Students' Academic Self-Perception

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Abstract:
Participation rates in higher education differ persistently between some groups in society. Using two British datasets we investigate whether this gap is rooted in students' mis-perception of their own and other's ability, thereby increasing the expected costs to studying. Among high school pupils, we find that pupils with a more positive view of their academic abilities are more likely to expect to continue to higher education even after controlling for observable measures of ability and students' characteristics. University students are also poor at estimating their own test-performance and over-estimate their predicted test score. However, females, white and working class students have less inflated view of themselves. Self-perception has limited impact on the expected probability of success and expected returns amongst these university students.

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1. Introduction

For decades, ensuring equal opportunity in access to higher education has been one of the main aims of policy makers, with the introduction of policies ranging from improved information to positive discrimination. Despite these efforts, and the general expansion of participation in higher education, large gaps in access between groups remain. This paper investigates the effect of students' perception of their absolute and relative ability on participation. Perceived ability affects the expected costs and benefits of attending higher education and might thus impact on the decision to attend university. Firstly, this paper explores the correlation between academic self-perception and the decision to attend university. Secondly, we examine whether differences in academic self-perception are related to socioeconomic background, and hence whether gaps in educational attainment between socioeconomic groups might be rooted in differences in self-perception. Finally, we assess whether self-perception of current abilities is correlated with expectations of success in future academic work and with expectations of the benefits of higher education.

The paper uses two British datasets and focuses on three groups with relatively low higher education participation: lower social class, male and white pupils. The reasons for gaps in attainment between these groups are not well understood. The higher education attainment gap may stem from differences in family resources, secondary education quality, heterogenous returns, peer effects or market failures to name a few of the factors. Market failures are multiple. First, in the absence of full publicly-guaranteed loans or grants, pupils may be deterred by the costs of entry into higher education. Evidence regarding financial constraints is mixed. For example, experimental evidence on the Educational Maintenance Allowance, a means tested benefit for 16 to 18 year olds in the UK, supports the view that financial support increased participation for poorer pupils (Battistin et al., 2004). In the US, student aid increased college participation and completion in Georgia (Cornwell et al., 2006, Dynarski, 2003) but not in Tennessee (Penn and Kyle, 2007). Altogether Carneiro and Heckman (2003), calculate that financial constraints can only explain about 10% of the gap in educational attainment in the US; and probably less in the UK since tuition fees are lower.

A second type of market failure involves imperfect information on the costs, benefits or quality of higher education. In the UK, information on costs[1] and quality is fairly easily available at low cost, although pupils from families that have never experienced higher education have lower rates of participation, suggesting that differences in the information set matter (DfES, 2003). Evidence from Canada for example, shows that poorer families grossly under-estimate the returns to education and over-estimate tuition costs (Usher, 2005).

This paper focuses on a third type of failure: academic ability perception. Ability plays a critical role in the decision to invest in higher education, the choice of institution and degree, and the chances of completion. Underestimating ability could reduce enrolment, as students overestimate the difficulties, under estimate their probability of success and doubt they have the talents to reap labor market rewards. Conversely, over confident individuals may enter higher education without considering the competition and find that they are out of their depth, potentially crowding out more able students. In a qualitative analysis of young people in England and Wales (Connor et al., 2001), 13 percents of pupils cited uncertainties about their ability as the main reason for not going to university. Teachers' perceptions of children's abilities could also have a part to play in higher education decisions, and we consider this issue in Gibbons and Chevalier (2008). However, here we focus on students' *self-perception* of their own academic abilities. We discuss the existing literature on self-perception in Section 2.

[1] There have been changes to the costs structures of higher education in the last decades but in all periods a unique price was charged by almost all higher education institutions. So differences in the information about the tuition costs of higher education are unlikely to play a major role. The main costs of attending higher education are thus foregone earnings and living costs. Nonetheless 35% of pupils who did not apply felt they did not have enough information about the cost of going to university (Connor et al., 2001)

We rely on evidence from two datasets that together reveal complementary evidence. First, we use the 2003 “England and Wales” component of the Program for International Student Assessment (PISA) which tested grade 10 students (age 15) in mathematics to elicit measures of confidence in mathematics and students’ expectations regarding attending higher education. We assess whether self-perception and expectations differ between demographic groups and whether it is related to higher education participation expectations. A drawback of this dataset is that it relies on general math confidence and contains no information about expected relative ranking.

To gain more insight into absolute and relative ability expectations we conducted a small on-line study of the expectations of incoming first-year university students (referred thereafter as the Student Expectation Survey). This survey was conducted at two British universities and asked students to evaluate their own performance at tests in literacy and numeracy, both in terms of absolute and relative scores. Additionally, we investigate whether academic self-perception is correlated with studying strategy, estimated probability of success and expected returns to education. The two surveys are described in more details in Section 3. The remaining of the paper presents the main results in Sections 4 and 5 for grade 10 pupils and first-year university students respectively. Section 6 provides brief further discussions and conclusions

2. Literature

Psychologists have long documented that there is a weak correlation between actual and perceived performance in several domains – see Dunning et al. (2004) for an extensive review. In the academic domain, the correlation between first-year college students’ own and instructors’ evaluations, for example, is only 0.35 (Chemers et al., 2001). Other work highlights the relevance of sex, age, social class and reference group (Wiltfang and Scarbecz, 1990; James, 2002), and in particular the “big fish little pond effect” by which individuals’ self-esteem is negatively related to the academic achievement of peers (Marsh and Parker, 1984). Institutions may affect self-perception, for example, if higher quality schools provide more accurate feedback to their pupils making them better at judging their own performance (see Dunning et al., 2004).

Students generally over-estimate their own ability (Falchikov and Boud, 1989) but are better at predicting the mean group outcomes. Hence for most tasks, more than p% think that they belong to the top p-percentile (Krueger, 1999). In England, 96% of secondary school pupils believe that they are “Average” or above when asked how good they are at their school work (Gibbons and Silva 2007) and predict GCSE[2] scores 10% above their actual achievement (Sullivan, 2006). In higher education too 90%, of first-year students reported being average or above average (Thorpe et al., 2007). Some of these studies also report that female and lower social class pupils under-estimate their own performance (Sullivan) and over-estimate the average performance of the group (Thorpe et al.). This positive self-image arises because individuals are egocentric and use their own (expected) outcome to predict their relative standing neglecting to consider the difficulty of the tasks for the others. Moore and Kim (2003) show that the easier the tasks the more positive the image of the self. For more challenging tasks, individuals are overly pessimistic regarding their relative position. Moreover, less competent students tend to have poorer judgment (Hacker et al., 2000). This may be because similar skills are needed to succeed at the test and to judge own performance.

