Information barriers, social inequality and plans for Higher Education: evidence from a field experiment

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Our article assesses the role of information barriers for patterns of educational participation and related social inequalities in plans for Higher Education (HE). Using longitudinal data, we investigate student expectations about the profitability of HE, their evolution over time and their correlation with study plans among Italian high school seniors. We find that student believes are highly inaccurate, systematically biased and poorly updated. Then, we present estimates of the causal effect of information barriers on educational plans based on a large-scale clustered randomized experiment. We designed a counseling intervention to correct student misperceptions of the profitability of HE and assessed whether treated students' plans changed differentially relative to a control group. The intervention was quite effective in correcting student misperceptions, but this did not translate into increased intentions to enroll in university education. However, the treatment affected preferences between fields of study, between short and long university paths, and between university and vocationally oriented programs. Hence, information barriers affect substantially the internal differentiation of HE and the related horizontal inequalities by gender and family background.

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1. Introduction

Educational stratification research has increasingly turned to rational action theory (RAT) to explain patterns of educational participation and related social inequalities[1]. This theory postulates that when families assess educational investments, they compare the available options and select the one that yields the highest expected value, defined in terms of expected costs and benefits (Breen and Goldthorpe, 1997). Hence, expectations lie at the heart of RAT. This raises the question of whether students have correct or biased expectations about education.

This article investigates beliefs about the profitability of Higher Education (HE) and their causal effect on enrolment plans in tertiary education. In western countries, HE has become increasingly complex to accommodate the growing amount and heterogeneity of students (Usher 2005). Differences between fields of study in university education have been complemented by vertical distinctions between bachelor's and master's courses; several countries have also widened their supply of vocationally-oriented courses. Additionally, these tertiary programmes offer an increasingly diversified mix of financial aid measures (grants, scholarships, and loans) that entail complex eligibility criteria. Hence, upper secondary graduates are confronted with several educational options that differ along multiple dimensions: costs, occupational returns and academic selectivity. All these developments suggest that students and parents may lack the knowledge and skills to navigate these increasingly complex systems of HE and to assess the costs, benefits and chances of success of different options.

These information barriers raise both equity and efficiency issues. Survey evidence indicates that families overestimate college costs and have poor knowledge of opportunities for financial aid

(Ikenberry and Hartle, 1998; Avery and Kane, 2004). Such information barriers can drive an underinvestment in HE and hinder the participation of less affluent students (Grodsky and Jones 2006). Indeed, some previous experiments indicate that, when students are provided with better information about tuition fees and/or individualised assistance with paperwork required to apply for financial-aid, their enrolment rates increase, particularly for working-class students (Loyalka et al., 2013; Oreopulos and Dunn, 2013; Bettinger et al., 2009). Moreover, it has been argued that these students may be more pessimistic about the difficulty of HE and the economic value of college degrees (Erikson and Jonsson, 1996:52). As a consequence, working-class families may underinvest in HE because they underestimate its profitability.

As for efficiency issues, there is widespread concern that students are poorly informed about the level and types of skills that are demanded in the labour market. Hence, information barriers may also fuel occupational imbalances among educational levels or tertiary programmes; for instance, among fields of study. However, the related evidence is inconclusive: two recent experiments indicate that field of study choices are responsive to information on graduate earnings (Wiswall and Zafar, 2015; Hastings et al., 2015), but two other experiments report null effects (Kerr et al., 2014; Mcguigan et al., 2012).

It should be noted that the available evidence mostly concerns Anglo-Saxon nations, whereas little is known about other western countries. This work provides empirical evidence on Italy, which seems an interesting test case. In this country tertiary attainment rates among adults are comparatively low, therefore most families have little familiarity with HE, and counselling about college is underdeveloped. At the same time, recent reforms have increased the horizontal and vertical differentiation of Italian HE, which previously virtually coincided with long university courses. As argued below, Italian students have yet to become familiar with this increasingly

complex system. Hence, information barriers may play a prominent role for educational decisions in Italy.

This article has a twofold purpose. First, using observational longitudinal data, we investigate student beliefs about the profitability of HE and their evolution over time among high school seniors. We find that student information are highly inaccurate, systematically biased and poorly updated. Second, we present estimates of the causal effect of student beliefs on educational plans based on a field experiment. We designed an educational guidance intervention to correct student misperceptions of the profitability of HE and assessed whether their plans changed differentially relative to a control group. The intervention was quite effective in correcting student misperceptions, but this did not translate into increased intentions to enrol in university education. However, it affected preferences between fields of study, between short and long university paths, and between university and vocationally-oriented programmes. Hence, misperceptions affect the internal differentiation of HE with significant consequences for a fair and efficient allocation of students in HE and in the labour market.

2. Educational plans, information barriers and their institutional context: a theoretical framework

We assume that educational plans reflect both instrumental considerations and intrinsic preferences. Concerning the former, according to RAT (Breen and Goldthorpe, 1997) families are responsive to the relative costs of education: they weigh the expected costs of educational options against their own economic resources. Moreover, they assess the expected occupational benefits of education against the current occupational position of the parents to minimise the risks of intergenerational social demotion. Finally, they assess the expected difficulty of tertiary programmes against the previous academic performance of their children to estimate their chances

of success. Hence, economic resources, parental occupation and previous academic results define the set of objective opportunities and constraints associated with education investments, but the model incorporates also an information component expressing the perceived profitability of educational options; that is, their expected costs, benefits and chances of success.

