to a non-negligible overestimation of university costs and of dropout risks.

Table 3 – Models for expectations about graduate earnings, upper secondary school diploma earnings, costs and dropout risks. Robust standard errors in parenthesis

	Graduate earnings		Upper secondary school diploma earnings		Costs		Dropout risks	
	M1	M2	M3	M4	M5	M6	M7	M8
Objective values	1.28***	0.77***	0.028	0.15	0.411***	0.385***	0.428***	0.342***
	(0.121)	(0.208)	(0.202)	(0.25)	(0.071)	(0.074)	(0.0299)	(0.062)
Objective values squared	0.00126***	0.00117**	-0.000951*	-0.00124**	0.0003**	0.0003*	-0.00312***	-0.00253**
	(0.000383)	(0.000481)	(0.000533)	(0.000516)	(0.0001)	(0.0002)	(0.00114)	(0.00115)
Province of residence: Bologna	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Milan	-28.87	-12.59	-57.02	-19.48	33.63**	37.33*	-0.418	-1.041
	(91.29)	(72.76)	(51.28)	(30.57)	(16.58)	(19.97)	(1.240)	(1.099)
Vicenza	213.5**	95.38	-164.2***	-73.87*	41.05**	15.58	-4.395***	-3.904***
	(101.9)	(86.31)	(53.65)	(37.84)	(19.50)	(22.91)	(1.257)	(1.197)
Salerno	-177.1*	-124.4*	-70.85	-25.86	28.97	27.09	-3.121**	-2.681**
	(89.56)	(70.67)	(49.87)	(27.26)	(18.06)	(21.40)	(1.220)	(1.167)
Gender: female	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Male	240.0***	259.9***	230.5***	172.4***	-9.687	-11.21	3.629***	2.586***
	(39.56)	(48.53)	(37.73)	(41.49)	(6.826)	(6.888)	(0.488)	(0.507)
Citizenship: born in Italy	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Born abroad	87.16	42.80	54.91**	29.59	26.97**	19.12*	1.834*	0.715
	(72.80)	(77.43)	(25.98)	(25.79)	(11.21)	(10.92)	(1.007)	(0.891)
Parental social status (ISEI)	-0.0729	-0.525	-0.618	0.604	0.169	-0.0476	-0.0546***	-0.0385**
	(1.115)	(1.060)	(0.447)	(0.493)	(0.216)	(0.193)	(0.0145)	(0.0152)
Parental education: lower secondary diploma or less	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Upper secondary diploma	42.91	54.17	-10.35	29.44*	6.627	4.785	-0.113	0.115
	(40.23)	(40.28)	(14.97)	(15.10)	(6.740)	(6.552)	(0.699)	(0.737)
Tertiary degree	155.7***	105.4*	-41.17*	37.54	4.388	-3.747	-0.792	-0.176
	(51.18)	(54.26)	(24.77)	(25.92)	(10.33)	(10.18)	(0.965)	(1.032)
Upper secondary school track: general, scientific curriculum		*Ref.*		*Ref.*		*Ref.*		*Ref.*
General, artistic curriculum		-85.78		42.40		28.66		-4.256**
		(156.1)		(55.12)		(29.12)		(1.727)