These differences in self-perception have important consequences. Marsh et al. (2005) use longitudinal data to show that students who are better at assessing themselves allocate study time more efficiently and have better academic outcomes. However, Baumeister et al. (2003) in their review find no causal effect of self-esteem on educational attainment, maybe

[2] GCSE is a national examination taking place at the end of compulsory schooling.

because over confidence has adverse consequences when participating in risky activities[3]. For example, Camerer and Lovallo (1999) demonstrate that individuals exhibit "reference group neglect" when competing, correctly estimating that the average gain is negative but predicting positive gains for themselves, thus creating excess entry. A similar argument might lead to excess entry in higher education which, when the supply of higher education is fixed, crowds out the less-self confident but potentially more able pupils.

3. Data and descriptive analysis

3.1. PISA 2003 and the self-perception of 15 year old pupils

Compared to previous evidence that relied on small samples, the "England and Wales" 2003 PISA contains 9,535 observations[4]. PISA is a triennial international survey organized by the OECD to assess 15-year old knowledge, the 2003 wave focused on mathematics[5] and included questions on mathematical confidence in general (not the specific test). Specifically, students were asked how confident they felt solving different types of problems, which is used to derive a *mathematical efficacy* score. *Mathematical anxiety* and *mathematical self-evaluation* are similarly computed, based on five questions each, such as "I often worry that it will be difficult for me in mathematic classes", and "I learn mathematics quickly" respectively. All scores are normalized to a mean of zero and a unit standard deviation; the correlations between these three concepts of academic self-perception range (in absolute value) from 0.50 to 0.70.

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[3] Drivers who attended a course to improve ice-driving had more accidents after the course than a non-treated group of drivers as the self-confidence boost was greater than the improvement in ability (Christensen and Glad, 1996).

[4] England and Wales were not included in the final PISA report due to lower school and student participation rates than advocated by the OECD protocol. However, Micklewright and Schnepf (2006) show that the sample is nonetheless representative.

[5] The 2000 PISA does not contain information on perception of competence in language. Several measures of math scores are available in PISA (OECD, 2003). Here we use the normalised first plausible value. Using a principal component of the first 5 plausible values led to similar results.

PISA 2003 also contains information on parental occupation (to define social class[6]), migration status and a large array of family characteristics. The PISA dataset samples schools and, secondarily, pupils within these schools, hence we can define individual and school average scores. Importantly for our purposes, participants were asked to report the highest qualification that they expected to achieve.

[Table 1: Here]

Descriptive statistics are shown in Table 1. Boys outperform girls in math in absolute and relative scores. They also report significantly greater efficacy, evaluate their mathematical skills more positively and show lower levels of anxiety. However 51% of girls expect to obtain a higher education qualification but only 41% of boys do. This gender ratio (51/41) equals the 2004/05 gender balance in higher education (HESA 2004). Turning to social class, pupils with professional parents (SOC II) are the highest performers, have the greatest level of self-confidence in math and are the most likely to expect to go to university. Pupils from the lowest social class (SOC V) have the worst outcomes. The gap in expected attendance at university between the top 2 and bottom 3 social classes is 24 percentage points, similar to the observed gap in attainment in England. Lastly, natives perform significantly worse than non-native in absolute terms, but not in relative scores. Compared to non-natives and first-generation pupils, native pupils have lower levels of academic self-esteem, and a smaller proportion expects to go to university. For these outcomes, PISA is in line with national evidence.

[6] Occupation is reported at the four digit level for both parents. We use the first digit only and report the higher occupation. We then recode occupation in 5 categories only (roughly accounting each for 20% of the sample). The categories are Managers, Professionals, Associate professionals and Secretarial, Craft and related occupations, and a final category for all remaining occupations.

3.2. *Students Expectation Survey and the self-perception of 1st year undergraduates*

Our second data source is an online survey of first-year students at two British universities students, carried out in October 2005 during the first week of term[7]. The sample obviously suffers from selection issues relative to the population of school leavers, since it includes only individuals who entered university[8]. Since only a minority of lower social class individuals goes to university, those that observed might have high self-esteem relative to their peers, thus biasing our estimates of the population social class effects downwards. Despites these drawbacks the survey provides unique information that is pertinent to our research question that is not found in any other dataset.

Before seeing the questionnaire, students completed two short tests in numeracy and literacy similar to those used by the Teacher Training Agency and Thorpe et al. (2007). The numeric test contained 10 mental arithmetic problems which had to be completed within 20 seconds each. The literacy test consisted of three sections: spelling, grammar and comprehension which had to be completed in less than 5 minutes. The scores are calculated as one point for each correct answer and the maximum recorded score on both tests is eight. Note that the questions are not multiple-choice, so students cannot guess the correct answer.

After completing the tests, students evaluate their own and others' average score, as well as their expected position in the test distribution[9]. Even if the tests are noisy or biased measures of ability, we would still expect the self-perception responses to be unbiased

[7] Students registered in Economics (both institutions) and Psychology, Law, Language and business (Institution B) were asked to complete the tests and questionnaire. Students were informed during the initial contact that on completion of the questionnaire they would enter a lottery for a monetary prize. It is generally believed that there is a positive relationship between ability and lecture attendance. Hence the selected population is probably more able than the potential population. If ability is positively related to self-perception, this is likely to bias our estimates downwards.

[8] Students were surveyed in the first week so that their expectations and perceptions would not been affected by their experience of higher education. Thirty "non-first year" students are excluded from the analyses. Three additional students had to be excluded due to non-response on some of the control variables.

[9] Since students may have a limited understanding of distributions; the exact phrasing of this question was kept as non-technical as possible. "If you can imagine the spread of marks from all the new students please indicate how you think you have performed. For example, if you think you were in the top 30% of marks (but not top 20%) select the 'top 30%' category".

estimates of expected achievement. The measure of expected relative performance is particularly interesting since, after just a few days at university, students would have little objective information on the quality of their peers, so this measure must reflect their preconceived position in the ability distribution.

[Table 2: here]

Table 2 provides descriptive statistics. The majority (54%) report themselves as being "middle" class, with 16% describing themselves as "upper" and 19% "working" class. The remainder did not provide an answer[10]. Women (45%) and ethnic minorities (12%) are under-represented by about 10 percentage points relative to national statistics.