The empirical evidence supports these behavioural assumptions. It shows that students' educational decisions are risk-averse and responsive to the expected occupational returns to education and to the perceived chances of success in education (Van de werfhorst and Hosfstede, 2007; Stocké, 2007). The evidence regarding the role of expected costs and liquidity constraints is less conclusive (Stocké 2007; Carneiro and Heckman 2002), and for Italy a recent study indicates that these constraints do not play any major role in access to HE (Barone, 2015).

Educational decisions reflect not only instrumental calculations, but also intrinsic preferences involving the general consumption value of education (the enjoyment of studying, the postponement of job duties) and interest for specific subjects and occupations. Intrinsic preferences act as heuristics that facilitate educational choices by restricting attention to a narrow set of options. For instance, a student wishing to attend university may discard most fields of study because they are too far from his/her study interests or jobs plans. Intrinsic preferences may thus represent an additional constraint to the set of options that students actually consider.

Hence, information barriers affect the evaluation of the set of options defined by objective opportunities, constraints and intrinsic preferences. Misperceptions of these options can involve the *correctness* and the *accuracy* of expectations about the related costs, benefits and chances of success in HE. The former refers to the existence of any systematic over- or underestimation of the actual values of these decision-making parameters. For instance, students systematically underestimate their actual chances of success if the average perceived chance of success is lower than the actual one. However, even in the absence of a systematic bias, student expectations can

be highly inaccurate, if large errors in opposite directions balance out. For instance, even if the average perceived and the actual chances of success in HE are identical, some high-ability students may fail to appreciate their own high chances of success, and some low-ability students may underestimate their risks of failure. This lack of precision can seriously undermine the optimality of students' decisions.

There are good reasons to suspect that student beliefs are both systematically biased and highly inaccurate. Research on decision-making processes shows that individuals are not inclined to engage in elaborate processes of information-gathering. Rather, following a bounded rationality approach, we should expect that they tend to pick up the information more readily available in their social environment, with a limited understanding of its reliability and representativeness (Kahneman, 2003). However, information about HE collected from informal sources such as relatives and friends is often anecdotal, imprecise and poorly updated. Therefore, estimates of the profitability of HE based on informal sources will be highly inaccurate.

The provision of high-quality information in educational guidance activities can correct these misperceptions. However, school-based counselling in Italy offers only broad overviews of the contents of university courses. Universities are another important source of information: they present some figures about fees and grants on their websites, but because tuition levels and eligibility criteria are based on complex calculations, students must typically matriculate before knowing the actual financial commitment required to attend university.

Moreover, following the reform implemented in 2001 under the Bologna process, university education has moved to a two-tier system comprising three-year bachelor's courses and two-year master's courses. The reform initially enhanced university enrolment rates, but these have declined since 2007, currently reaching pre-reform levels (Vergolini and Schizzerotto, 2015). This reform has raised serious concerns about the market value of the new bachelor's degrees, particularly in a

context where the demand for skilled jobs has stagnated in recent decades (Marzadro and Schizzerotto, 2011; Schizzerotto 2013). These problems are exacerbated for graduates from the Humanities and the Social Sciences, whereas more applied-oriented fields, such as Engineering, Computing and the Health Sciences, still show positive occupational prospects (Almalaurea, 2013). Unfortunately, schools and universities provide transparent information about neither the weak economic prospects of bachelor's degrees nor the marked differences between fields.

As an alternative to university courses, upper secondary graduates may opt for the sector of vocational HE, which has been traditionally underdeveloped in Italy. Currently, the main option consists of two-year work-study programmes (*istituti tecnici superiori*) jointly designed by schools, firms and local authorities. These programmes cover fields with sustained demand for high-level technicians and their graduates enjoy positive occupational prospects, even in comparison with bachelor's graduates (Miur, 2014). However, these courses were introduced in 2011, and they still enrol small numbers of students. There are also several opportunities to attend post-secondary vocational programmes, but the supply of these courses is highly fragmented at local level, and weakly institutionalised. Students are often simply unaware of the existence of these application-oriented options and this is an additional information gap.

Overall, we would argue that in Italy institutional sources of information do little to remedy the information gaps, biases and inaccuracies coming from informal sources. In contrast, the lack of information about financial aid is likely to push students to overestimate university costs. At the same time, students do not receive transparent information concerning the poor market prospects of new bachelor's degrees, particularly in the fields of the Humanities and the Social Sciences. Therefore, they tend to overestimate economic returns to bachelor's degrees and fail to consider appropriately other options, such as participation in vocational HE. We designed an information

initiative to correct these misperceptions and we delivered it in the context of a field experiment, as described in the next section.

3. Experiment design

We ran a clustered randomised controlled trial, involving a random sample of 62 high schools from all upper-secondary streams2 located in four Italian provinces (Milan, Vicenza, Bologna, and Salerno), covering different areas of the country to enhance the external validity of our results.