General, classical curriculum	69.03	0.375	31.83**	-2.397***
	(72.87)	(39.75)	(15.90)	(0.870)
General, linguistic and social/psychopedagogical curriculum	-47.82	-20.76	-7.426	1.317
	(46.69)	(18.90)	(15.74)	(0.930)
Technical, business curriculum	-90.67	169.5***	-11.34	3.439***
	(58.70)	(20.82)	(11.42)	(1.226)
Technical, industrial curriculum	-101.6*	193.2***	0.768	3.246**
	(60.32)	(19.11)	(14.55)	(1.529)
Vocational, business curriculum	43.75	316.7***	17.16	3.063*
	(65.49)	(56.10)	(21.98)	(1.719)
Vocational, industrial curriculum	133.1	139.1***	32.99*	4.983***
	(90.65)	(29.03)	(18.07)	(1.873)
Conditional advancement to next grades: Never	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Yes, once or more	60.58	-2.057	2.609	1.733***
	(36.72)	(19.61)	(5.611)	(0.513)
Average school grades in upper secondary school	30.44*	-8.818	-5.081	-2.059***
	(17.63)	(8.355)	(3.131)	(0.361)
School failures: Never	*Ref.*	*Ref.*	*Ref.*	*Ref.*
Yes, once or more	4.967	11.81	-12.01	0.554
	(44.93)	(17.60)	(8.032)	(0.717)
Academic field of study: Humanities	*Ref.*		*Ref.*	*Ref.*
Medicine	653.9***		69.79***	11.33***
	(125.5)		(11.82)	(1.104)
Law (Bachelor)	964.8***		61.09***	4.185***
	(114.5)		(18.61)	(1.248)
Law (Bachelor+Master or one-tier course)	943.4***		68.79***	-1.074
	(125.3)		(21.67)	(1.168)
Engeneering and ICT studies	420.0***		11.40	3.752***
	(67.68)		(12.33)	(0.822)
Pharmacy	302.6**		0.681	2.648
	(141.3)		(26.61)	(2.298)
Veterinary	354.7***		45.19	13.19***

		(109.0)				(33.18)		(3.242)
Architecture (Bachelor)		683.9***				51.18***		4.805***
		(99.99)				(15.73)		(1.183)
Architecture (Bachelor+Master or one-tier course)		541.8***				35.38		1.992
		(160.8)				(28.77)		(1.984)
Nursing and midwifery		11.41				16.49		7.154***
		(72.17)				(13.82)		(1.097)
Economics and statistics		474.4***				54.79***		1.212*
		(98.13)				(11.92)		(0.694)
Education and psychology		-13.18				1.882		2.987***
		(43.38)				(11.48)		(0.861)
Mathematics, physics, chemistry		82.23				-9.654		3.055***
		(83.10)				(17.29)		(1.107)
Biology, geology and geography		60.45				6.353		-0.00924
		(57.14)				(16.29)		(0.953)
Social and political sciences		302.8***				13.46		-0.346
		(87.46)				(13.35)		(0.908)
Plans to move to study: No						*Ref.*		*Ref.*
Yes						54.62***		-1.342**
						(18.16)		(0.627)
Constant	1,669.1***	1,170***	1,023***	970***	306.9***	326.8***	25***	32.5***
	(95.3)	(187.1)	(75.49)	(71.6)	(18.39)	(29.14)	(1.19)	(2.5)
Observations	7,747	7,645	8,085	8,085	7,584	7,240	7,825	7,807
R-squared	0.080	0.129	0.063	0.096	0.046	0.073	0.164	0.225

** p<0.1; ** p<0.05; *** p<0.001*

The second set of models for each outcome incorporate variables that refer to school background and intended educational paths. Students enrolled in vocational and technical schools, who are less likely to continue to university, overestimate future earnings with their high school diplomas, as well as their actual dropout risks at university (M2 and M4). Better performing students, who are more likely to enrol at university, underestimate their actual risks of failure relative to low-performers. A possible interpretation of the results for gender, ethnicity, school type and school results is that students hold more optimistic views of the options that they are more inclined to choose, that is, beliefs seem *over*-adaptive.