The students have the following demographic characteristics: 90% are aged under-21, 6% describe themselves as disabled, 10% are non-UK residents and 45% are the first member of their direct family to go to university. The remaining variables relate to test scores and academic self-perception. The students struggled with the math test and the mean score is only 2.7 out of 10. For each numeracy question between 6% and 50% of students did not answer. However, 90% of students answered 5 or more questions and only 2 students had missing responses on all 10 questions[11]. There is also no evidence that the response rate decreased as the test progressed. One concern might be that participants did not try to get the correct answers. However, the correlation between response rate and the difficulty of the question (proxied by the proportion of students who answered correctly) is 0.55, suggesting that non-response could be due to a genuine lack of knowledge. In literacy, 89% of students answered all questions.

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[10] In 2001/2002, 26% of young entrants to full time degree courses came from skilled manual, partly skilled and unskilled background (Admissions to Higher Education, 2004), which are likely to be individuals self-declaring themselves as working class. Excluding the non-respondents, 22% of our sample is from working class background which is not significantly different from the national statistics. Self reported class is often unreliable but is the appropriate measure here since self-perception is related to the group that the individual believes to belong to rather than the true group.

[11] As a robustness check, the empirical analysis was also conducted on the sub-sample of participants who answered at least one numeracy question correctly. The results are similar to those presented later in the paper.

Students over-estimate their own numeracy score: expecting to score 3.50 on average, 0.77 points or 28% more than realized. However, the correlation between predicted and realized score is high (0.74). Respondents have an 'egocentric' view and did not take into account that other students were likely to struggle too. Thus, they over-estimate the average group score by over 2.5 points and are overly pessimistic in estimating their position in the score distribution, placing themselves on average at the 38th percentile[12]. The correlation between predicted and realized decile is 0.52. The pattern of results for the literacy test is similar. Students over-estimate their own performance by 20% and their error in predicting the group score is similar in both tests. On average, students are overly pessimistic about their relative position, ranking themselves at the 43rd percentile. Curiously, the correlation between realized and predicted achievement in literacy is very low, both in terms of the test score (correlation of 0.2) and the decile position in the distribution (0.15).

[Figure 1: Here]

We now investigate whether the gaps between realized and predicted test scores differs by sex, social class, or ethnicity. Figure 1 reports the distribution of realized and predicted math scores separately for low and high social class students and by gender. For all groups, the distribution of predicted scores lies to the right of the realized score distribution.

Individuals from all social classes over-estimate their performance but those from lower social classes have, on average, the smallest bias. The mean gap between true and expected score is a full point for upper class students, but only 0.5 for lower class. The relationship between self-estimation bias and social class amongst these university students is monotonic, with upper class students being the most self-confident. Girls under-perform boys by a full point in numeracy, but the average gap in expected performance is even higher at 1.5 points,

[12] Note also that students did not assume that the tests were designed to return a mean of 5 out of 10. The median predicted group score is 5 for numeracy and 6 for literacy, but a full distribution of scores is reported. This variable thus represents students' judgement of the group ability.

as women overestimate their performance to a lesser extent than men. The differences by ethnic groups are less pronounced, with no significance difference between ethnic groups in either mean expected or realized performance (not reported). Results for literacy are similar and can be found in Chevalier et al. (2007).

These results for first-year undergraduates are in line with the previous literature: all groups of students significantly over-estimate their own and their peers' performance, especially in tests that they find difficult. Boys and pupils from higher social class over-estimate themselves the most.

4. Regression evidence based on 15 years old pupils

4.1. Links between pupil characteristics and self-perception

We now consider the links between the socioeconomic characteristics of pupils and their self-perceived maths ability, using the PISA dataset. All models are estimated by ordinary least squares separately for boys and girls[13] and include a range of controls listed in the notes to Figure 2, which reports the coefficients of interest.

[Figure 2: Here]

Pupils from the higher-ranked social groups score between one third and one half of a standard deviation above those from the lowest two social backgrounds. In part this could be due to lower school quality (peer groups, teaching quality etc.), but the social class differences persist – though attenuated – when using pupil-school relative test scores. Thus, the difference in test by social background cannot solely be due to school characteristics.

[13] A pooled model was also estimated. Boys score 0.14 of a standard deviation greater than girls in absolute and relative scores, and rate their efficacy, anxiety and self-concept 0.35 of a standard deviation higher, 0.33 of a standard deviation lower and 0.34 of a standard deviation higher respectively but are 15% less likely to expect to go to university.

After controlling for pupils' environment, own and school test scores, there are still significant differences in academic self-perception by social class. As in Baumeister et al. (2003) own test performance is highly positively correlated with self-esteem. The greater self-perception of higher social class pupils, observed in Table 1, disappears when controlling for own test-score. Contrary to Sullivan (2006), pupils from higher social classes show lower self-efficacy, lower self-evaluation, and greater anxiety. This may be due to the "big fish small pond effect" (note that school score is negatively correlated with self-perception), where pupils in more affluent families have lower self-esteem because their reference peer group has higher average ability. Alternatively, the lower self-esteem of individuals from higher social background could stem from higher parental expectations creating additional performance pressure on the children. All these conclusions are similar for boys and girls.

4.2. Links between self-perception and higher education expectations

We now investigate the relationship between perceptions and pupils' stated intentions of going to university using a linear probability (OLS) model as reported in Table 3[14].

[Table 3: Here]

We first estimate the model without any controls for self-perception or test performance. Girls from the top two social classes are 10 percentage points more likely to expect to go to university than girls from the baseline social class. First generation pupils are also 16 percentage points more likely than natives to expect to continue to higher education. The social class gap disappears when own and school test score are included (column 2) which suggests that any impact of social class on higher education participation works through differences in achievement and schooling that are already manifest by age 15, as in Chowdry et al. (2008). Adding mathematical self-perception does not alter these conclusions. However, self-perception matters; a one standard deviation increase in efficacy is associated

[14] Marginal effects from a probit model are similar to the reported OLS estimates. Models including school fixed effects rather than the school mean test scores were also estimated and lead to very similar results.

with a six percentage point increase in the probability of expecting to attend university, equivalent to a half standard deviation change in own test score and to a two standard deviation shift in the school score[15]. The effect of self-evaluation is only half that size and anxiety is never significant. Interactions between self-perception and social class were also included but were never statistically significant.