3.1 Randomization, baseline equivalence and internal validity

Sample size was determined on the basis of power calculations and of considerations about the feasibility of the intervention. Sampling was stratified by both province and school stream; only four schools of the initial sample refused to participate and were replaced with other schools of the same province and stream. This procedure resulted in 31 pairs of schools belonging to the same province and school stream. We randomly assigned one school of each pair to the treatment and the other to the control condition. Control schools did not receive any placebo for both ethical reasons and feasibility constraints. No school left the project after we communicated the results of the randomisation. It was agreed that all 62 schools would receive the treatment, but that the control group would wait one year.

Table A1 in the appendix shows the distribution of several individual and contextual variables among treated and control students, thus providing evidence of the statistical equivalence of the two groups before the treatment; in the appendix we also document the absence of contamination among the two groups and the lack of treatment replacement among controls.

3.2 Data collection

Longitudinal data concerning student beliefs about the profitability of HE and enrolment plans were collected among treated and control students before and after the intervention. The first wave occurred in October 2013 (paper-based questionnaires) and collected data regarding students' social background, family resources and academic performance. The response rate was 99%. The second wave occurred at the end of the school year (May 2014) after the treatment and before the opening of university registrations. This second wave assessed whether treated and control students had updated their beliefs and plans about HE during the school year. The second wave was based on telephone interviews, and the response rate was 82.8%, virtually identical among treated and control students (82.9% and 82.6%, respectively).Overall, the equivalence between the two groups, the balance in attrition rates and the lack of contamination ensure a high level of internal validity. Moreover, the high level of participation of schools in the experiment and the high student response rates to the survey ensure high external validity.

3.3 Treatment design

The treatment involved all final-year students of treated schools and provided detailed information concerning costs, economic benefits and chances of success of different educational options. We met each single class separately on three occasions for a total of five hours. All meetings occurred during school time to maximise student participation. The meetings were held by professional educators of social cooperatives providing educational services who had been extensively trained and briefed by the research team.

During the first meeting (October 2013), these educators provided information on direct costs (tuition fees, study materials, meals, and transportation), on financial aid and on the indirect costs associated with foregone earnings. In the second meeting (February 2014), students were

confronted with data on economic returns to university degrees in comparison with high school diplomas. Differences between bachelor's and master's degrees and between fields of study were stressed, focusing on four indicators of occupational returns: time required to obtain first job, net monthly salary, over-education risks and horizontal mismatch across educational levels and fields. During the third meeting (March 2014), educators delivered information on dropout risks for different student profiles among fields of study. Moreover, they provided information on the vocational sector of HE in terms of available study opportunities, tuition fees and some general indications on occupational prospects.

These materials were based on the best data available for recent cohorts of students, collected by the National Statistical Office (Istat). More precisely, we used the surveys "Educational and occupational pathways of upper-secondary graduates" and "Occupational attainment of university graduates", both carried out in 2011 on students that had graduated four years before, and we computed predicted values for different student profiles.

The statistical results were then summarised into simple messages using visual formats suitable for power-point presentations in the classrooms. For instance, educators initially showed figures displaying detailed comparisons between fields of study for each occupational outcome. Then, they summarised these differences using a three-step scale with weak fields at the bottom (the Humanities and the Social Sciences), strong fields at the top (Engineering, Computing, Health-related fields) and the remaining fields in an intermediate position. Moreover, the information was highly targeted to the individual situation of each student. For instance, information on university fees and grants referred to the specific economic situation of each student and to the universities most often attended by the students of each province. Similarly, information on meal costs referred to standard meal packages in the cafeterias of these universities; for transportation, we mapped the cheapest travel solutions from the municipality of each school to these universities. Each

student reported his/her estimated cost entries in a personalised form that (s)he could bring home and discuss with parents. For occupational returns, we delivered data disaggregated by area of residence, school stream and tertiary field. Finally, data on dropout risks were differentiated by social background, gender, school stream and academic performance.

We performed an extensive pilot study to design the treatment and realised that students often endorse stereotypes about HE (e.g., "a university degree is worth nothing" or "having the right friends is what really matters") which could hinder their receptiveness to the information treatment. We familiarised ourselves with these views and in the treatment we discussed with students the most common stereotypes[3]. The treatment is described in some more detail in the online appendix (section 2).

Overall, the face-to-face format of this information initiative, its duration and the extensive use of targeted materials mark a significant difference from previous information treatments, which used short telephone treatments, booklets or web materials.

4. The evolution of beliefs and study plans in the final year of high school among control students

In this section, we trace the evolution of beliefs and of study plans about HE over the final year in the absence of the treatment, that is, in the control group. We thus describe the pattern of misperceptions of costs, benefits and chances of success that the treatment had to correct. To assess these misperceptions, we compare each student's subjective estimate for a given parameter with his or her actual values. Concerning subjective estimates, all students were asked to forecast: a) the four main cost entries (fees, study materials, meals, and transportation) to attend university in Italy; b) the net monthly earnings from full-time employment four years after graduating in their preferred fields of study (bachelor's or single-tier degrees); c) the net monthly earnings from full-

time employment four years after graduation from upper-secondary education (if they do not enrol in university); and d) the dropout risks in their preferred fields of study. In section 4 of the online appendix we report the exact wording of the items.

