Confidence and College Applications: Evidence from a Randomized Intervention*

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Abstract

This paper investigates the role played by self-confidence in college applications. Using experiments, we collect unique data on the self-confidence of more than 2,000 students applying to colleges in France. This data reveals that the best female and low-SES students significantly underestimate their rank in the grade distribution compared to male and high-SES students. By matching our survey data with administrative data on real college applications and admissions, we show that higher confidence leads to more prestigious college applications and admissions, conditional on ability. We then estimate the impact of a randomized intervention that corrects students' under- and overconfidence by providing them information on their real rank in the grade distribution. The treatment reduces the impact of under- and overconfidence for college applications, to the point that it does not predict application behavior of treated students. Providing feedback also makes the best students, who were initially underconfident, apply to more ambitious programs with stronger effects for female and low-SES students.

JEL-codes: I24, J24, D91, C90
Keywords: matching mechanism, confidence, information treatment, survey experiment

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1 Introduction

Access to prestigious colleges and high-paying careers varies substantially by gender and social background. In the US, children with parents in the top 1% of the income distribution are 77 times more likely to attend elite colleges and universities than children with parents in the bottom 20% of the income distribution (Chetty et al., 2017; Hoxby and Avery, 2012). Gender also plays a key role. Females disproportionately enter less selective colleges and lower-paying jobs than men (Saygin, 2016; Blau and Kahn, 2017). A number of reasons have been documented for this unequal access to college, from financial constraints (Angrist et al., 2022; Bettinger et al., 2019; Dynarski, 2000; Scott-Clayton and Schudde, 2020) to preferences over programs or peers (e.g., Wiswall and Zafar, 2015, 2018; Patnaik et al., 2021), information frictions (Bettinger et al., 2012; Hoxby and Turner, 2015; Bergman et al., 2019) and complexity and uncertainty in the admissions and aid process (Dynarski et al., 2021). While financial and informational barriers have received lots of attention, we know much less about behavioral barriers to college enrollment.

This paper considers a novel behavioral constraint to college access, namely student over- and underconfidence about their academic ability, two phenomena we refer to as "misconfidence". It is very common for individuals to have biased beliefs about their own abilities (Moore and Healy, 2008). Yet, how much misconfidence affects college choices is less clear. To shed light on these questions, this paper combines survey and administrative data to address three key questions: First, how large are social and gender differences in self-confidence about academic ability? Second, how much do under- and overconfidence matter for college applications and admissions? Finally, does feedback about true academic ability reduce the role played by under- and overconfidence in college applications; and does it alleviate the gender and social college admission gap?

Studying how confidence affects college choices is a first-order question both from an efficiency and an equity perspective. When students apply to colleges based on their true ability, i.e., when the misperceived ability is irrelevant, the final allocation is stable, meaning that students attend the best college among the colleges that would accept them.[1] Over- and underconfidence can distort stability. Underconfident students might shy away from the most prestigious colleges, wrongly believing their admission chances are too low. Post factum, it can lead to stability distortion as students realize they could have been

[1] We assume the designer uses a mechanism that leads to a stable match, a common goal for centralized college admissions. In our setup, this is the case.

admitted to colleges they liked more had they applied there.[2] Overconfident students might aim too high and end up unmatched, distorting efficiency.[3] From an equity perspective, studying the link between confidence and college choices is also essential because of the well-documented gender and social gaps in confidence (e.g., Niederle and Vesterlund, 2007; Almås et al., 2016; Guyon and Huillery, 2020; Bobba and Frisancho, 2022). Female and low-SES students' underconfidence can discourage them from applying to prestigious programs, a potential concern as prestigious colleges usually have higher returns (Zimmerman, 2019; Anelli, 2020; Altonji et al., 2016; Kirkeboen et al., 2016; Hastings et al., 2013). However, there is little evidence on how these confidence gaps translate into college application gaps and then into admission gaps.

We conduct a large-scale survey of high school seniors participating in the French college admission procedure in 2021. We survey students before the national deadline for college applications, collecting information on their intended application list and their perceived admission chances in each program.[4] We also use the survey to measure students' confidence in their academic ability. To do so, we ask students about their grade point average (GPA)—a well-known score among French students—and what they think the rank of this GPA is in the national distribution. Importantly, French students do not have this information, which forces them to guess their rank, a guess that reveals over- or underconfidence. We incentivize correct elicitation by rewarding students who correctly guess their rank. Finally, we match our survey data with administrative data on the universe of 2021 college applicants which contains information on students' application lists, on the offers they receive, and on the program they ultimately enroll in.

The survey data on student confidence reveals that students largely misperceive their position in the distribution. Students in the bottom half of the grade distribution are, on average, overconfident, while students in the top half are on average underconfident. Strikingly, underconfidence among top students is much larger among female students than among males. Conditional on true rank, top female students position themselves 9.2 ranks lower in the distribution than top males. Underconfidence is also larger among high-achieving low-SES students, who underestimate their rank by 5.8 percentiles more than

[2]In the market design literature, it is referred to as justified envy.

[3]The cost of over- and underconfidence would be amplified when the size of the application list is restricted, a restriction that is standard when countries use centralized assignment systems, for instance, China, Australia, Turkey, and Germany.

[4]Each college contains several subjects, such as math, economics, literature, and so on. A program corresponds to a college-by-subject unit.

their high-SES peers. We do not find large gender and social differences in overconfidence among students in the bottom half of the distribution.

The administrative data further shows that under- and overconfidence are not only common and large; they also predict students' college applications. Underconfident applicants apply to significantly less prestigious programs. Being ten percentiles less confident reduces the prestige of the best program a student applies to by 0.07 standard deviations (where prestige is measured as the average GPA of the students in a program). It also reduces by 3.2 percentage points the probability of applying to one of the elite French programs (called CPGE).[5] The negative effect of underconfidence on applications lowers admission chances in prestigious programs, too. Being ten percentiles less confident reduces by 0.04 standard deviations the prestige of the program a student is admitted to and by 1.5 percentage points the probability of enrolling in one of the elite French programs. These first results show that misconfidence (meaning over- or underconfidence) is correlated with the prestige of college applications, controlling for true ability, and thus likely to distort the stability of the final allocation. Given that we documented the gender and social confidence gaps, the correlation suggests that misconfidence can be a driver of the well-documented social and gender aspiration gaps. Thus, correcting misconfidence might move the allocation closer to stability. Moreover, it can be an effective way of mitigating gender and social gaps.

In the second part of the paper, we, therefore, evaluate the effect of an intervention that makes students aware of their under- or overconfidence and corrects it. We embed the intervention in our survey. After measuring students' confidence, we randomly split the survey participants into a treated group that receives feedback on their correct rank in the grade distribution and a control group that does not receive any feedback. This intervention has two purposes: (1) to understand whether correcting misconfidence reduces how much misconfidence matters for college choices, and (2) to explore whether correcting misconfidence is an effective way of alleviating the gender and social gaps.