To summarize, self-perception differs by social class and is correlated with the decision to attend university. However, the effect of self-perception on higher education expectations operates independently of social class background and self-perception may not explain the educational attainment gaps that are observed by gender, social class or ethnicity.

5. Evidence amongst first-year university students

5.1. First-year students' test performance

We now check if test performance and the probability of answering test questions are correlated with gender, social class or ethnicity. The OLS estimates are presented in Table 4.

[Table 4: here]

All models include the additional regressors listed in the table. Men outperform women in numeracy by a full point even after controlling for prior achievement but there are no class or ethnicity differences. In literacy the gender pattern is reversed and women out-perform men by 0.4 points, white students score 0.5 points higher than non-white students, but again there are no significant class differences. We also estimate total non-responses controlling for the test score. Only 22% of students responded to all numeracy questions and there is a large variation in non-response. In literacy, 89% of pupils responded to all questions and there is insufficient variation for the results to be informative. Male students reply to 0.7 more

[15] If the test score and the self-perception are both proxy for ability, we would expect that the inclusion of one would lead to an increase in the standard errors of the estimate for the other. This is not observed which give us some confidence that the two variables are not measuring the same concept.

questions than female, whilst working class students replied to 0.6 or 17% fewer questions than upper class students. We are unable to distinguish whether these students are slower, or less confident at guessing an answer.

5.2. *Evaluating own performance and relative position*

Table 5 presents estimated coefficients from models in which we regress pupils' predicted test scores for numeracy (Columns 1), or literacy (Column 2) on pupil characteristics. All specifications include realised test performance, so the coefficients can be interpreted as the determinants of the expectation bias[16]. The positive constant indicates that all students over-estimate their score but as in Dunning et al. (2004), more able students have a smaller bias. In numeracy male students over-estimate their performance by an extra 0.6 points compared to females. Students from working class under-estimate their score by 0.7 points compared to upper class students, but no significant difference is found for white students. These estimates may appear small but imply that female and working class students under-estimate themselves by 20% to 25% at the mean compared to other students. Students are poor at predicting performance in literacy and 70% of students over-estimate their score. Males again over-estimate their score, by an additional 0.42 points or 10% at the mean, but not whites or working class students[17].

[Table 5: here]

The estimates may be biased if unobservable characteristics, such as school quality, are correlated with the variables of interest and with predicted score. As a robustness check we

[16] We also estimate a model where the difference between the predicted and realised score is used as the dependent variable. Such a model is less flexible than the one presented since it imposes a coefficient of -1 on the realised score. Results from this model do not differ widely from those presented.

[17] A model including interaction between score and the group identifiers estimates that for males, each additional test point lead to an over-estimation of own performance by 0.24 point. Other interactions term were never found significant in the numeracy test. In the literacy model, the interaction between social class and score is significant and when included the main term also becomes significant and negative.

estimate both self-assessments simultaneously using a Seemingly Unrelated Regression Equations (SURE) model. We reject the independence of the errors terms (corr = 0.39) but none of the previous conclusions is altered. Alternatively, we re-estimate the OLS models including the prediction bias at the other test, so as to capture unobservables affecting both predictions.

The numeracy results remain largely unchanged but the estimated coefficient on working class is reduced by 10%. In the literacy model all pupil characteristics other than test score become insignificant. Column 3 and 4 report estimates of the bias in relative self-perception[18]. Being egocentric, students under-estimate their relative performance in numeracy by 1.1 decile but over-estimate it in literacy (+1.8) Compared to girls, boys over-estimate their position in both numeracy (by 0.9 deciles) and literacy (by 0.4 deciles). White and working class students under-estimate their relative position by 0.4 to 0.7 deciles[19]. Higher test performance reduces the bias in relative perception. Similar robustness checks to those described for own test performance are conducted but do not alter the conclusions.

To summarize this section, students are poor at predicting their own score. Moreover, self-assessment depends on observable characteristics. Girls and working class students over-estimate their performance to a much smaller extent than other pupils. These differences are the most salient in numeracy where the gap reaches 20% to 25%. Students under-estimate their ranking in numeracy and over-estimate it in literacy, maybe because the latter test was perceived as easier. White students under-estimate their ranking. The self-assessment error is not due to unobserved characteristics correlated with gender, class, or ethnicity.

[18] For this we compute scores with a penalty for wrong answers which increases the dispersion of scores. This improves the precision of the estimates but does not substantially alter the conclusions compared to a score attributing points only for correct answers.
[19] The estimate on social class becomes significant when interaction terms with test score were included in the literacy model. In all models, social class is marginally insignificant with p-values around 0.11

5.3. Studying behavior and other expectations

The survey also contains several measures of academic motivation, expectation of success and risk which are likely to be correlated with the decision to participate in higher education. We check whether these are correlated with academic self-perception or differ by gender, social class, and ethnic group. Each measure is based on a 4-point Likert scale, with the highest agreement coded as 4. Students who responded "did not know" are excluded so the sample size varies for each statement (with a maximum of 7% missing observations on any one statement). Our modeling approach uses an ordered probit and Table 6 reports the marginal effects, estimated at the mean for the probability of responding "I agree strongly" (the highest level of agreement). The specifications comprise pupil characteristics including prior achievement measured by A-level point scores. Men put less effort in understanding things, are less worried that they are not good enough for the course and are more confident that they will keep up with others. These results are in line with the view that men have more self-confidence. Working class students are less confident on all measures, there is a 9 percentage point gap in the belief that they are not good enough and that they can keep up with the others. Moreover they enter higher education to get a specific job and as such, are less likely to agree that they would rather choose a degree they can complete than a more difficult one with higher earnings. Despite these perceptions, working class students also admit that they do not put a lot of effort into understanding things. There is no difference in these measures of educational motivation by ethnic status.

[Table 6: here]

Columns 5 and 6 show how the literacy test score and prediction bias are linked to the indicators of academic motivation[20]. Despite conditioning on A-level score, those with a higher test score are slightly less worried about not being good enough for the course but put

[20] The literacy and numeracy scores produce similar results, as does the absolute versus relative prediction error.

less effort into studying. Having greater academic ability, these students are less likely to have chosen a degree for its returns or for a specific occupation. Students who place themselves higher up the test score distribution are more likely to agree that they are good enough for the course, but less likely to have chosen a course for a specific job or its returns. Maybe, as for the higher ability students, higher academic self-perception makes students believe they can succeed whatever their degree subject.