The degree of overestimation of graduate earnings varies considerably by intended field of study. Students' overestimates are particularly strong for Law, Medicine, Architecture and Business and Economics. They are much smaller for the Humanities (the reference category), the Social Sciences (Political Science and Sociology), Education and Psychology, Nursing and Midwifery and for scientific fields. This pattern of differences matches the results of previous studies that investigated field of study differences and reported higher positive mismatches for the fields of Economics, Law and Engineering and lower overestimates for the Humanities and the social sciences (Wiswall and Zafar 2013). This pattern fits reasonably well with our previous argument that, when forecasting graduate earnings, students rely on a simple availability heuristic that associates each field with a restricted set of stereotypical occupations. Hence the overestimation of college earnings is stronger for fields that are associated with the most prestigious and rewarding professions (doctors, lawyers, architects) and with managerial positions. Students may fail to appreciate that nowadays a bachelor degree in Economics or Law often leads to white-collar jobs, and that it often takes more than four years after graduation to reach high-ranking positions in managerial and professional careers, especially in a country like Italy where career advancement is slow and mostly based on seniority (Schizzerotto 2002). Moreover, students who plan to enrol in Medicine, Veterinary Science, Nursing and Architecture courses overestimate more their dropout risks. The actual failure risks for these fields are particularly low because selective entry examinations are enforced nationwide, which screen out potential drop-outs. Regarding yearly costs, differences between fields are weaker and less systematic. When controlling for field of study, the parameters for social origins mentioned above display lower values in the models for graduate earnings and dropout risks, because high-status students are over-represented in the fields of the liberal professions. However, even after controlling for a large set of variables, high-status students are still more optimistic about the profitability of university education.

Finally, let us briefly mention some robustness analyses (results available upon request). First, we have presented the multivariate results for the subjective estimates concerning the preferred field of study, but extending the analysis to the second and third option (for the sub-sample of students who mention them) does not affect our conclusions. Second, using social class measures of parental occupation rather than a socio-economic index is equally irrelevant for our substantive conclusions. Third, we know that median deviations between objective and subjective predictions are smaller than mean deviations (table 1). Therefore, we have specified quintile regression models to check that our results are not driven by a small number of outliers in the upper tail of the distributions of subjective values.

Finally, it should be appreciated that estimating individual-level objective predictions is a challenging task. Let us take graduate earnings as an illustration. We must build a predictive model using data for university graduates, but the results of this model must

be used to infer predictions for the whole population of upper secondary school seniors. The predictive models cannot incorporate all predictors of graduate earnings. If some of the omitted predictors differ between the two populations (upper secondary school seniors and university graduates), the objective forecasts are biased. In order to control for this selection process, the predictive models described in section 4 incorporate a large set of predictors. This marks an improvement over previous studies. Moreover, this methodological issue only arises if we compare objective predictions with individualised estimates. If we survey students on their estimates for the "average student" (i.e. their generalised beliefs), selection processes are no more relevant. Interestingly, a previous study reports that individualised and generalised estimates are highly correlated (Botelho and Pinto 2004), and we found unequivocal evidence of such a strong correlation in our pilot study[10]. Hence, selection processes seem unlikely to affect our substantive conclusions. Indeed, if we restrict the analyses to students who plan to continue to university to neutralise at least part of these selection processes, our substantive conclusions remain virtually unchanged.

7 Conclusions

This article has suggested that upper secondary school seniors face considerable information barriers when deciding whether to invest in university education. First, their estimates are affected by a noticeable degree of inaccuracy and uncertainty. On the one hand, the average of the gaps in absolute value between their subjective estimates and objective ones is large. Previous research has focused almost exclusively on the correctness of students' estimates, while disregarding the substantial degree of their imprecision. However, if educational decisions are made on the basis of highly inaccurate beliefs, they are likely to be sub-optimal, even in the absence of systematic information biases. On the other hand, we have found that students are aware that they have poor knowledge of the economic value of university education. In particular they attach low confidence to their estimates concerning returns to university degrees, in line with two previous studies (Dominitz and Manski 1994; Wolter 2000).

A second set of results that point to the importance of information barriers is that students' perceptions of costs, benefits and chances of success in Higher Education are systematically biased, though in different directions. Students overestimate the returns to university degrees, while they are over-pessimistic regarding university costs and drop-out risks. These results confirm previous studies concerning perceived costs, but they challenge the dominant view that students can realistically assess graduate earnings. We notice in this regard that most previous studies on perceived graduate earnings have surveyed small samples of university students (often enrolled in Business and Economics courses) rather than representative samples of upper secondary school seniors. These studies unrealistically assume that the views of the former are representative of the views of upper secondary school seniors in general, and that no information updating occurs during university studies.