Our results reveal that correcting student misconfidence drastically reduces how much it matters for college choices. Without feedback, a student who is 10 percentiles too confident applies to a top program that is 0.06 SDs more prestigious. Providing feedback reduces this boosting effect by 0.05 SDs, rendering misconfidence irrelevant. Among students who receive feedback, conditional on ability, misconfidence no longer plays a role in college

[5]In contrast, confidence does not affect the prestige of the "safe" choices that students make. Thus, underconfident students have less diversified application portfolios.

choices. This conclusion carries over to most of the other outcomes we consider. Providing feedback on rank reduces the role played by misconfidence in the likelihood of applying (-39%) and being admitted (-72%) in an elite track (CPGE). These results show that misconfidence has a causal effect on application and outcomes and distorts the stability of the final match. Crucially, providing feedback about relative ability reduces the relevance of the misconfidence and, thus, moves the allocation closer to the optimal one. Importantly, boosting the confidence of students who are initially underconfident has a large effect on their likelihood of applying to an elite track program (CPGE) and of being admitted to one, but decreasing the confidence of overconfident students has no significant effect on their likelihood of applying to an elite track. This larger effect on underconfident students suggests that correcting misconfidence might help to close the gender and social aspiration gaps.

We then test whether rank feedback mitigates the aspiration gap among high-achieving students. While providing feedback does not significantly affect the college applications of high-achieving male students, high-achieving females apply more ambitiously when receiving feedback. In the control group, among high-achieving students, the top program that female students apply to is 0.51 SDs less prestigious than the top program that male students apply to. Moreover, female students are 32.6% points less likely to apply to an elite program (CPGE) than male students and 28.3% points less likely to attend one. Our intervention closes 81% of the gender prestige gap, 57% of the gender gap in elite program applications, and 73% of the admission gap in elite programs. Correcting misconfidence is equally effective at alleviating the social aspiration gap. Providing feedback on real rank closes 69% of the social gap in the top program prestige; it completely closes the gap in applications and admissions to an elite program (CPGE). To summarize, misconfidence has a causal impact on the stability of the final match and can be substantial behavioral constraint for equal college access.

In the last section, we investigate likely mechanisms behind our large effects. By correcting misconfidence, our intervention might shift students' perception of their admission chances. Recent work shows that students often have incorrect beliefs about their admission chances, which makes it particularly important to understand where these misperceptions are coming from (Agarwal and Somaini, 2018; Kapor et al., 2020; Tincani et al., 2022; Larroucau et al., 2021; Arteaga et al., forthcoming). We use the information on students' guessed admission chances to show three main results. First, among high-achieving students, there is a gender and social gap in perceived admission chances that mirrors the

confidence gaps we document in the paper. Top female and top low-SES students think that they have lower admission chances in the most prestigious programs. Second, higher confidence is associated with higher perceived admission chances. Finally, in the survey, we asked students to guess which program they think they will enroll in at the end of the admission process, a variable that partially captures their perceived admission chances. We show that our intervention makes misconfidence less relevant when students predict the prestige of their final match.

Our results are of direct policy interest. Concerns regarding unequal access to college have given rise to a wide range of policies to boost college enrollment among low-SES students. Previous attempts include the adoption of quotas and reserved seats (Dur et al., 2018), provision of information about the cost and returns of colleges (Bettinger et al., 2012; Hoxby and Turner, 2013; Bergman et al., 2019; Jensen, 2010) and financial aid Angrist et al. (2022).[6] We add to the policymaker's toolbox a new intervention that is low-cost, easy to implement, easy to scale, and helps to fight gender and social aspiration gaps.

This paper contributes to the literature on the effects of informational frictions in matching mechanisms. Kapor et al. (2020) find that many applicants have biased beliefs about admission probabilities, which impact their matching outcomes. Arteaga et al. (forthcoming) find that feedback on non-placement risk as part of "smart matching platforms" can lead individuals to add more programs to their list. Larroucau et al. (2021) find evidence for strategic mistakes in the college admission mechanism in Chile, which they try to mitigate using personalized information about admission chances. Our intervention is related to the interventions of Arteaga et al. (forthcoming) and Larroucau et al. (2021), who give students individual feedback on their admission chances in schools and universities. Both our intervention and their interventions are relevant in different contexts. While personalized information on admission chances is the most precise way of informing students on their admission chances, calculating admission chances is often not possible absent rich data on student rank, program competitiveness, and admission criteria. This is typically the case in countries in which admission criteria are not transparent

[6]In France, concerns over self-censorship in college applications led to a major reform of university admissions in 2018 (described in the paper), whose effectiveness in terms of social diversity is unclear (Cour des Comptes, 2020).

or in which there is no centralized college entrance exam, like in France, Mexico, Canada, South Korea, England, and others.[7]

Our paper contributes to an extensive empirical literature documenting gender and social gaps in confidence and aspirations in the lab and in the field (Niederle and Vesterlund, 2007; Buser et al., 2014; Hoxby and Turner, 2013; Bordalo et al., 2019; Landaud et al., 2019; Möbius et al., 2022; Reuben et al., 2017). We provide direct evidence of the causal effect of confidence in a high-stakes environment: college applications.

A few recent papers have provided indirect evidence on how confidence gaps affect education and career choices.[8] Carlana et al. (2022) provide a mentoring program to high-achieving immigrant students in Italy, which makes male students more confident about their ability and more likely to pursue the highest educational track (while there was no social aspiration gap for females at baseline). Falk et al. (2020a) and Falk et al. (2020b) show that a mentoring program for low-SES students improves their self-assessment and makes them more likely to enter an academic school track. Guyon and Huillery (2020) show that among middle-school students in France, those from low SES are more likely to underestimate their relative academic potential and that this is correlated with the propensity to choose an academic high school track. Closest to our setting, Bobba and Frisancho (2019) provide feedback about rank in the test score distribution after a mock exam. Correcting students' beliefs about their rank in the test score distribution induces a steeper gradient between academic achievement and demand for academic high schools. Compared to these papers, we directly measure and experimentally alter students' confidence about their relative academic ability, which allows us to quantify the causal effect of confidence on college choices.

Our paper is also related to literature that uses natural or field experiments to study how feedback on students' academic ability affects relevant outcomes. Azmat and Iriberri (2010) and Azmat et al. (2019) document the effect of knowledge on students' relative rank on their effort and grades in school and university.[9] Andrabi et al. (2017) provide individual performance information and average school performance to schools and households with

[7] In France, university admission criteria and their weights are not transparent. Policymakers are not able to calculate personalized admission chances.

[8] More broadly, a rich literature has documented how confidence affects a wide range of real-life outcomes (Barber and Odean, 2001; Malmendier and Tate, 2005; Ortoleva and Snowberg, 2015; Sterling et al., 2020).

[9] A better within-class rank increases test scores (Murphy and Weinhardt, 2020), affects the choice of academic tracks (Delaney and Devereux, 2021b), and raises future earnings (Denning et al., 2018).

children, documenting positive effects on scores. [10] Goulas and Megalokonomou (2021) exploit the abolition of national centralized exams, which allowed students to calculate their score in the national distribution. They find that high-achieving students in earlier cohorts, who could still infer their rank, enrolled in more prestigious university departments. Our results would suggest that self-confidence is the main channel for the observed effects.