Concerning actual values, we exploited the above-mentioned surveys of the National Statistical Office on upper secondary and tertiary graduates. We used these data to regress dropout risks and earnings on gender, field of study, area of residence, citizenship, parental education and social class, upper-secondary stream and four measures of school proficiency. We could thus obtain predicted values for several profiles of students defined according to these variables. Then, we assigned the expected dropout risks and earnings to each student of our survey (with and without a degree in their preferred field) corresponding to his/her profile[4].

[Table 1 about here]

Table 1 describes how misperceptions evolved among students over the final-year, that is, between October 2013 (wave 1) and May 2014 (wave 2). These values refer to all control students, regardless of their intention to enrol in university. The top panel refers to the correctness of student expectations, computed as the average of the deviations of subjective estimates from actual values. At the beginning of the school year, students overestimated by 434 euros[5] their future monthly graduate earnings with a bachelor's degree in their preferred field. According to our predictive model, the average of their actual values is 1,444 euros, but their estimates were close to 1,900 euros on average, which corresponds to an upward bias of 30%. The second column shows that this huge overestimate was reduced by the end of the school year, but it remained substantial (188 euros). Moreover, the second row shows that respondents assessed quite realistically in both waves earnings of students not enrolling into university. This implies that students overestimated economic *returns* to university degrees. At the same time, at the beginning of the school year, they overestimated university costs by 146 euros per month. This huge upward bias (+72% of the actual

costs) remained unchanged over the school year. Students also overestimated to some extent the difficulty of university education, and this bias even increased over the school year.

The second panel of table 1 refers to the accuracy of student expectations, computed as the average of the *absolute value*s of the deviations of subjective estimates from actual values. When taking the absolute values, errors in opposite directions do not cancel out, and we see that student estimates are highly inaccurate for all parameters in both waves. For instance, graduate earnings are overestimated on average by 188 euros per month, but the average error made by each student amounts to 462 euros. This result reinforces considerably our conclusion that students face severe information constraints.

Overall, these descriptive results indicate that student expectations are systematically biased, highly inaccurate and only partially updated over the final high school year. Interestingly, the optimistic bias regarding economic benefits is counteracted by pessimistic biases about the costs and risks of failure of the investment in university education. For reasons of space, we do not display results by family background; suffice it to say that this pattern of findings holds across different social classes.

The survey pre-test indicated that students could meaningfully answer the questions concerning the profitability of university education, but these items were cognitively burdening. Therefore, in wave 1 we decided to investigate only expectations of economic returns in the short run (four years after graduation) and for the same reason we focused on bachelor's or single-tier courses (mobility between fields in the transition from bachelor's to master's courses is uncommon in Italy, and many high school students are highly uncertain as regards continuation to master level). However, in wave 2 we could also assess expectations of long-term career opportunities across several fields. We used this format: "*It is easier to find a job with good career opportunities for a graduate in technical fields (Engineering, Computing) than for a graduate in the natural sciences (e.g., Biology, Chemistry)"*. Students had to express their agreement on a 10-point scale. We submitted to them four

dichotomous contrasts between different field clusters reflecting the three-step hierarchy between strong, intermediate and weak fields described above. As reported in table 1, which indicates the mean agreement scores and the percentages of ratings below 6, a substantial minority of control students disagree that the pure sciences offer better career prospects than the Humanities (26%) or the Social Sciences (39%). There is also limited awareness that technical fields are more rewarding than the pure sciences (21% of disagreement)[8]. The average ratings are always below 7, indicating that only few students express high levels of agreement with these sentences. We may conclude that, by the end of the final year, students have limited awareness of the marked differences between fields in terms of job opportunities.

We now describe study plans and their evolution over the final year (*see* table A2 in the appendix). At the beginning of the year, a large majority of students state that it is either sure (42.1%) or likely (30.1%) that they will go to university. In the academic year 2014-15, the actual enrolment rate in the same provinces was 61%. Therefore, although study plans do not necessarily translate into actual decisions, they are fairly realistic at the aggregate level. Among students intending to matriculate, 14.9% plan to attend only a bachelor's course; the rest are either interested in a longer path (52.6%) or remain undecided (32.5%). Uncertainty concerning field of study choice is widespread: 79.5% of the students willing to enter university consider more than one course. Weak and strong fields account for 20.2% and 33.8% of the first options, respectively. Among students who do not plan to enrol in university, only 10% consider vocational training as an option.

Between October and May, student uncertainty is reduced, but the pattern of preferences remains unchanged. On one hand, the share of students expressing uncertainty about university enrolment (agreement with the sentence "I will *probably* enrol/not enrol") declines from 41% to 25.3%. Similarly, the share of students who are undecided between long and short university paths shifts from 32.5% to 4.4%, and the number of respondents who express a single field of study preference

doubles. On the other hand, study plans appear highly stable over the final year. The share of students stating that it is either sure or likely that they will attend university is virtually unchanged across waves (from 72.2% to 70.2%). Most significantly, if we cross-tabulate enrolment intentions across waves, we find that by the end of the school year, only 9.4% of the students have changed their minds (i.e. from going to not going to university, or vice versa). Similarly, the aggregate distribution of fields of study preferences is largely unchanged, and cross-tabulating preferences across waves reveals that four students out of five confirm their initial preference for a strong, intermediate or weak field[7]. The only significant change is the increased popularity of vocational training among students not intending to attend university (from 10.8% to 23.3%), but for the rest it appears that, over the final year, most students crystallise decisions that have been already largely taken.