Next, we investigate the components of the decision to invest in higher education using measures of perceived risk and returns. Students were asked to report their expected probability of passing the first-year at university (1): 87% believe that they would. Students also report the lowest probability of success that will make them decide to change degree (2) or not go to university (3). A high value of these thresholds indicates a higher level of risk aversion. On average, these marginal graduation rates are 57% and 40% respectively; students are not highly averse to risk and the difference between their expected probability of graduating and the threshold probability which would induce them to switch degree or stop university range from 30 to 45 points on average. The average expected grade on graduation (4) corresponds to an Upper-Second which is the minimum grade for applying to post-graduate studies and an important requirement in the job market.

Table 7 reports OLS estimates of the association between student characteristics and these measures of perceived risk and return. Considering the evidence of men and higher social class students self-confidence, there is surprisingly little difference in risk perception between groups. White students are eight percentage points more likely to believe they will pass first year but expect lower graduation grade.

[Table 7: here]

Individuals with higher test score and greater self-perception estimate their probability of first-year success and their final grade to be marginally higher. As suggested in the introduction, attainment gaps may stem from bias in expected returns. Students predict their earnings at age 45-50 to be £47,500 as a graduate and £24,451 as a non-graduate[21]. These expectations are rational for non-graduate earnings (£22,800), but inflated by 50% for graduates (£32,500) compared to the UK Labour Force Survey, which could lead to over-entry into higher education. Men expected earnings and returns are between 18% and 28% greater than women, which is consistent with the observed gender pay gap and previous results on the wage expectations of European students (Brunello et al., 2004). None of the other characteristics are correlated with earnings expectations.

6. Discussion and Conclusion

Students are poor at predicting own performance in absolute and in relative terms. These misperceptions could affect their decisions over participation in higher education. For example, self-reported 'efficacy' in math is linked to age-15 pupils' expectations of going to university, even after controlling for observable achievement in math tests; a one-standard deviation change in self reported efficacy is roughly equivalent to the effect of a half-standard deviation change in test-based achievement.

First-year university students overestimate their performance. In particular, the gender and class gaps in self-assessment are large in numeracy, at around 20% of the average score. White students underestimate their relative position. Self-perception also correlates with educational confidence in general but the effect is small. The effect of self-perception on the decision to participate in higher education does not seem to work through its effect on risk aversion and the returns to higher education, since self-perception is only weakly correlated with these factors.

[21] We trim the bottom and top 2% of the distribution to eliminate outliers.

These findings leave some questions unanswered. For instance, although working-class undergraduates underestimate their performance relative to others, working-class secondary school pupils have less anxiety, greater confidence and a more positive self-evaluation in terms of their math ability. This difference between the two samples is difficult to reconcile but may be due to: a) differences in peer groups between schools and university – a disadvantaged child may be confident when comparing herself to her school peers but less so when considering her position amongst university students (big fish, small pond effect); b) unobserved differences in attitude between the population of working class school pupils and the population of university entrants; or c) differences in the methods used to elicit academic self-perception between samples. On all measures, males are more self-confident. Their low participation would be consistent with a model of counter-signaling (Feltovitch et al. 2002), in which over-confident individuals do not invest in schools to signal their high (perceived) ability. Over-confident individuals are thus "too cool for school" and believe they will succeed in life without investing in higher education.

Policies that raise academic self-confidence in schools are, unsurprisingly, likely to raise participation rates but are unlikely to close participation gaps unless targeted mainly at under-represented groups. This is not to suggest that students should be praised whatever their results but on the contrary, trained to develop objective views about their own ability.

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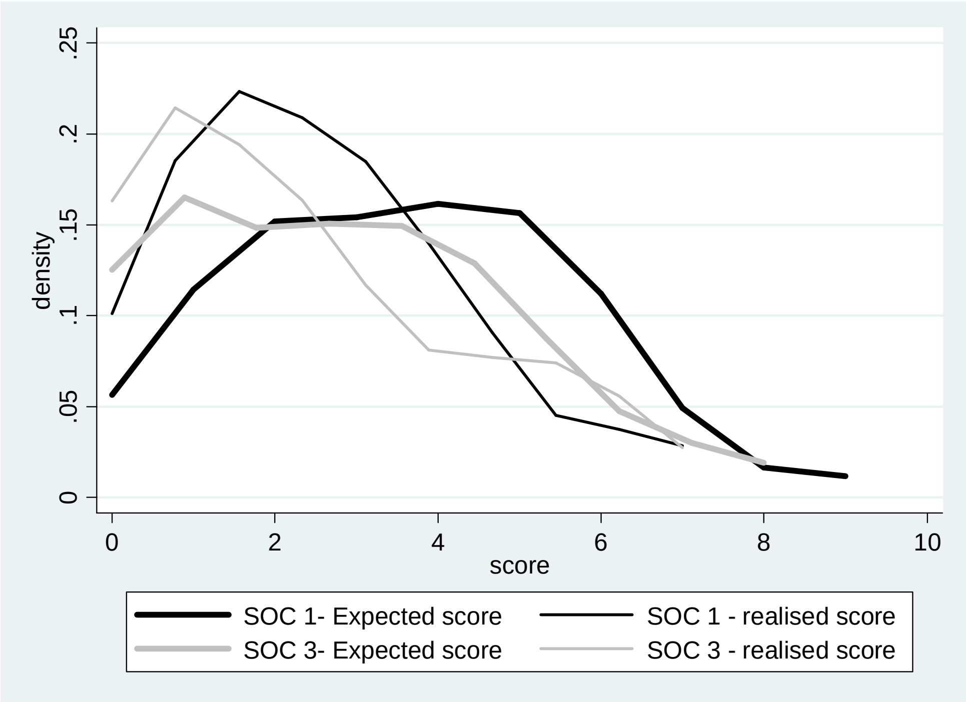
Figure 1: Predicted and realized numeracy scores by social class and gender