The paper is organized as follows. In Section 2, we describe France's educational system and college admission mechanism that are relevant to our research question. In Section 3, we describe the surveys and admin data. In Section 4, we introduce the design of the main survey. Section 5 presents descriptive evidence of aspiration gaps from admin data. Section 6 presents the paper's main results on confidence and aspiration behavior. Finally, in Section 7, we conclude.

2 Institutional Setting

2.1 University Admissions in France

Higher education in France. In France, education is compulsory for children between the ages of three and 15 and consists of three cycles: primary school up to age 11, middle school (*collège*) between ages 11 and 15, and high school (*lycée*) from 15 to 18. At the end of high school, students can obtain the high school diploma called *baccalaureat*, which allows them to enter higher education. Three types of high schools exist that lead to three different diplomas: *bac général* (preparing for university education), *bac technologique* (preparing for short-term studies), and *bac professionnel* (preparing for a vocational career). After high school, students who wish to continue their studies move to higher education. In 2021, 931,000 students applied to one of the 17,000 programs. Four main types of higher education institutions exist (presented by decreasing order of prestige):

- Preparatory classes for elite colleges (*classes préparatoires aux grandes écoles*, CPGE) enroll 8% of the students. These classes constitute the most prestigious educational track. They last for two years and prepare students for the competitive entrance exam of the *grandes écoles*. Preparatory classes are free for students. Importantly,

[10] Recent papers show the relevance of the feedback to parents rather than students. Dizon-Ross (2019) conducts a field experiment in Malawi, informing parents about their children's academic performance, which leads to an increase in investment in high-ability children's education. Bergman (2021) provides weekly feedback to parents about children's missing assignments, which corrects parental over-optimism about children's performance and improves performance.

if students fail to enter the elite colleges after preparatory class, students do not loose the two years, as they can enter the third year of public universities. Elite colleges, such as Écoles Normales Supérieures (ENS), Ecole Polytechnique, engineering schools, business and management schools can be either public or private. Most of them last for four years. In the rest of the paper, we will refer to CPGE as the *elite track*.[11]

- Public universities enroll 46% of the students. They deliver bachelor degrees after 3 years of studies.

- Technical universities and technical high-schools, respectively, enroll 10% and 21% of the students. They deliver technical degrees (called DUT and BTS) after 3 years (for DUT) or 2 years (for BTS).

The vast majority (66%) of higher education training is provided in public institutions. The French state subsidizes admission fees, which reduces financial constraints for students. In 2021/2022, a student paid 170 euros per year to enroll in an undergraduate course.[12]

College applications. During the final year of high school, students apply for post-secondary education via a centralized platform called Parcoursup. This platform allows students to browse programs using various types of filters (by types of institutions, location, public or private status, ...).[13] Using the platform, students can then submit up to ten unordered choices, and within these choices, they can make a maximum of 20 sub-choices. For example, a student can apply to a science elite track in up to 20 different institutions. This would count as one choice and 20 sub-choices.[14] Therefore, we refer to a university or higher education institution as an *institution* (e.g., Paris Sorbonne), and we refer to a subject within an institution as a *program* (e.g., Paris Sorbonne, Math). In Figure A.1, we

[11]The wages of students who graduate from a Master's program (5 years of higher education) is on average 60% higher than the wage of students who do not attend a higher-education institution. For students who graduate from a Grande Ecole (most of them also require 5 years of higher education), the wage bonus raises to 81% (Dabbaghian and Péron, 2021). Landaud and Maurin (2021) also find an hourly wage premium of about 15% of graduating from a first-tier grande école program rather than from a less prestigious grande école program.

[12]Source: https://www.campusfrance.org/en/tuition-fees-France (retrieved 11/04/2022).

[13]See https://dossier.parcoursup.fr/Candidat/carte (retrieved 11/04/2022). Each program provides the following information: public or private status, fees, address, website, classes offered, admission criteria, open days, contact person, number of places, number of candidates, and number of students admitted the previous year).

[14]For some programs, the number of sub-choices is not limited (e.g., Sciences Po).

plot a histogram of the number of choices that students made in 2021. The spike at ten choices indicates that for many students the choice limit is binding. However, there are also many students that do not exhaust the limit and many who apply to more than ten programs (e.g., by using their sub-choices or applying to programs without a limit on the number of choices).

Student information on own ability. In 2021, students had to submit their application list by March 11. Importantly, in March they have not taken the high school exit exam yet, which takes place in June. This means that students, at the time of their applications, only know their average teacher-given grades (GPA).[15] More specifically, at the end of each term (three-month period), students receive a one-page document summarizing their average grades in each subject. This sheet also indicates the rank of the student within their class. This is the only information that students have to judge their ability relative to their peers. In the absence of a unique college entrance exam that gives students accurate information on their position in the ability distribution, we expect student under- or overconfidence to have a larger effect on their college applications. We discuss in the conclusion how the effect of our "confidence-correcting" intervention might differ in a different environment, for instance, one with a college entrance exam used by all colleges to rank students.

College admission criteria After the application deadline, programs review all the applications they receive and rank students. Importantly, programs are free to decide the admission criteria they use, which makes it hard for students to figure out their priorities in each program. This difficulty is exacerbated by the lack of transparency on the exact criteria employed by the programs and their respective weights. Although programs are required to indicate which criteria they take into account (e.g., raw GPA, math grade, history grade, or grade in the literature exam), some of these criteria are difficult to evaluate (e.g., motivation, perseverance, autonomy, quality of reasoning, quality of expression, ability to concentrate)[16] and programs do not provide information on how they weigh each criterion.

[15]Students also know their grades in the centralized Literature exam, which takes place at the end of the second year of high school. Students generally take the Literature exam at the end of the second to last year because that subject is not taught in the last year.

[16]For each applicant, programs receive a sheet filled in by the high-school teachers and the principal which contains comments on the student's cognitive and non-cognitive skills. Teachers comment on a student's test scores, but also on their autonomy, work methodology, engagement in work, whether a student demonstrates initiatives...

For each criterion, they only state whether the criteria is "essential," "very important," "important," or a "side" criterion.[17] The fairly large uncertainty that prevails in France on admission chances in each program means that a student's under- or overconfidence can easily translate into a biased perception of their admission chances which can in turn affect the set of colleges they decide to apply to. In the conclusion, we conjecture how a different environment, for instance, one with uniform admission criteria across colleges or clear information on admission chances, might alter the effect of our feedback intervention.

Offers and rejections. To allocate students to programs, the Parcoursup clearinghouse performs a dynamic implementation of the college-proposing Deferred-Acceptance mechanism. On offer day, the clearinghouse sends out offers to students up to the capacity of each program. Some students may receive several offers, while others do not receive any. Students with one or multiple offers have to decide whether they want to (i) accept an offer and renounce the other choices they made (thereby making their acceptance a definitive choice)—this typically happens when a student receives an offer from their favorite program—or (ii) tentatively accept an offer but keep the remaining choices in the hope of receiving an offer from a program they prefer in the future—this typically happens when a student receives an offer from a program which is not their favorite one—or (iii) reject an offer—this typically happens when there are several offers, as rules do not allow tentative acceptance of more than one offer.