5. Causal effects of the treatment on student expectations and study plans

We now assess whether the information treatment impacted on the highly inertial decision-making process described above.

Causal estimation method

For each outcome of interest, we estimated the Average Treatment effect on the Treated (ATT), which adjusts the effect of the treatment to take non-compliance into account. In our case, the effect of the programme refers to the students actually attending the meetings. A student from a school assigned to the treatment is considered as actually treated if (s)he participated in at least two meetings: 90.4% of the students assigned to the treatment have been treated. ATT estimates are retrieved from 2-stage instrumental variable regression models where treatment assignment is used as an instrument for being actually treated. In the first-stage equation, T indicates whether the

subject attends a school assigned to the treatment or to the control group[8]. The two sampling stratification variables, province (*P*) and school stream (*S*), are fitted as controls and, when available for any given outcome, we control for intentions in wave 1 (*I*) in order to gain statistical power. Hence, for individual *i* attending school *j* in province *k*, the first-stage equation takes the following form:

$$y_{ijk} = \alpha + \beta T_j + \gamma P_k + \delta S_j + \sigma I_i + \varepsilon_{ijk} \quad (1)$$

Standard errors are clustered at the school level. We also assess treatment effect heterogeneity by social origins and gender; in these models treated students sharing a particular trait (e.g., being female) are compared with the corresponding group among the controls.

Results

Starting from the effects of the treatment on student beliefs, the first four rows of table 2 refer to the same numerical estimates of the profitability of HE described above. As seen, by the end of the school year, the treatment lowered to some extent graduate earnings expectations (-41 euros per month), particularly for upper-class students (-110 euros), whereas it increased expected earnings with upper-secondary diplomas (+43 euros), particularly for the middle classes (+61 euros). In other words, the upward bias concerning returns to degrees has been reduced. At the same time, treated students expected to pay 68 euros per month less for university than control students did. Treated students learned that university is less expensive, and it seems that the treatment was particularly effective among students from underprivileged families. Finally, the treatment was barely effective with respect to expected dropout risks.

[Table 2 about here]

This picture is confirmed by the effects on qualitative items that we present as robustness analysis for comparison with the above results. Here again, as concerns high school diploma earnings ("a

high school diploma is worth nothing", agreement ratings on a 10-point scale), the treatment enhanced the perceived competitive value of high school diplomas. We confronted students also with a qualitative item on costs ("university is too costly for me"), and results confirm that treated students are less concerned about costs. The qualitative item on the perceived difficulty of university studies confirms that the treatment was not effective in this regard.

Overall, the treatment brought good news (university education costs less than expected) and bad news (university degrees are less rewarding than expected) to the students. Moreover, students were more receptive to the messages that were more relevant to their specific situation: underprivileged students listened more carefully to information about costs, the middle classes focused more on data on earnings with school diplomas, and the upper-classes internalised more the messages about graduate earnings.

The bottom panel of table 2 refers to perceived differences between fields in terms of career prospects. Treated students agree more with the sentence stating that technical fields offer better prospects than the natural sciences and that the latter are in a better position than the humanities and the social sciences. Hence, they interiorised also the threefold hierarchy of profitability between fields. Overall, treated students were receptive to the core messages of the treatment. However, if we compare the treatment effects with the information biases of control students, we see that these biases are quite far from being entirely removed, as reported also in previous experiments (Wiswall and Zafar 2013; McGuigan et al. 2012).

[Table 3 about here]

We move now to treatment effects on study plans, the main primary outcome of our trial. The first column of table 3 indicates that 70.3% of control students intended to attend university by the end of the final year. The third column shows that the treatment did not have any effect on university enrolment plans, nor did it reduce social origin differentials other than discouraging children of the

petty bourgeoisie (-5.4%). We performed heterogeneity analyses to assess whether the treatment had any effect on more targeted groups of students defined by gender, academic performance, school stream, bias in expectations concerning the profitability of university education and level of indecision about study plans before the intervention. We could not find any significant effect for any of the subgroups defined by these variables, nor for any plausible combination of them. This null effect is unsurprising in the light of our previous analyses: students had both pessimistic and optimistic biases concerning the profitability of university studies and, therefore, the treatment had cross-cutting influences on their cost-benefit evaluations. Moreover, social origin differentials in university enrolment plans are largely mediated by previous school paths and academic performance, rather than by economic constraints (Barone 2015). This may explain why working-class students updated their information about college costs, but not their enrolment intentions.

The following outcomes reported in table 3 refer to the internal differentiation of HE. To avoid selection bias, the effects are estimated on all students, including those who do not plan to attend HE. For instance, when modelling intentions to enrol in weak fields, we built a dichotomous variable that takes a value of 1 for students who state that they plan to enrol in university *and* choose a weak field, and takes a value of zero for all other students.