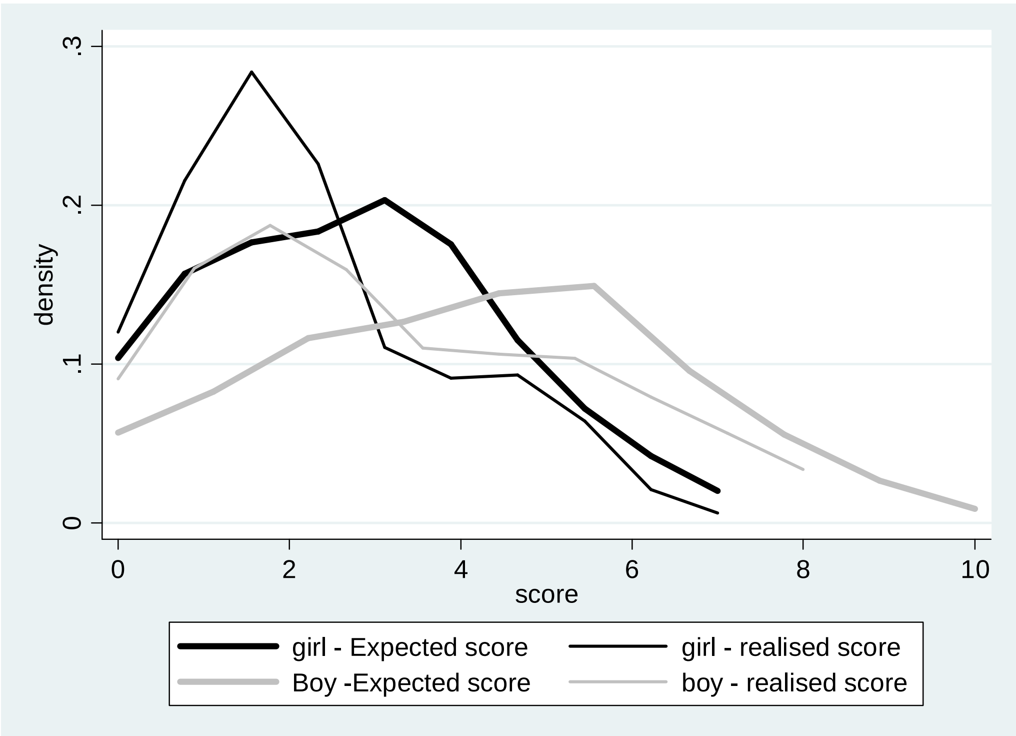
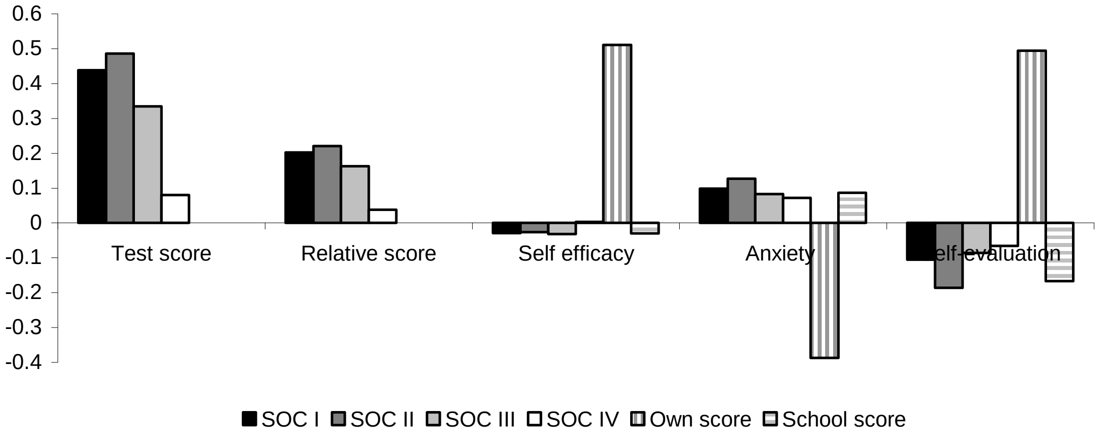
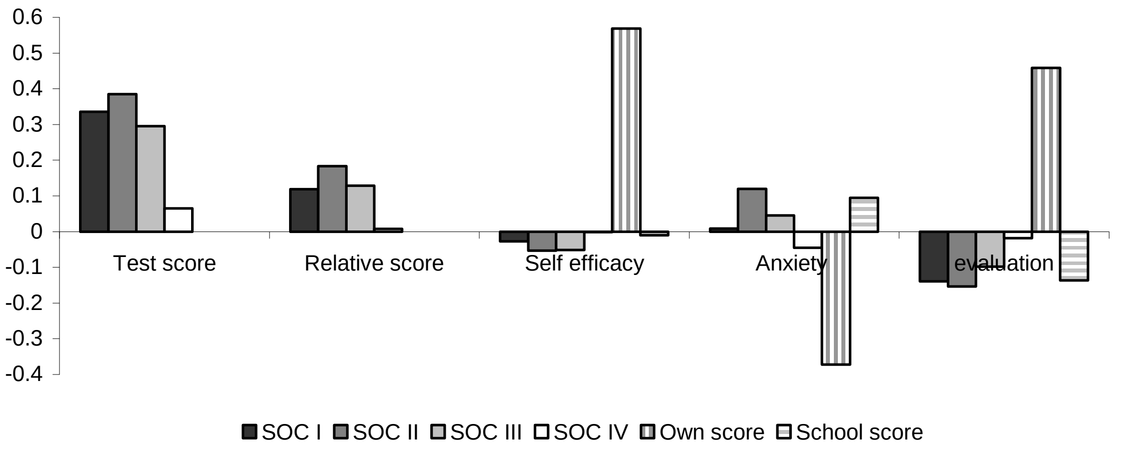


Figure 2: OLS estimates of social class on test performance and self-perception at age 15

A- Girls



B- Boys



Note: The above figures are OLS estimates of the effect of social class, own test score and school test score on the specified outcomes. All are significant at 5% level, using standard errors clustered at school level. The regressions were run separately by gender using PISA 2003. The regression also includes the following covariates: age, grade, immigration status, number of hours of math self-study per week, family structure, language spoken at home, numbers of books at home, Welsh sample, length of mathematics instruction per week, parental education and parental labor market activity. Relative score is defined as individual minus school average. Observations: 4210 girls, 3831 boys

Table 1: Mean normalized score from PISA 2003 England and Wales (standard deviation)