In 2021, the first offers were sent out on May 27 and the offers/rejections stopped on July 16. For offers sent out on May 27, students have four days to decide on an offer, for offers sent out on May 28 they have three days, and for all offers from May 29 they have two days to decide. Declined or renounced offers are automatically given to the student with the next highest priority. From June 16 to September 16, students can take part in the complementary phase and reapply to programs that have unfilled seats. However, students face a significantly reduced choice set in the complementary phase. For example, only 39.3% of programs make any offers in the complementary phase and only 10.9% of candidates are admitted through the complementary phase.

[17] Using machine learning methods on student files and admission decisions, the French Court of Auditors identified a dominant role for the simple GPA in exemplary programs (Cour des Comptes, 2020).

2.2 Aspiration gaps by gender and socioeconomic status

A rich literature has documented aspiration gaps by gender and socioeconomic status (Falk et al., 2020a; Carlana et al., 2022; Black et al., 2015; Page and Scott-Clayton, 2016; Hoxby and Avery, 2012; Delaney and Devereux, 2021a; Saygin, 2016). We find similar evidence in France using administrative data on the applications reported by more than 400,000 high school students in 2021. We look at the prestige of the application list, as measured by the average grades of the students enrolled in each of the programs listed by a student. More specifically, for each program, we consider the pool of students enrolled in the program, and we define its prestige as to the average grades in the high school exit exam of these students.[18] We explain in greater detail why we proxy prestige by grades in Section 3.2.

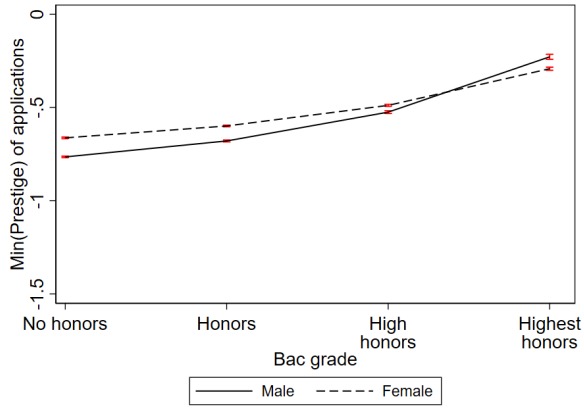
Figure 1a shows the minimum prestige of the application list (i.e., the prestige of the "safe" program) and Figure 1b shows the maximum prestige of the application list (i.e., the prestige of the "top" program) by gender and by academic achievement (expressed on the X-axis from the lowest achievers who receive "No Honors" to the highest achievers who receive the "Highest honors").[19]

Aspiration gap by gender. We find only small gender differences in the prestige of the "safe" program. However, large differences emerge when considering applications to "top" programs. When building their application portfolio, the best programs high-achieving females apply to are significantly less prestigious than the best programs high-achieving males apply to. This female modesty has direct consequences for their college admissions. Females with the highest honors are matched to programs with a 0.35 standard deviations (SDs) lower prestige than males with the highest honors (see Figures A.5a in the appendix). An alternative measure of aspirations is whether students apply to at least one of the prestigious elite tracks (CPGE). Figure A.4a in the Appendix, shows that the best female students are also significantly less likely to apply to CPGE. Among students receiving "highest honors," female students are 17 percentage points less likely to apply to an elite track. Again, this aspiration gap translates into a gender gap in admissions to elite tracks, with the highest honor females being 17.9 percentage points less likely than males to enroll in elite tracks (see Figure A.5a in the Appendix). The large gender aspiration gap we

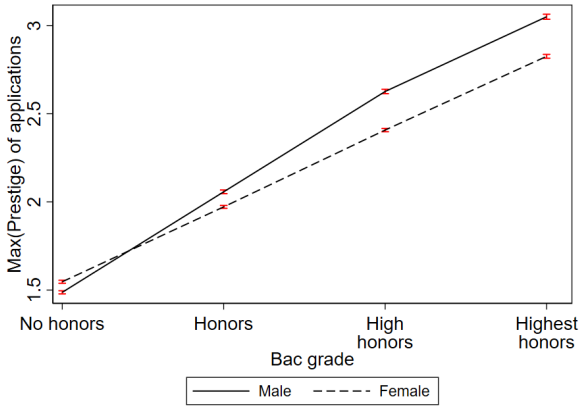
[18] We standardize the prestige measure to have a mean of zero and a standard deviation of one.

[19] In France, high school diploma grade translate to the following honors (*mention*): Among 2021 high school graduates that take part in Parcoursup, 14% earn "Highest honors" (*Trés bien*), 26% earn "High Honors" (*Bien*), 34% earn "With Honors" (*Assez bien*), and 26% are not granted honors (*Pas de mention*).

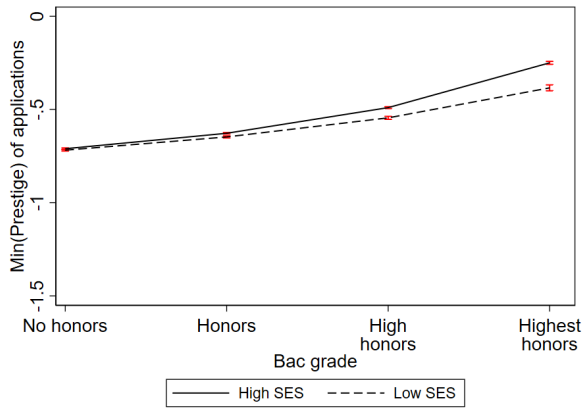
Figure 1: Prestige of applications by gender and socioeconomic status



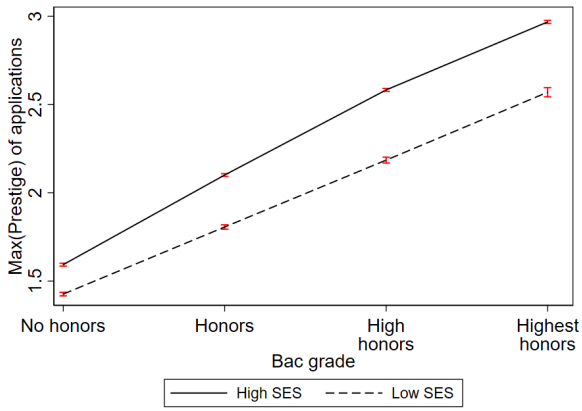
(a) Min(prestige) by gender



(b) Max(prestige) by gender



(c) Min(prestige) by SES



(d) Max(prestige) by SES

Notes: The figures show the minimum and maximum prestige of the programs in the application list by honors level and gender/SES. Prestige of a program is defined as the mean grade level of all enrolled students. 99% confidence intervals are based on predicted values from a regression on the interaction of honors level and female/low SES.

document in France builds on extensive evidence in other countries that high-achieving females are less likely than males to select highly paid professions and more selective colleges (Delaney and Devereux, 2021a; Saygin, 2016).

Aspiration gap by socioeconomic background. We also find remarkable aspiration gaps by socioeconomic background. Students from lower SES apply to significantly less

prestigious "top" programs, with the largest differences among the best students (see Figure 1d).[20] As previously, this ambition gap has consequences on admissions. Among students with highest honors, low-SES students are matched to programs that are 0.55 SDs less prestigious than high-SES students. We find a similar pattern in applications to the elite track (CPGE). Among students receiving the highest honors, low-SES students are 14.7 percentage points less likely to include an elite track in their application list than high SES students (see Figure A.4c) and they are 10.7 percentage points less likely to enroll in one. The striking social gap in aspirations we document brings one more piece of evidence on a well-documented fact: high-achieving low-SES students are less likely to select prestigious academic tracks than high-SES students (Falk et al., 2020a; Carlana et al., 2022; Black et al., 2015; Page and Scott-Clayton, 2016; Hoxby and Avery, 2012).