The preferences of treated students have shifted significantly towards longer tracks (+2.5%) and, correspondingly, stopping after the bachelor's has become a less attractive option (-3.6%; for controls the reference value is 21.8%). These effects vary weakly by parental occupation and education. The treatment also increased the preference for vocational tertiary education by 3.3% (21.9% in the controls). This effect is negligible for high-status students, but it reaches 4.9% for working-class students and 8.9% for children of the petty bourgeoisie. Moreover, the effect is stronger (9.6%) among students attending industry-oriented curricula of technical and vocational schools. Vocational options are more appealing for underprivileged students because they are less

costly and more application-oriented, but these students may thus be diverted from longer university studies. However, we have shown that the treatment did not discourage university participation of underprivileged students. Moreover, if we estimate this effect only on students who did not plan to go to university, we detect an even stronger main effect (5%) that reaches 10.6% among working-class students. Hence, the treatment encouraged underprivileged students who did not plan to attend university to consider vocational education as an alternative to labour market entry.

Moving to the choice of field of study, the share of respondents indicating only one field is higher by 2.7% among treated students (the value for the controls is 24.5%). Moreover, the treatment reduced the propensity to select weak fields by 2.1% (14.6% for the controls). We found that the effect involves girls (-3.3%) rather than boys (-0.6%); it is well-known that the former are more likely to choose weak fields. Moreover, the targeting analyses suggest stronger treatment effects on two subgroups of students. Firstly, among students who indicated a weak field as first or second choice in wave 1, the effect increases to 4.5%. Secondly, we detect an effect of 8.8% among working-class students attending humanistic curricula of general high schools, who display a high propensity to select weak fields. If we combine these two characteristics, we find a treatment effect of -11.3%. Overall, the treatment discouraged students who were initially more inclined to select weak fields.

The above-mentioned treatment effects are not substantively negligible. For instance, we have seen that 14.6% of control students intend to enrol in weak university fields and that the treatment effect is -2.1%; the potential consequences of this effect in terms of reduced supply and thus improved job opportunities for graduates of these fields are far from marginal. The reduction in the share of students intending to stop at the Bachelor's and the increase in the share of students planning to attend vocational programmes are even more important in substantive terms, particularly when contrasted with the corresponding values for the controls.

6. Concluding remarks

The analyses presented in this work have significant implications for RAT models of educational decisions. We have found that student beliefs about the profitability of HE are highly inaccurate, systematically biased and only partially updated over the final year of high school. Moreover, students show limited awareness of the marked differences between tertiary fields in terms of career opportunities.

Of course, it remains to be seen whether and how these biased beliefs affect the actual decisions of students[9]. In the literature it is often assumed that information constraints lead students to underinvest in HE because they underestimate its economic value (Usher 2005). However, our evidence for the Italian case depicts an alternative scenario, where pessimistic biases about costs are balanced by optimistic biases about graduate earnings. This overestimation of economic returns to college degrees is a novel result, which suggests that the direction of information biases is not predetermined and can reflect institutional arrangements and reforms.

We designed an information experiment to correct these misperceptions and to assess their aggregate consequences. Treated students interiorised the core messages of the intervention. They learned that college is less expensive, but also less rewarding, than they expected. They assimilated the threefold hierarchy of profitability between fields, and they received information about vocational alternatives to university.

Nonetheless, the treatment did not enhance intentions to enrol in university. The treatment brought both good and bad news to the students: these conflicting messages seem to have cancelled one another out.

However, the treatment shifted the preferences of the students intending to continue in education towards more rewarding options. It reduced the propensity to select weak fields and to stop

immediately after the bachelor's degree; it encouraged students to consider vocational education as an alternative to labour market entry. These results confirm our concerns that increased differentiation and complexity of HE entail significant information barriers.

Finally, providing students with high-quality information about university costs and financial aid did not reduce social origin differentials in university plans. This is in line with studies indicating that these differentials are not mediated solely by family economic resources. However, the treatment was effective in reducing social inequalities in two ways. Firstly, it pushed underprivileged students to consider vocational courses as an alternative to leaving education after the upper secondary degree. Secondly, working-class students attending general high schools were more discouraged from planning their enrolment in weak fields. Hence, the information initiative was particularly beneficial for underprivileged students. These results suggest that information barriers are consequential not only for the internal differentiation of HE, but also for related social inequalities. Of course, as stressed throughout the article, intentions are not decisions, but the former represent a necessary precondition of the latter. Moreover, we cannot assume that these conclusions hold also outside Italy and an interesting development for future research might be to carry out a similar experiment in a comparative framework to assess the role of institutional contexts.

Beside contributing to research concerning the role of information barriers for HE plans, our experiment could entail some relevant policy implications. First, it suggests that information campaigns can attenuate some of the most striking social inequalities in HE study plans. Second, it suggests that these campaigns can reduce the mismatch between supply and demand of skilled workers by restricting the pool of students inclined to enrol in educational programmes that display poor occupational returns. Providing students with accurate information does not entirely remove their information biases, but it can improve the efficiency and equity of decision-making processes concerning HE.

Endnotes

[1] This study stems from the project, “Information barriers in access to Higher Education”, funded by the Italian Ministry of Education, University and Research (funding ID: CUPE61J12000220001).

[2] In Italy upper-secondary education comprises general schools (*licei*), vocational schools (*istituti professionali*) and an intermediate stream (*istituti tecnici*) offering a mix of theoretical knowledge and applied skills. These streams give access to university in any field, regardless of previous school performance.