The general wisdom of current research is that information biases may drive an under-investment in tertiary education if students overestimate the costs, but not the

[10] We found a Pearson correlation of 0.92 between individualised and generalised estimates of graduate earnings, and of 0.91 for upper secondary diplomas. As discussed above, we decided to focus on the former because they are more immediately relevant for students' decisions, but in practice this decision should make little difference.

economic returns of university education (Usher 2005). Our results challenge this view and suggest that alternative scenarios are possible. Overestimation of costs and of drop-out risks may be balanced out by optimistic biases concerning graduate earnings. Yet these opposite pressures need not be equally strong, as university costs are only borne for a few years, whereas economic returns to education affect the whole working career. Therefore, the overestimation of graduate earnings may even drive an over-investment in tertiary education.

Our interpretation of the importance of information barriers focuses on the interaction between cognitive biases and institutional constraints. At the micro level, research on decision-making processes shows that individuals do not engage in elaborate processes of information-gathering, but instead use over-simplified heuristics to form their expectations. For instance, we have suggested that when forecasting future earnings with a degree in a given field (e.g. Economics) students tend to only focus on the jobs that are stereotypically associated with it (e.g. manager, broker, etc.) and pay little attention to the possibility of ending up in white collar jobs. This availability heuristic is likely to be reinforced by a mechanism of wishful thinking. Unfortunately, school- and university-based counselling activities do little to correct these biases, as they fail to provide students with a realistic picture of the actual job prospects with a university degree or a school diploma. In addition, information about university costs is of poor quality, and media reporting is often alarmist[11]. It may be noted that similar problems also involve other western countries (Mc Guygan, McNally, and Wyness 2012; Harris 2013). Moreover, the recent dynamics of credential inflation and the university reform that implemented a two-tier structure in the context of the Bologna process have deeply restructured the relationship between tertiary degrees and the graduate labour market. However, in Italy and in other European countries these transformations have not been consistently accompanied by efforts to make the new system more transparent to families and to employers.

Our third main conclusion is that information barriers are not equally distributed among social groups. High-status students overestimate economic returns to university degrees more, and they are more optimistic regarding their chances of success in Higher Education (even after allowing for their higher objective payoffs). Our interpretation is that, if institutional sources of information deliver poor signals as to the value of educational investments, the different information inputs originating from different social environments are likely to shape different views of the profitability of university education. However, the overestimation of university costs is similar across social groups. This finding contradicts our expectations. Nevertheless, we should note that the same absolute bias is more consequential for less affluent families, which perceive higher *relative* costs. On the whole, our results suggest that information barriers may fuel social inequalities in participation in Higher Education. Hence, the empirical evidence provided in this work suggests that educational research could benefit from incorporating information biases and their social structuring in theoretical and empirical models of educational decisions.

[11] It should be noted that our data were collected at the beginning of the senior high school year. Because of the above-discussed weaknesses of counselling activities, it is quite unlikely that students update their information and study plans to any significant extent. Indeed, there is evidence that only one student in ten changes her mind about university enrolment during the senior school year (Abbiati and Barone 2014).