To sum up, we document large aspiration gaps by gender and social background in France, a major concern because high-achievers are precisely those with the highest chance of attending prestigious colleges with higher returns (Zimmerman, 2019; Anelli, 2020; Altonji et al., 2016; Kirkeboen et al., 2016; Hastings et al., 2013). The gender and social aspiration gap is therefore a key driver of labor market inequalities. Many factors can explain the aspiration gap, from differences in preferences over programs or peers (e.g., Wiswall and Zafar, 2015, 2018; Patnaik et al., 2021; Beffy et al., 2012), to information frictions on programs prestige or admission chances (Bettinger et al., 2012; Hoxby and Turner, 2015; Bergman et al., 2019), complexity and uncertainty in the admissions and aid process (Dynarski et al., 2021) and budget constraints (Angrist et al., 2022; Bettinger et al., 2019). But the aspiration gap could also stem from a self-confidence gap. The best female and the best low-SES students might be less confident in their relative academic ability than their male and high-SES peers, which could discourage them from applying to ambitious programs. In the following sections, we combine survey and administrative data to identify the role of confidence in college applications.

3 Data and intervention

3.1 Survey data

Social media recruitment. We conducted a large-scale survey of students participating in the French college admission procedure in 2021. Our target group—French high

[20] We do not find large differences in the prestige of the "safe" program (see Figure 1c).

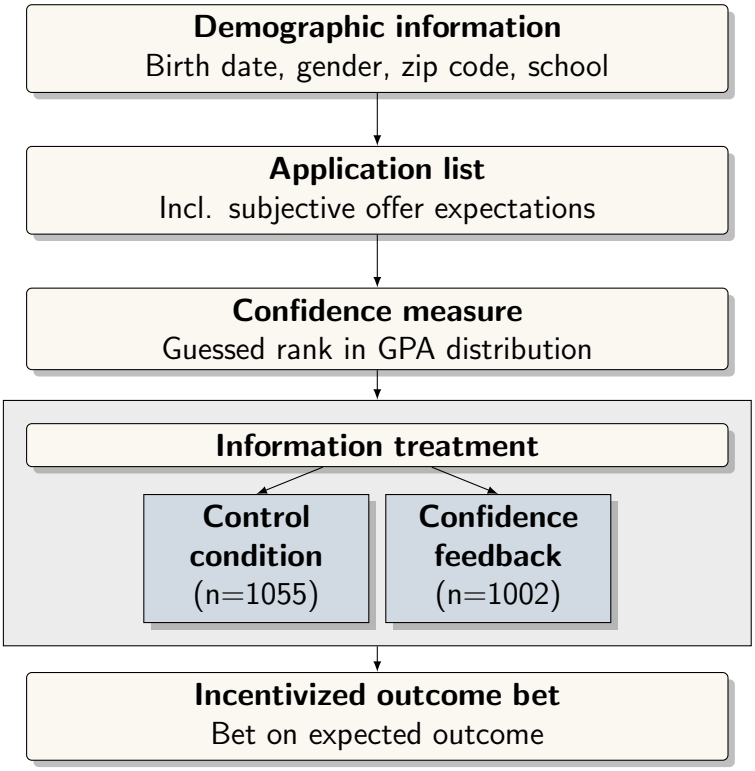
school seniors aged 17 to 18 years— is notoriously hard to reach using traditional sampling techniques (like telephone screening). Therefore, we recruited our sample using social media ads (Instagram, Snapchat, and Facebook), an effective recruitment channel as the overwhelming majority of our target group are active users. In 2020, 89% of 16 to 18-year-olds in France used Instagram, and 82% used Snapchat (Leroux, 2020). We used the platforms' targeting options to show the ads to individuals living in France and aged 17 to 18. Moreover, we targeted the ads by gender to obtain a gender-balanced sample. The ad (see Figure C.1.) was shown to more than 530,000 unique users on Snapchat and to more than 550,000 unique users on Instagram and Facebook.[21] The ad invited students in their final year of high school, who were about to submit their college preferences, to participate in a survey. To incentivize participation, the ad also offered participants the chance to win Amazon.fr gift cards upon survey completion. Individuals who clicked on the ad were redirected to the Qualtrics survey. 2,057 students in the general high school track completed the survey between February 18 and March 11, that is, in the three weeks before the deadline to submit college application lists (March 11). Appendix C provides additional details on the recruitment process and the sample.

Students intended applications. Figure 2 provides an overview of the survey flow. We started by collecting demographic information on students' birth date, gender, zip code, and school name. We use these variables to match our survey data to the administrative data for students, who did not provide their national student identifier (INE). We then asked students the list of programs they were planning to apply to on Parcoursup. Students could enter between two and ten programs. For each program, we asked them to type in the city, the institution, and the program name. Finally, for each program on their list, we ask students how they evaluate the probability (in percent) that they will receive an offer from that program. This question aims at measuring students' beliefs about admission chances. Comparing these beliefs to the real offers that students receive (whose information comes from the administrative data presented below) allows us to evaluate whether students' beliefs about admission chances are miscalibrated, and by how much.[22]

[21] These numbers are lower bounds since they are based on our own ad activities. We also hired a social media agency that bought ads on our behalf, but we do not know how many times their ads were shown. We expect the number to be much lower, as most of the ad budget was spent on our own ad.

[22] The survey also contained questions on students' cardinal preferences over programs, on the way students acquired information on programs, and on their preferences over peers. We collected this additional data for a complementary project.

Figure 2: Survey Design



Confidence measure. In the second part of the survey, we measure students' confidence in their academic ability. To do so, we elicit beliefs about their rank in the grade distribution in an incentivized way. We asked students what was their grade point average (GPA) in the most recent academic term.[23] After students entered their GPA, we asked them what they thought their rank was, in terms of this GPA, compared to a reference sample of 1,000 students from the general high school track. Students had to report their percentile rank on a slider from 0 to 100.[24] To encourage correct elicitation, we informed students that, among those who provided the correct belief (+/- 3 percentiles), we would randomly select ten students to receive a 100 Euro Amazon.fr gift card.

We had to collect data on the reference sample of 1,000 students ourselves because data on students' GPAs is not available in administrative data. Yet, despite this information

[23]As discussed in Section 2.1, the French academic year is divided into three academic terms that last three months each (Sept-Nov, Dec-Feb, and March-June). At the end of each term, students receive a one-page document summarizing their average grades in each subject, and their average grades across all subjects. We asked students to report the latter grade. When participating in our survey they had not yet received the second-term GPA, so we asked them about the first-term GPA.

[24]The starting position of the slider was at the 50th percentile rank.