	Math score	Math pupil-school relative score	Math efficacy	Math. anxiety	Math Self-evaluation	Expect to go to University	Obs.
Girls	0.037* (0.940)	0.003* (0.789)	-0.176* (0.903)	0.118* (0.890)	-0.074* (0.921)	0.514* (0.500)	4210
Boys	0.182 (0.961)	0.141 (0.812)	0.249 (1.026)	-0.258 (0.887)	0.318 (0.894)	0.412 (0.492)	3831
Social Class I (Managers)	0.309* (0.885)	0.153* (0.760)	0.154* (0.974)	-0.124* (0.916)	0.159* (0.927)	0.542* (0.498)	1653
Social Class II (Professionals)	0.534* (0.897)	0.279* (0.808)	0.321* (1.035)	-0.139* (0.941)	0.200* (0.980)	0.664* (0.473)	1700
Social Class III (Ass. Professionals)	0.141* (0.892)	0.092* (0.784)	0.002* (0.967)	-0.052* (0.896)	0.116 (0.911)	0.453* (0.498)	1897
Social Class IV (Skilled manual)	-0.224* (0.897)	-0.090* (0.782)	-0.173* (0.930)	0.010 (0.884)	0.020 (0.898)	0.331* (0.470)	1562
Social Class V (Other occupation)	-0.394 (0.911)	-0.171 (0.807)	-0.262 (0.889)	0.027 (0.888)	0.041 (0.910)	0.279 (0.449)	1229
Native	0.099 (0.952)	0.066 (0.804)	0.016 (0.981)	-0.052 (0.905)	0.102 (0.926)	0.452 (0.498)	7554
1st Generation	0.115 (0.982)	0.094 (0.820)	0.135* (0.972)	-0.183* (0.934)	0.274* (0.874)	0.663* (0.474)	267
Non-native	0.312* (0.952)	0.138 (0.744)	0.271* (1.115)	-0.236* (0.981)	0.279* (1.045)	0.691* (0.463)	220

Note: PISA (2003). * denotes significant difference of the mean values at the 95% confidence interval compared to the relevant base groups: boys, native and social class V.

Table 2: Summary statistics: Student Expectations Survey

Variable	Mean	Std. Dev.
Male	0.544	0.498
Class missing	0.106	0.308
Upper Class	0.158	0.365
Middle class	0.544	0.499
Working class	0.192	0.394
White	0.873	0.333
Age <21	0.901	0.298
Disabled	0.057	0.232
University A	0.062	0.241
European students	0.062	0.241
Non-European International students	0.041	0.199
1st to go to university	0.448	0.497
Numerical score	2.725	2.005
Estimated own score	3.497	2.195
Estimated group mean score	5.303	1.703
Estimated decile	3.841	1.817
Literacy score	4.310	1.566
Estimated own score	5.474	1.968
Estimated group mean score	6.746	1.712
Estimated decile	4.357	1.461

Note: Expectation of Students Survey (2005) – 382 observations

Table 3: Linear probability of expectations at age 15 regarding university attendance

	Measures of mathematical self perception				
Female	No self perception measure	No self perception measure	Math efficacy	Math anxiety	Math self-evaluation
SOC I	0.105	0.022	0.024	0.022	0.024
	[0.025]**	[0.023]	[0.023]	[0.023]	[0.023]
SOC II	0.100	0.007	0.009	0.007	0.012
	[0.026]**	[0.025]	[0.025]	[0.025]	[0.025]
SOC III	0.089	0.026	0.028	0.026	0.028
	[0.023]**	[0.022]	[0.021]	[0.022]	[0.022]
SOC IV	0.038	0.023	0.024	0.022	0.025
	[0.024]**	[0.023]	[0.023]	[0.023]	[0.023]
1st Generation	0.160	0.142	0.139	0.143	0.143
	[0.056]**	[0.059]*	[0.058]*	[0.059]*	[0.058]*
Non-native	0.026	-0.003	-0.003	-0.003	-0.004
	[0.046]	[0.046]	[0.045]	[0.046]	[0.046]
Math self-perception			0.064	0.003	0.024
			[0.009]**	[0.008]	[0.008]**
Normalized score		0.163	0.13	0.164	0.151
		[0.009]**	[0.010]**	[0.009]**	[0.010]**
Normalized school score		0.028	0.03	0.028	0.032
		[0.008]**	[0.008]**	[0.008]**	[0.008]**
Observations	4210	4210	4210	4210	4210
R-squared	0.22	0.30	0.31	0.30	0.30
Male					
SOC I	0.093	0.035	0.035	0.035	0.039
	[0.025]**	[0.024]	[0.024]	[0.024]	[0.024]
SOC II	0.085	0.018	0.02	0.019	0.023
	[0.025]**	[0.025]	[0.024]	[0.025]	[0.025]
SOC III	0.046	-0.007	-0.005	-0.007	-0.004
	[0.024]	[0.023]	[0.023]	[0.023]	[0.023]
SOC IV	-0.018	-0.034	-0.036	-0.035	-0.034
	[0.024]	[0.023]	[0.022]	[0.023]	[0.022]
1st Generation	0.138	0.121	0.117	0.12	0.117
	[0.052]**	[0.051]*	[0.051]*	[0.051]*	[0.051]*
Non-native	0.092	0.099	0.094	0.097	0.098
	[0.048]	[0.045]*	[0.045]*	[0.045]*	[0.045]*
Math self-perception			0.071	-0.012	0.035
			[0.009]**	[0.008]	[0.008]**
Normalized score		0.163	0.123	0.159	0.147
		[0.009]**	[0.010]**	[0.010]**	[0.010]**
Normalized school score		0.002	0.003	0.003	0.007
		[0.010]	[0.010]	[0.010]	[0.010]
Observations	3831	3831	3831	3831	3831
R-squared	0.24	0.32	0.33	0.32	0.32

Note: Table reports OLS coefficients. Robust standard errors in brackets – clustered at school level. * significant at 5%; ** significant at 1%. Data: PISA (2003). The regression also includes the following covariates: age, grade, number of hours of math self-study per week, family structure, language spoken at home, numbers of books at home, Welsh sample, number of minutes of mathematics instruction per week, parental education and parental labour market activity.

Table 4: Determinants of test performance amongst university students

	Numeracy test score	Literacy test score	Numeracy non-response
Male	0.694	-0.362	-0.750
	[0.209]**	[0.176]*	[0.218]**
Middle class	0.062	0.321	0.182
	[0.271]	[0.229]	[0.279]
Working class	-0.511	0.002	0.616
	[0.333]	[0.282]	[0.344]+
SOC missing	0.222	0.296	0.362
	[0.379]	[0.319]	[0.390]
White	-0.083	0.513	-0.072
	[0.340]	[0.287]+	[0.350]
Test score			-0.456
			[0.054] **
Constant	1.523	2.968	3.677
	[0.703]	[0.592]**	[0.728] **
Observations	382	382	382
R-squared	0.22	0.08	0.28

Note: Expectation of Students Survey (2005). Table reports OLS estimates. Standard errors are reported in brackets. +, * and ** signal significance at the 10%, 5% and 1% level respectively.