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Appendix

Table A1 –Empirical studies on costs and benefits expectations

Expectations about benefits				
Selection criteria: studies written in English and published since 1980 that provide numerical estimates of expected costs and economic returns to university. Analytical sample: cases with valid information on earnings (or costs) expectations. Questions: generalised earnings (or costs) estimates refer to expectations about the "typical graduate", while individualised earnings/costs estimates refer to respondents' own expectations. Abbreviations: EE: Earnings Expectations; HE:Higher Education				
Reference	**Analytical Sample**	**Question(s)**	**Realism of Earnings Expectations**	**Differences by Social Origins**
Psacharopoulos and Sanyal (1981)	Nation-wide random sample of 9,105 college students in the Philippines	Individualised earnings at the start of their career, 5 and 10 years after with and without a university degree	Yes, for both individualised earnings and returns to university (relative to upper secondary school diplomas), at all career stages	Yes, father's income affects EE positively
Williams and Gordon (1981)	2,944 senior upper secondary school students in the United Kingdom	Individualised earnings at the beginning of the career, at age 26 and 46, with and without a college degree	Yes, at all career stages	No
Psacharopoulos and Sanyal (1982)	Nation-wide random sample of 1935 HE students in Egypt	Individualised earnings at the beginning of the career, 5 and 10 years after with and without a university degree	Yes, at all career stages	Yes, father's income affects EE positively
Smith and Powell (1990)	388 university seniors in two campuses in the United States	Individualised earnings and earnings of university peers and upper secondary school peers who did not attend university, at the start of the career and 10 years after	Yes, for both individualised and peers' salaries, at all career stages	Father's income affects EE positively but the effect of father's education is negative
Betts (1996)	1,269 undergraduates from University of California	Generalised earnings of different university degrees and of upper secondary school degree	No, median error of 20%; mean error of 6%; errors vary according to the field of study	Yes, father's income affects EE positively; no effect of father's education
Menon (1997)	Non-random sample of 811 senior upper secondary school students in Cyprus	Individualised earnings with and without a university degree, at the start of the career, after 4 years and at age 46	No, perceived returns to university degrees are considerably lower than actual returns at both career stages	-
Wolter (2000)	Non-random sample of 137 students in economic fields at upper secondary school (seniors)	Individualised and generalised earnings at the ages of 30 and 40 with and without a university degree	Yes, at all career stages	Father's income does not affect EE

	and Fachhochscule in German-speaking Switzerland			
Avery and Kane (2004)	Non-random sample of 293 senior upper secondary school students in four public schools in Boston	Individualised earnings with and without a university degree at the beginning of the career and at age 25	No, overestimation of both upper secondary school diplomas and university degrees (higher for university degrees, so estimated returns are higher)	Family background does not affect EE
Botelho and Pinto (2004)	Non-random sample of 273 university students in Economics from a single University in Portugal	Individualised and generalised earnings in specific fields, after 1, 4 and 20 years of experience with and without a university degree	Yes, for generalised earnings and for returns at all career stages. Individualised earnings are quite realistic, but higher	-
Brunello, Lucifora, and Winter-Ebmer (2004)	5589 undergraduate students of 32 Universities in 10 EU countries (mostly students in Economics)	Individualised earnings at labour market entry and with 10 years of experience	No, students overestimate graduate earnings considerably at all career stages	-
Webbink and Hartog (2004)	National panel study of 657 Dutch students who started HE in 1991	Individualised estimates elicited in 1991 compared with their actual values in 1995	Yes	-
Martins (2006)	Nation-wide random sample of 755 Portuguese undergraduate students in economics & engineering	Individualised earnings with a university degree at the beginning of the career	Yes (slight over-estimate)	Parental education affects EE positively
Attanasio and Kaufman (2009)	3,865 upper secondary school students aged 19 and their mothers in urban Mexico	Individualised earnings with and without a university degree at the beginning of the career	Yes for university earnings, but overestimation of upper secondary school diplomas, so estimated returns to degrees are low. This applies to students and to their mothers	-
Mc Guygan, McNally, and Wyness (2012)	Non-random sample of 14/15-year-old students in London	Individualised earnings with a university degree at age 30	Yes	-
Menon, Pashourtidou, Polycarpou, and Pashardes (2012)	243 university students and 233 graduates at University of Cyprus	Individualised earnings at the beginning of the career	Yes	-
Wiswall and Zafar (2013)	Non-random sample of 495 undergraduates attending New York University	Individualised and generalised earnings with and without a university degree	No, substantial overestimation of graduate earnings, especially for individualised beliefs and in the fields of Economics and	-