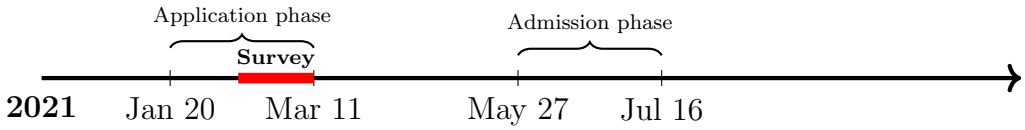


Figure 3: Survey timing in the college admissions process

being unavailable, GPA is the most salient proxy of a student's ability in high school, which made GPA the obvious candidate to measure students' confidence. To build the reference group of 1,000 students, we, therefore, conducted a pre-survey 1.5 months before our main survey in which we asked students about their GPAs. We conditioned participation to students who (i) were in the last year of high school and in the general track (*bac général*), (ii) planned to apply to colleges in 2021, and (iii) were at least 16 years old.[25] Students reported their GPA in the first trimester of the last year of high school, the same GPA we also elicited in the main survey. We used these 1,000 stated GPAs to compute the distribution of grades to which we compare students in the main survey.

Importantly, we carefully explained to the students in our main survey the characteristics of the benchmark sample. We explained that the sample had been recruited via Instagram and Facebook and that students were in the last year of the general high school track, planned to apply to colleges in 2021, and that their gender composition is approximately representative of Parcoursup participants (57.4 percent female, 42.6 percent male).

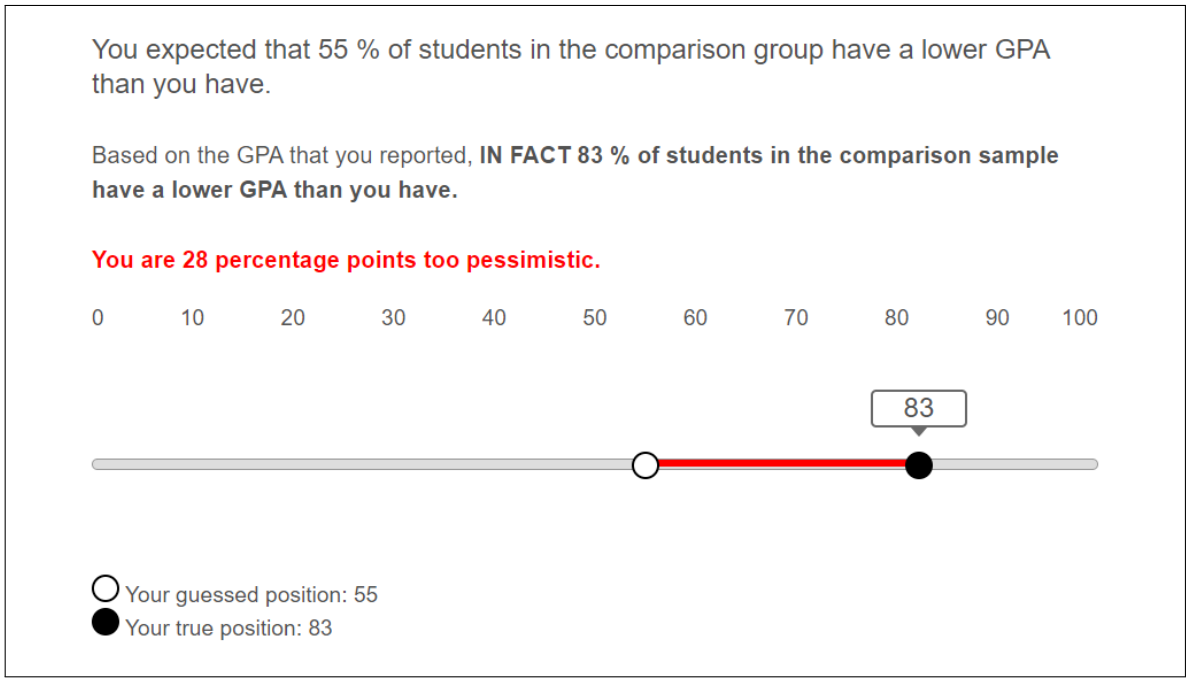
Information treatment: Correcting over- and underconfidence Just after eliciting students' confidence, we implemented an information treatment whose objective is to correct students' over- or underconfidence. We randomly split the sample into a treated group that received feedback on their correct rank in the grade distribution and a control group that did not receive any feedback. The feedback provided is simple as illustrated in Figure 4. On a slider, we show students both their guessed rank and their real rank. The gap between the guessed and the correct rank illustrates their mistake.

In addition, to make large mistakes (i.e., large over- and underconfidence) more salient, we highlighted the distance between the guessed rank and the real rank in three different colors depending on how large the mistake was. When a student's guess was within three ranks of the correct rank, we colored the gap in green to show a small over- and underconfidence (see Figure F.14). When a student's guess was between three and ten

[25]For this survey, we recruited students via ads on Instagram and Facebook. The final sample consists of 1,001 students (see Appendix D for details).

ranks away from the correct rank, we colored the gap in yellow to stress a medium over- and underconfidence (see Figure F.13). Finally, when a student's guess was more than ten ranks away from the correct rank, we colored the gap in red to highlight a large over- and underconfidence (see Figure F.12). Correspondingly, the feedback stated: "You are X ranks too optimistic/pessimistic" in green, yellow, or red font.

Figure 4: Screenshot of grade feedback (red version)



Notes: After subjects guessed their rank on a slider, the treatment group received feedback on their actual rank on the same slider. In this example, the subject underestimated their rank by more than 10 percentiles. The instructions are translated from French.

Short-term outcome: Guess of the final match. As illustrated in Figure 3, we conducted the survey right before the application deadline, so we suspect that our information treatment may affect the final applications submitted by the students. In order to capture short-term outcomes, in the very last part of the survey (i.e., after the information treatment), we also asked students about their admission chances. We asked students to bet on the program they think they will enroll in. We asked students to choose one program from their submitted application list. To incentivize bets, we told students that those who

correctly guessed the program would have the chance to win one of twenty 50 Euro gift cards.[26]

3.2 Administrative data

Student demographic characteristics. We matched our survey data with administrative data, provided by the French Ministry of Education, on the universe of 2021 college applicants. The data contains information on student demographic characteristics, such as gender, age, parent's profession, high school, and the final high school diploma (*baccalaureat*) grade in four honors categories ("highest honors", "high honors", "honors" and "no honors"). We use this last information on student academic level to check whether confidence and treatment effects differ for high- and low-achieving students. During the academic year we consider (2020/2021), honors were attributed based on the continuous evaluations students took during the last two years of high school.[27] In the paper, we often use honors rather than students' self-reported GPA to proxy for a student's academic ability for three reasons: this variable comes from administrative data, it summarizes student test scores over six terms (which makes it less prone to measurement error than student self-reported GPA which only pertains to one term), and it is almost entirely determined before we run our intervention, so honors are unaffected by our intervention (French Ministry of Education, 2021; L'étudiant, 2021).

We define a student's socioeconomic background based on their parent's profession. We use a standard classification of occupations defined by the French statistical institute (Insee, 2016).[28] Manual workers, low-skilled employees (working and retired), and the unemployed are considered as low socioeconomic status. We classify a student as being from low SES if both of her parents are low SES (or if one is low SES and the other parent is missing). Otherwise, we classify the student as being from high SES.