[3] We initially planned to involve parents, but in the pilot study we realised that their participation was so low that we would have informed only few highly motivated middle-class parents. Teachers could attend the meetings but only a minority came, and they seldom stepped into the presentations.

[4] We followed the same approach for university costs, but in this case actual values were computed using detailed administrative data, because no survey data was available. For more details, see section 5 of the online appendix.

[5] We focus on student estimates concerning the preferred field, but averaging them with estimates for the second- and the third-preferred field leads to the same results.

[6] There is no clear-cut hierarchy in terms of economic profitability between Economics, Law and the natural sciences. This situation is well reflected in the agreement scores concerning this contrast.

[7] If we use ISCED detailed fields of study (80 categories), we still find that 60.5% of the students do not change their first option and that an additional 13% shifts the first option with the second or third one.

[8] In the appendix (sections 6 and 7) we show that we obtain similar results if compliance is defined more narrowly as participating in all three meetings, and that intention-to-treat estimates lead to similar substantive conclusions.

[9] However, university plans, when measured at the very end of the senior school year, are highly predictive of final decisions. We analysed a survey conducted among high school diploma leavers in Northern Italy in 2012 and found that 83% of students intending to enrol at university in May confirm their choice after the summer; at the same time, 94% of those not intending to enrol in May did not change their mind.

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Tables

Table 1 – The evolution of expectations about the profitability of university education among high school seniors (control students): average deviations from actual values (average actual values in brackets)

		October 2013 deviations and actual values	**May 2014** deviations and actual values
Beliefs Correctness	Monthly graduate earnings in full-time employment (€)	+434 (1,444)	+188 (1,421)
Average of the deviations of subjective estimates from actual values	High school diploma earnings in full-time employment (€)	+76 (1,008)	+24 (1,008)
	Total monthly university costs (€)	+146 (204)	+152 (206)
	Dropout risks (%)	+4 (16)	+10 (13)
	N	3,579	
Beliefs Accuracy	Monthly graduate earnings in full-time employment (€)	+731	+462
Average of the absolute values of the deviations of subjective estimates from actual values	High school diploma earnings in full-time employment (€)	+311	+251
	Total monthly university costs (€)	+179	+178
	Dropout risks (%)	+15	+16
	N	3,579	
"Currently, it is easier to find a job offering good career opportunities for..." **Average agreement on a 1-10 point scale (% below 6 in brackets)**	- a graduate in technical fields (e.g., Engineering, ICT) compared with a graduate in the natural sciences (e.g., Biology, Chemistry)	-	6.9 (21%)
	- a graduate in the natural sciences (e.g., Biology, Chemistry) compared with a graduate in the Humanities (e.g., Philosophy, Foreign languages)	-	6.7 (26%)
	- a graduate in the natural sciences (e.g., Biology, Chemistry) compared with a graduate in the social sciences (Sociology, Political science)	-	6 (39%)
	- a graduate in the natural sciences (e.g., Biology, Chemistry) compared with a graduate in Law or Economics	-	5 (60%)
	N	3,968	