			Engineering	
Expectations about costs				
Reference	**Analytical Sample**	**Question(s)**	**Realism of costs expectations**	**Differences by social origins**
Olson and Rosenfeld (1985)	Random nationwide sample of 6,564 upper secondary school senior and sophomore students and their mothers (United States)	Generalised estimates of yearly costs of full tuition and books (not adjusted for financial aid)	No, large overestimation for both students and parents	Yes, high-income parents have better knowledge of university costs
Ikenberry and Hartle (1998)	Random nationally representative sample of 2,000 US citizens, with detailed estimates for parents of 12 to 17-year-old students	Generalised estimates of yearly total costs (not adjusted for financial aid).	No, large overestimation	Parental education affects the estimated costs negatively
Avery and Kane (2004)	Non-random sample of 293 senior upper secondary school students in four public schools in Boston	Generalised estimate of yearly costs of full tuition (not adjusted for financial aid)	No, strong overestimation	-
Loyalka, Song, Wei, Zhong and Rozelle (2013)	Random sample of 2,508 senior upper secondary school students in the Shanxi province	Yearly tuition fees	No, strong overestimation	-

*Table A2 – predictive models for graduate earnings ([a] Linear models; values expressed in euros; *** p<0.01, ** p<0.05, * p<0.1)*

Graduate earnings (master degree) [a]	**β (std.error)**	**Graduate earnings (bachelor degree)[a]**	**β (std.error)**
Sex: Male	*Ref.*	*Sex: Male*	*Ref.*
Female	-125.89 (10.09)***	Female	-126.27 (13.03)***
Geographical area of work: North	*Ref.*	*Geographical area of work: North*	*Ref.*
Centre	-59.9 (14.54)***	Centre	-55.0 (17.59)***
South	-149 (14.51)***	South	-122 (18.95)***
Abroad	535.2 (34.83)***	Abroad	431.2 (83.45)***
Citizenship: not Italian	*Ref.*	*Citizenship: not Italian*	*Ref.*
Italian	68.72 (32.01)**	Italian	-52.06 (32.24)
Age: 23-24	*Ref.*	*Age: 21-22*	*Ref.*
25-29	-3.3 (10.64)	23-24	-11.64 (12.04)
30 or more	48.51 (18.62)***	25-29	15.55 (13.37)
Parental education: primary or less	*Ref.*	30 or more	62.47 (17.92)***
Lower secondary	-6.8 (16.02)	*Parental education: primary or less*	*Ref.*
Upper secondary	10.13 (16.47)	Lower secondary	16.94 (15.87)
Tertiary	17.13 (18.71)	Upper secondary	5.861 (17.32)
Not available	-24.35 (70.49)	Tertiary	-6.039 (21.79)
Parental occupational position: Manual workers	*Ref.*	Not available	17.09 (50.34)
Routine non-manual	-30.70 (13.45)**	*Parental occupational position: Manual workers*	*Ref.*
Self-employed	33.20 (13.56)**	Routine non-manual	33.23 (13.97)**
Employee	12.35 (12.71)	Self-employed	30 (13.79)**
Managers, Professionals, Entrepreneurs	63.65 (14.79)***	Employee	26.43 (13.38)**
Not available	26.84 (36.59)	Managers, Professionals, Entrepreneurs	92.73 (17.72)***
Interaction sex geographical area*		Not available	27.40 (32.95)
Female * Centre	-10.27 (18.36)	*Interaction sex* geographical area*	
Female * South	9.39 (18.51)	Female * Centre	-3.11 (21.07)
Female * Abroad	-88.47 (62.2)	Female * South	3.28 (22.7)
Upper secondary school: general pre-academic, scientific	*Ref.*	Female * Abroad	94.65 (117.42)
General pre-academic, classical studies	-2.98 (12.19)	*Upper secondary school: general pre-academic, scientific*	*Ref.*
General pre-academic, linguistic and social/psychopedagogical	9.61 (13.61)	General pre-academic, classical studies	12.47 (19.37)
General pre-academic, artistic studies	-37.68 (44.22)	General pre-academic, linguistic and social/psychopedagogical	3.2 (13.09)
Technical	-13.10 (9.6)	General pre-academic, artistic studies	22.56 (38.29)
Vocational	-71.6 (20.83)***	Technical	-14.02 (11.37)
Upper secondary school final mark	0.813 (0.362)**	Vocational	10.73 (20.12)