[26] After the mechanism ended, we contacted 20 respondents and asked which program they accepted. 15 of them responded, and, among those, eight indicated the program they betted on (and received the gift card), while seven indicated a program different from their bet.

[27] Honors are usually also based on students' performance in the centralized high school exit exam, but the pandemic prevented most final exams from taking place. This is why in 2020/2021 honors were attributed based on the continuous evaluations students took during the last two years of high school (French Ministry of Education, 2021). L'étudiant (2021) estimates that 82% of the general Baccalaureate in 2021 is based on continuous evaluations.

[28] Insee (2016) and Insee (2020) group 42 professions into four categories: manual workers (with a monthly gross income of €2,295), low-skilled employees (€2,198), intermediate occupations (€3,095), and high-skilled occupations (€5,514).

College applications, college admissions, and program prestige. The administrative data also contains the complete list of programs students applied to, the offers they received (including the date on which the offer was made), the response given by the student to each offer, and the final match. The data covers 17,107 programs in 4,947 institutions.

One of the objectives of our analysis is to bring evidence on a confidence gap by gender and social background, and more importantly, to understand if confidence gaps contribute to the well-documented aspiration gaps by gender and social background. To discuss aspiration gaps, we first need to define the prestige of a program. We do so based on the quality of the students it admits. For each program, we identify the students enrolled in this program, and we define the program prestige as the average grades of these students in the high school exit exam.[29,30] Figure A.2 shows the distribution of the resulting prestige index.

Before moving to the results, let us justify why, to characterize an aspiration gap, we use the prestige of applications to characterize aspirations. Instead of prestige, other program characteristics, like college access rate, come to mind to document an aspiration gap. However, college access rates, i.e., the ratio of the number of students admitted over the number of applicants, are less relevant to show aspiration gaps because some of the most selective programs are over-demanded due to students' specific preferences rather than the program quality or the quality of the students they enroll. For instance, some programs providing training in sports, arts, or specific programs in health are very popular, and therefore over-demanded, without being particularly prestigious. To illustrate this point, Appendix B reports the list of the 16 most prestigious programs and the 16 most over-demanded programs, and shows correlations between the prestige and access rate.

In the rest of the paper, we present our findings in three building blocks. First, we document a significant confidence gap by gender and social background. Second, we show that misconfidence is highly predictive of student applications. Finally, we show that the simple information treatment we designed, by correcting students' over- and underconfidence, has a large effect on college applications.

[29]We standardize grades to have a mean of zero and a standard deviation of one

[30]Similarly, MacLeod et al. (2017) calculate the mean admission scores of graduates to measure a program's reputation in Colombia. They find that the reputation increases graduates' earnings and earnings growth. Another potential measure, the threshold grade of a program (e.g. Arenas and Calsamiglia, 2022), cannot be computed with our data since grades are only reported in four honors categories.

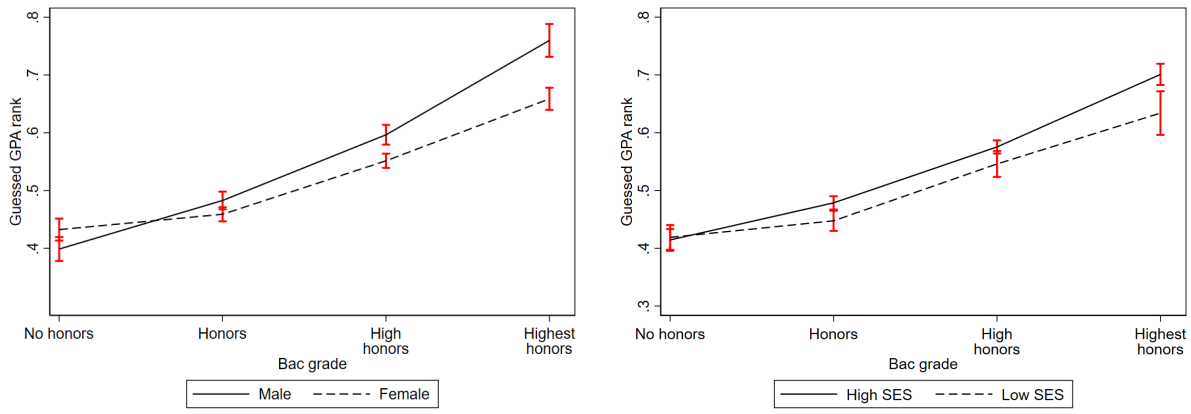
4 Evidence on confidence gaps

4.1 Confidence gaps by gender and SES

We start by presenting descriptive evidence on student confidence in their relative ability. Figure 5 plots individuals' beliefs about their rank in the GPA distribution (Y-axis) as a function of their high school diploma grade (x-axis). The higher the rank on the Y-axis, the higher they believe to be in the GPA distribution.

Gender confidence gap. We find large confidence gaps between male and female students at the top of the distribution. In contrast, there are only small gender differences in confidence for students who obtain "No honors" or "Honors." Figure A.6a corroborates this finding by plotting the guessed GPA rank against the real GPA rank, which we calculated using the reference sample. The figure shows a fuller picture of confidence along the distribution. In the bottom half of the grade distribution, males and females are all significantly overconfident, but we do not see large differences between males and females. In contrast, in the top half of the grade distribution, male and female students are all significantly underconfident, but female students are much more underconfident than male students.

Figure 5: Guessed GPA rank by honors and gender/SES



(a) Guessed rank by gender

(b) Guessed rank by SES

Notes: The figures show the guessed GPA rank by actual Bac grade. 90% confidence intervals are based on predicted values from a regression of guessed rank on the interaction of honors level and gender dummies.

To quantify the confidence gap, we construct the variable Misconfidence:

$$\text{Misconfidence}_i = \text{Guessed rank}_i - \text{Real rank}_i, \tag{1}$$

Misconfidence$_i$ corresponds to the difference between a student's guessed ability rank and her actual rank. This variable is positive for overconfident students—who guess a higher rank than their real rank—and negative for underconfident students—who guess a lower rank than their real rank. While the original values of this variable range from -100 to +100, we rescale the variable to range between -1 to 1. The larger this variable, the more overconfident (and the less underconfident) a student is. Moreover, to see whether miscalibrated confidence is driven by under- or overconfident students, we construct two additional variables: Underconfidence$_i$ is equal to the difference between the guessed rank and the real rank for underconfident students and zero for overconfident students (hence, scaled between -1 and 0). Conversely, Overconfidence$_i$ is equal to the difference between the guessed rank and the true rank for overconfident students (hence, scaled between 0 and 1).

In Panel A of Table 1, we regress the misconfidence variable on a female dummy variable and controls for students' grades. The results in columns (1), (3), and (5) show that female students are on average 2 percentage points less confident and that this is driven by underconfident females. We then investigate whether female underconfidence is more prevalent among high-achievers by adding interaction terms between student grades and the female dummy variables. The results, reported in columns (2), (4), and (6) show that the gender confidence gap is heavily driven by students with a GPA in the top of the distribution. Female students with no honors (the reference category) are 3.7 percentage points more confident than males. In contrast, among students with the highest honors, female students are 9.2 (12.9-3.7) percentage points less confident than male students with most of this difference being driven by underconfident students.