Table 2 – Effects of the treatment on student expectations

	value controls	Control for value in wave 1 (y/n)	main effect (std. err)	parental education			parental social class				gender	
				Tertiary	high school	lower secondary or less	service cl.	white collar	petty bourgeoisie	working class	male	female
Beliefs on the value of tertiary education												
Graduate earnings (€)	1609	Y	-40.53**	-84.23*	-58.12***	68.75	-110.2*	-25.77	-5.773	-19.43	-48.28*	-38.00
			(18.99)	(47.17)	(20.36)	(50.47)	(56.99)	(26.72)	(39.58)	(38.97)	(24.96)	(25.58)
High school diploma earnings (€)	1030	Y	42.77***	90.47***	18.76	66.49***	27.86	61.11***	62.71**	11.17	47.25***	28.94**
			(9.283)	(20.73)	(12.69)	(20.58)	(21.00)	(13.67)	(24.77)	(19.04)	(13.15)	(11.86)
Total monthly university costs (€)	359	Y	-67.50***	-57.30***	-66.21***	-82.13***	-59.60***	-62.63***	-65.58***	-87.24***	-62.81***	-72.13***
			(8.048)	(12.45)	(8.139)	(13.49)	(13.09)	(9.178)	(15.03)	(12.57)	(7.179)	(12.36)
Dropout risks (perc. points)	23.4	Y	0.605	-0.700	1.034*	0.898	1.291	0.233	0.500	0.902	0.347	0.756
			(0.473)	(0.599)	(0.570)	(0.909)	(0.846)	(0.685)	(0.919)	(0.943)	(0.539)	(0.651)
N (minimum)			6.796	1.706	3.833	1.257	1.453	2.563	1.091	1.689	3.231	3.565
Agreement with the following sentences *(1-10 point scale of agreement)*												
Currently, a high school diploma is worth nothing	6.2	N	-0.708***	-0.928***	-0.619***	-0.690***	-0.961***	-0.799***	-0.423***	-0.574***	-0.702***	-0.692***
			(0.0898)	(0.174)	(0.103)	(0.143)	(0.184)	(0.0893)	(0.162)	(0.144)	(0.105)	(0.106)
Studying at the university is too costly for me	5.4	Y	-0.593***	-0.656***	-0.524***	-0.665***	-0.476***	-0.565***	-0.517***	-0.739***	-0.601***	-0.581***
			(0.0901)	(0.198)	(0.0715)	(0.139)	(0.168)	(0.0974)	(0.126)	(0.122)	(0.0956)	(0.109)
Importance of the following issues on post-diploma choice *(1-10 point scale of agreement)*:												
The difficulty of university studies	6.3	N	0.00106	-0.110	0.0723	-0.0597	0.133	-0.0349	0.191	-0.146**	0.0482	-0.0547
			(0.0657)	(0.139)	(0.0820)	(0.0803)	(0.112)	(0.106)	(0.129)	(0.0702)	(0.0769)	(0.0964)
Currently, it is easier to find a job offering good career opportunities for… (1-10 point scale of agreement)												
a graduate in technical sciences vs natural sciences	6.9	N	0.349***	0.293***	0.369***	0.354***	0.349***	0.350***	0.467***	0.304***	0.370***	0.341***
			(0.0601)	(0.0941)	(0.0783)	(0.0964)	(0.0999)	(0.0793)	(0.111)	(0.0998)	(0.0761)	(0.0712)
a graduate in natural sciences vs humanities	6.7	N	0.470***	0.620***	0.489***	0.208***	0.610***	0.585***	0.300***	0.334***	0.406***	0.554***
			(0.0624)	(0.106)	(0.0680)	(0.0773)	(0.105)	(0.0981)	(0.108)	(0.0792)	(0.0758)	(0.0687)
a graduate in natural sciences vs social sciences	6	N	0.524***	0.731***	0.516***	0.268***	0.715***	0.594***	0.371***	0.374***	0.482***	0.597***
			(0.0643)	(0.0998)	(0.0647)	(0.0908)	(0.0967)	(0.0848)	(0.107)	(0.0931)	(0.0744)	(0.0732)
a graduate in natural sciences vs business and adm. and law	5	N	0.139**	0.0983	0.206***	-0.0461	0.124	0.145**	0.124	0.150	0.0773	0.224***
			(0.0607)	(0.119)	(0.0650)	(0.110)	(0.125)	(0.0738)	(0.121)	(0.0919)	(0.0708)	(0.0762)
N			7.522	1.884	4.208	1.430	1.599	2.797	1.211	1.915	3.580	3.921

* p<0.1; ** p<0.05; *** p<0.01

Table 3 – Effects of the treatment on study plans

	value controls	Control for value in wave 1 (y/n)	main effect (std. err)	parental education			parental social class				gender	
				tertiary	high school	lower secondary or less	service cl.	white collar	petty bourgeoisie	working class	male	female
Enrollment												
university enrollment (likely/quite likely)	70.3	Y	-0.598	<0.1	-2.78	0.49	0.41	-5.44*	<0.1	-0.60	-0.41	<0.1
			(1.13)	(1.56)	(1.36)	(2.04)	(1.74)	(1.34)	(2.82)	(2.20)	(1.41)	(1.40)
bachelor's only	21.8	Y	-3.55***	-4.79**	-2.47*	-4.52**	-3.25*	-1.29	-8.12***	-3.62*	-2.81**	-4.10**
			(1.17)	(2.13)	(1.37)	(2.24)	(1.87)	(1.60)	(2.85)	(1.91)	(1.15)	(1.70)
bachelor's and master's	45.4	Y	2.46*	2.98	2.42	2.11	4.12*	<0.1	1.54	5.30**	2.43	2.46
			(1.41)	(2.69)	(1.60)	(1.89)	(2.35)	(2.29)	(2.50)	(2.14)	(1.53)	(1.90)
vocational tertiary enrollment (likely/quite likely)	21.9	Y	3.31**	0.426	3.12**	6.13***	-0.610	1.53	8.90***	4.86**	3.01**	3.29**
			(1.32)	(1.76)	(1.59)	(2.28)	(1.27)	(1.41)	(2.78)	(2.25)	(1.41)	(1.67)
N (minimum)			7.431	1.865	4.174	1.392	1.589	2.768	1.195	1.879	3.552	3.879
Field of study (dummies)												
only one field chosen in wave 1	24.5	Y	2.66*	3.60	3.01	0.22	0.446	4.66**	0.657	3.11	<0.1	5.87***
			(1.59)	(3.15)	(1.90)	(2.20)	(3.03)	(2.11)	(2.74)	(2.13)	(2.02)	(2.05)
strong fields	21.5	Y	1.29	-0.71	2.63**	-0.551	0.52	0.68	3.12	<0.1	-0.67	3.56***
			(1.02)	(2.47)	(1.10)	(1.82)	(1.65)	(1.33)	(2.12)	(1.63)	(1.45)	(1.20)
weak fields	14.6	Y	-2.10**	-2.22	-2.24**	-1.43	-1.58	-2.07	-1.69	-1.90*	-0.562	-3.28**
			(0.963)	(1.91)	(1.11)	(1.35)	(1.65)	(1.48)	(1.50)	(1.00)	(0.915)	(1.51)
N (minimum)			7.519	1.883	4.206	1.430	1.599	2.794	1.211	1.915	3.579	3.919

* p<0.1; ** p<0.05; *** p<0.01