Matriculation year: 1999-2000 and later	*Ref.*	Upper secondary school final mark	0.25 (0.393)
1998-99 and previous	-17.47 (11.73)	*Matriculation year: 1999-2000 and later*	*Ref.*
Field of study: Mathematics, chemistry, biotechnology	*Ref.*	1998-99 and previous	7.2 (18.94)
Engineering and ICT	101.2 (12.60)***	*Field of study: Mathematics, chemistry, biotechnology*	*Ref.*
Biology and Earth Sciences	-115 (16.56)***	Engineering and ICT	73.11 (30.89)**
Pharmacy, Veterinary Science	55.32 (26.83)**	Biology and Earth Sciences	-33.12 (37.31)
Health	428.6 (26.96)***	Pharmacy, Veterinary Science	23.65 (42.85)
Medical professions	275.9 (30.47)***	Medical professions	213.0 (28.47)***
Architecture	-64.8 (20.73)***	Architecture	-66.42 (49.62)
Business and Administration, Statistics	44.53 (13.39)***	Business and Administration, Statistics	69.60 (30.10)**
Social Sciences	-66.4 (15.76)***	Social Sciences	-15.57 (33.28)
Law	-39.53 (19.35)**	Law	64.93 (34.79)*
Arts and Humanities	-171 (16.15)***	Arts and Humanities	-10.62 (38.07)
Education, Psychology	-106 (17.92)***	Education, Psychology	14.46 (37.27)
Graduation mark: 66-90	*Ref.*	*Graduation mark: 66-90*	*Ref.*
91-100	42.35 (18.62)**	91-100	9.5 (13.85)
101-105	52.60 (18.93)***	101-105	15.57 (15.49)
106-110	75.81 (18.98)***	106-110	-2.1 (16.52)
110 cum laude	105.8 (19.18)***	110 cum laude	21.96 (19.14)
Work during studies: No work during HE lessons; started current job after graduation	*Ref.*	*Work during studies: No work during HE lessons; started current job after graduation*	*Ref.*
No work during HE lessons; started current job before graduation	147.0 (42.08)***	No work during HE lessons; started current job before graduation	32.54 (46.73)
Occasional work during HE lessons; started current job after graduation	17.65 (8.31)**	Occasional work during HE lessons; started current job after graduation	-19.86 (9.36)**
Occasional work during HE lessons; started current job before graduation	56.83 (18.23)***	Occasional work during HE lessons; started current job before graduation	6.2 (24.32)
Continuous work during HE lessons; started current job after graduation	93.42 (13.18)***	Continuous work during HE lessons; started current job after graduation	25.07 (15.26)
Vocational training: never enrolled	*Ref.*	*Vocational training: never enrolled*	*Ref.*
Interrupted	49.33 (30.47)	Interrupted	28.17 (24.53)
Concluded	-25.4 (7.57)***	Concluded	-4.5 (8.7)
Working time: full time	*Ref.*	*Working time: full time*	*Ref.*
Part-time	-425 (11.65)***	Part-time	-473 (13.79)***
Intercept	1,335 (44.08)***	Intercept	1,371 (52.4)***
N	12,182	N	6,820
R2	0.344	R2	0.337

Table A3 – predictive models for upper secondary school diploma earnings and drop-out risk