Additional controls are age, disability status, Institution, fee status, A-level score, Subject of studies, geographical origin and an indicator for being the first of the family to go to university.

Table 5: Determinants of 1st year university students' predictions

	Predicted own test performance		Bias in predicted decile	
	Numeracy	Literacy	Numeracy	Literacy
Male	0.660	0.653	0.853	0.502
	[0.170]**	[0.211]**	[0.188]**	[0.174]**
Middle class	-0.254	0.029	-0.026	-0.106
	[0.217]	[0.274]	[0.244]	[0.226]
Working Class	-0.703	-0.596	-0.471	-0.630
	[0.268]*	[0.336]+	[0.300]	[0.278]*
Class missing	-0.155	0.058	-0.352	0.001
	[0.303]	[0.382]	[0.341]	[0.314]
White	-0.083	-0.197	-0.640	-0.442
	[0.272]	[0.344]	[0.306]*	[0.340]
Test score	0.754	0.235	-0.373	-0.588
	[0.042]**	[0.065]**	[0.017]**	[0.018]**
.				
Constant	2.045	3.371	-0.809	1.554
	[0.566]**	[0.731]**	[0.585]*	[0.584]**
R-squared	0.59	0.17	0.60	0.77
Observations	382	382	382	382

Note: Expectation of Students Survey (2005). Table reports OLS estimates. Standard errors are reported in brackets. +, * and ** signal significance at the 10%, 5% and 1% level respectively. Bias is the difference between the predicted and realized score or decile.

Additional controls are age, disability status, Institution, geographical origin, A-level score, Subject of studies and an indicator for being the first of the family to go to university.

Table 6: Estimates of educational motivation (ordered probit marginal effects)

	Male	Middle class	Working class	White	Literacy score	Bias in literacy[a]	Mean (st. dev.) [obs.]
"I entered HE to get a specific job"	-0.040 (0.055)	0.102 (0.067)	0.163 (0.083)*	-0.025 (0.088)	-0.033 (0.019)+	-0.016 (0.013)	3.243 (0.900) [375]
"I'm worried that I will not be good enough for this course"	-0.101 (0.025)**	0.034 (0.026)	0.079 (0.046)+	0.023 (0.028)	-0.017 (0.007)*	-0.016 (0.005)**	2.341 (0.937) [369]
"I want to learn about the subjects which really interest me"	-0.070 (0.048)	-0.004 (0.062)	0.028 (0.078)	-0.006 (0.078)	-0.014 (0.017)	0.001 (0.011)	3.171 (0.172) [379]
"I would rather choose a degree I can complete than a more difficult one with higher earnings"	-0.011 (0.030)	-0.043 (0.039)	-0.093 (0.034)**	-0.013 (0.049)	0.004 (0.010)	-0.008 (0.007)	2.516 (0.921) [366]
"I generally put a lot of effort understanding difficult things"	-0.188 (0.045)**	-0.071 (0.058)	-0.131 (0.057)*	0.018 (0.069)	-0.032 (0.015)*	0.002 (0.011)	3.124 (0.680) [380]
"I choose this degree because of its financial returns"	0.024 (0.019)	0.026 (0.024)	0.002 (0.030)	0.007 (0.029)	-0.020 (0.007)**	-0.009 (0.005)+	2.488 (0.886) [371]
"I will be able to keep up with the other students on this course"	0.121 (0.038)**	-0.036 (0.049)	-0.061 (0.052)	-0.059 (0.069)	0.017 (0.013)	0.018 (0.009)+	3.022 (0.674) [357]

Note: Expectation of Students Survey (2005). Standard errors are reported in parentheses. Marginal effects of the probability of "I strongly agree" outcomes are calculated. The marginal effects are calculated at the mean values of the independent variables. The ordered probit model includes controls for age, disability status, institution, geographical origin, A-level score, subject of degree an indicator for being the first to go to university in the family, test score in literacy. +, * and ** signal significance at the 10%, 5% and 1% level respectively. [a]Bias in literacy is measured as the difference between predicted and realized own scores.

Table 7: Estimates of graduation risk and expected financial returns

	Male	Middle class	Working class	White	Score in Literacy	Bias in literacy[a]	Mean (St. Dev.) [obs][b]
(1) Expected probability of passing first year	0.862 (1.686)	-0.800 (2.154)	-1.117 (2.662)	8.972 (2.713)**	1.861 (0.585)**	1.461 (0.413)**	87.785 (14.982)
(2) Lowest probability of success before I switch course	0.111 (1.761)	5.460 (2.251)*	2.833 (2.782)	3.054 (2.834)	-0.240 (0.612)	0.379 (0.431)	57.215 (14.974)
(3) Lowest probability of success before I stop University	2.682 (2.167)	-1.203 (2.769)	-3.285 (3.422)	0.757 (3.487)	-0.061 (0.752)	0.438 (0.531)	39.832 (18.451)
(4) Expected grade point average on graduation	2.043 (0.933)*	-2.411 (1.192)+	-1.174 (1.473)	-0.259 (1.501)	1.001 (0.324)**	0.693 (0.229)**	63.974 (7.188)
(5) Expected graduate ln earnings at age 45-50	0.221 (0.062)**	-0.078 (0.080)	-0.051 (0.099)	0.069 (0.101)	-0.031 (0.022)	0.012 (0.015)	10.594 (0.522) [369]
(6) Expected non-graduate ln earnings at age 45-50	0.137 (0.052)**	-0.078 (0.066)	-0.126 (0.082)	-0.058 (0.085)	-0.015 (0.018)	0.000 (0.013)	10.036 (0.372) [367]

Note: Expectation of Students Survey (2005). Standard errors, clustered at institution level are reported in parentheses. The models are estimated by OLS and include controls for age, disability status, institution, geographical origin, A-level score, subject of degree an indicator for being the first to go to university in the family, test score in calculus and literacy. +, * and ** signal significance at the 10%, 5% and 1% level respectively. [a] Bias in numeracy and literacy are measured as the difference between predicted and realized own scores. [b] the number of observations is 382 unless an alternative is provided.