Upper secondary school diploma earnings[a]	**β (std.error)**	**Drop-out risk[b]**	**β (std.error)**
Sex: Female	*Ref.*	*Sex: Female*	*Ref.*
Male	157.88 (14.15)***	Male	0.134 (0.086)
Geographical area of work: North	*Ref.*	*Geographical area of the University: South*	*Ref.*
Centre	-40.87 (12.6)***	Centre-North	-0.31 (0.07)***
South	-145.57 (19.1)***	*Parental education: lower secondary or less or NA*	*Ref.*
Abroad	302.26 (160.6)*	Upper secondary	-0.35 (0.081)***
Citizenship: not Italian	*Ref.*	Tertiary	-0.65 (0.121)***
Italian	0.49 (36.12)	*Citizenship: not Italian*	*Ref.*
Parental education: primary or less or NA	*Ref.*	Italian	-0.224 (0.27)
Lower secondary	-31.8 (20.93)	*Upper secondary school: Vocational, industrial*	*Ref.*
Upper secondary	-26.95 (21.46)	Vocational, commercial	-0.048 (0.149)
Tertiary	-40.74 (31.85)	Technical, industrial	-0.916 (0.146)***
Parental occupational position: Manual workers	*Ref.*	Technical, commercial	-0.87 (0.14)***
Routine non-manual	-17.03 (14.88)	General pre-academic, linguistic and social/psychopedagogical	-1281 (0.154)***
Self-employed	0.3 (12.46)	General pre-academic, classical studies	-2.22 (0.162)***
Employee	32.55 (17.53)	General pre-academic, scientific	-2.24 (0.209)***
Managers, Professionals, Entrepreneurs	41.19 (22.77)*	General pre-academic, artistic studies	-0.61 (0.164)***
NA	7.39 (32.65)	*School failures: never*	*Ref.*
Interaction sex geographical area*		At least once	0.3 (0.111)***
Centre*Male	-24.76 (20.24)	*Conditional advancement to next grades: Never*	*Ref.*
South*Male	4.95 (24.43)	At least once	0.274 (0.273)***
Abroad*Male	369.76 (194.93)*	*Lower secondary school final mark: 'Sufficient' or 'Good'*	*Ref.*
Upper secondary school: vocational, industrial	*Ref.*	Very good and Excellent	-0.188 (0.084)**
Vocational, commercial	16.7 (13.99)	*Upper secondary school final mark (quartiles): 1st*	*Ref.*
Technical, industrial	20.69 (15.63)	2nd	-0.403 (0.106)***
Technical, commercial	41.49 (15.06)***	3rd	-0.644 (0.112)***
General pre-academic, linguistic and social/psychopedagogical	50.28 (25.69)**	4th	-1.2 (0.127)***
General pre-academic, classical or scientific studies	15.9 (36.44)	*Change region to study: NO*	*Ref.*
General pre-academic, artistic	-71.1 (17.4)***	Yes	-0.25 (0.093)***
Upper secondary school final mark	1.21 (0.57)	Field of study: Mathematics, biotechnology	Ref.
School failures: Never	*Ref.*	Engineering and ICT	-0.165 (0.153)
Once	5.07 (13.75)	Pharmacy, Veterinary Science, Chemistry	-0.25 (0.199)
Twice or more	9.24 (23.06)	Health	-1.46 (0.351)***

Conditional advancement to next grades: Never	*Ref.*	Medical professions	-1.63 (0.209)***
Once or more	-38.12 (11.5)***	Architecture	-0.95 (0.185)***
Working time: full time	*Ref.*	Business and Administration, Statistics	-0.31 (0.154)**
Part-time	-424.8 (14.74)***	Social Sciences	-0.432 (0.171)**
Intercept	937 (53.3)***	Law	-0.16 (0.191)
		Arts and Humanities	-0.28 (0.162)*
		Education, Psychology	-0.76 (0.168)***
		Continuous work during studies: No	*Ref.*
		Yes	0.193 (0.089)**
		Intercept	0.824 (0.211)***
N	7,720	N	13,700
R2	0.31	R2	0.17

[a] Linear models; values expressed in euros; [b] Binomial logistic models (1=dropout; 0=non dropout); *** p<0.01, ** p<0.05, * p<0.1