We document significant gender confidence gaps, which are particularly pronounced among the best students. These findings contribute to long-standing literature suggesting that men are on average more confident about their ability than women, partly explaining gender differences in willingness to compete (Niederle and Vesterlund, 2007; van Veldhuizen, 2022; Gillen et al., 2019).[31] Our finding that the gender confidence gap is driven

[31]For example, the data in Niederle and Vesterlund (2007) shows that the gender difference in willingness to compete among those who should compete (high-ability subjects) is 42 percentage points. Among those who should not compete, it is only 26 percentage points.

Table 1: Confidence gap by gender and SES

	Misconfidence		Only underconfidence		Only overconfidence	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: By gender						
Female	-0.020***	0.037**	0.021***	0.001	0.001	0.038**
	(0.007)	(0.016)	(0.004)	(0.003)	(0.005)	(0.016)
Honors	-0.010	0.021	-0.024***	-0.028***	-0.035***	-0.007
	(0.011)	(0.015)	(0.004)	(0.005)	(0.010)	(0.014)
High honors	0.008	0.052***	-0.033***	-0.049***	-0.025**	0.003
	(0.013)	(0.017)	(0.007)	(0.009)	(0.011)	(0.014)
Highest honors	0.058***	0.143***	-0.011	-0.063***	0.047***	0.080***
	(0.019)	(0.025)	(0.014)	(0.018)	(0.013)	(0.016)
Female × Honors		-0.055***		0.007		-0.049***
		(0.020)		(0.006)		(0.019)
Female × High honors		-0.073***		0.026**		-0.048***
		(0.020)		(0.011)		(0.017)
Female × Highest honors		-0.129***		0.076***		-0.053***
		(0.026)		(0.019)		(0.017)
True rank	-0.699***	-0.702***	0.252***	0.254***	-0.447***	-0.448***
	(0.022)	(0.022)	(0.015)	(0.015)	(0.017)	(0.017)
Constant	0.384***	0.353***	-0.042***	-0.032***	0.342***	0.321***
	(0.010)	(0.013)	(0.003)	(0.003)	(0.009)	(0.012)
Adj. R2	0.593	0.598	0.352	0.360	0.514	0.517
Observations	2034	2034	2034	2034	2034	2034
Panel B: By socioeconomic status						
Low SES	-0.020**	0.007	0.017***	0.001	-0.003	0.009
	(0.008)	(0.017)	(0.005)	(0.003)	(0.006)	(0.016)
Honors	-0.012	0.002	-0.020***	-0.027***	-0.033***	-0.026**
	(0.011)	(0.013)	(0.004)	(0.004)	(0.010)	(0.013)
High honors	0.004	0.019	-0.026***	-0.035***	-0.022**	-0.016
	(0.013)	(0.015)	(0.007)	(0.008)	(0.011)	(0.013)
Highest honors	0.051***	0.071***	-0.001	-0.015	0.050***	0.056***
	(0.019)	(0.020)	(0.014)	(0.014)	(0.013)	(0.015)
Low SES × Honors		-0.031		0.014**		-0.017
		(0.021)		(0.006)		(0.020)
Low SES × High honors		-0.036		0.020		-0.016
		(0.022)		(0.012)		(0.018)
Low SES × Highest honors		-0.065**		0.049**		-0.016
		(0.029)		(0.023)		(0.017)
True rank	-0.698***	-0.699***	0.249***	0.250***	-0.449***	-0.450***
	(0.022)	(0.022)	(0.015)	(0.015)	(0.017)	(0.017)
Constant	0.381***	0.369***	-0.038***	-0.031***	0.343***	0.338***
	(0.010)	(0.012)	(0.003)	(0.003)	(0.010)	(0.012)
Adj. R2	0.592	0.593	0.348	0.350	0.514	0.513
Observations	2000	2000	2000	2000	2000	2000

Notes: The table reports OLS regression estimates. In Columns (1) and (2), the dependent variable is the guessed rank minus the true rank (positive misperception); in (3) and (4), it is the true rank minus the guessed rank if a respondent underestimates her rank (degree of underconfidence) and in (5) and (6) the guessed rank minus the true rank if a respondent overestimates her rank (degree of overconfidence). Only Bac Général students are considered. Robust standard errors in parentheses. Significance levels are indicated by $* < .1, ** < .05, *** < .01$.

by top-performing students is consistent with Buser et al. (2022). They find that gender differences in willingness to compete among Swiss students are substantially stronger for high-ability students (27 pct. points) compared to low-ability students (10 pct. points). Moreover, Bobba and Frisancho (2022) find that high-achieving female students update their ability beliefs less in response to positive feedback than high-achieving males do.

Social confidence gap. Figure 5a shows a very similar confidence gap by socioeconomic status. While high-SES and low-SES students are equally overconfident at the bottom of the distribution, there is a large underconfidence gap between low-SES and high-SES students at the top of the distribution. This finding is also supported by Figure A.6b, in which we plot students' guessed GPA rank (y-axis) against their real rank (x-axis). Panel B of Table 1 allows us to put numbers on these confidence gaps. Low SES students are, on average, 2 percentage points less confident, which is mostly driven by underconfident students. As previously, low-SES students' underconfidence is much more prevalent among high-achieving students. Among students with the highest honors, low-SES students are 5.8 (6.5-0.7) percentage points less confident than high-SES students, with most of this difference being driven by underconfident students.

Our findings contribute to literature that suggests that students from low socio-economic status are less accurate in assessing their abilites (Falk et al., 2020b). Closely related to our setting, Guyon and Huillery (2020) find that French high-school students from low SES score 0.15 standard deviations lower on a "scholastic self-esteem" index (including items like "being just as smart as others"), despite having the same high-school grades. In Mexican middle schools, Bobba and Frisancho (2019) find that high-achieving low SES students update their ability beliefs less in response to positive feedback compared to high SES students.

5 Misconfidence and college choices

Our results so far document a large confidence gap between female and male students and between students from low and high social background. Confidence gaps are of particular concern if they influence student aspirations. Hence the question we address in this section: How much does under- and overconfidence affect student college applications and admissions?

Outcomes. We are interested in two main types of outcomes, namely college applications and college admissions, which we present and discuss here as we will use these outcomes to investigate both the effect of confidence on college choices (in this section) and the effect of our information treatment on college choices (in the next section).

First, we look at the effect of confidence on the prestige of student application list. Among all applications submitted by a student, we compute the minimum prestige of the applications—which we refer to as the "safe" program—, the maximum prestige of the applications—which we refer to as the "top" program—, and the average prestige of the application list. In addition, we consider whether a student is applying to at least one elite track (CPGE), an important outcome as *grandes écoles* in France lead to higher paying jobs and prestigious positions (cf. Section 2.1).

Second, we consider the prestige of the final match, which corresponds to the prestige of the program a student ultimately enrolls in, and whether a student enrolls in an elite track.

Estimation strategy To estimate whether overconfidence predicts application behavior and outcomes, we use the following specification:

$$\text{Y}_i = \alpha_0 + \alpha_1 \text{Misconfidence}_i + \alpha_2 \text{Real rank}_i + \alpha_3 X_i + \epsilon_i \tag{2}$$

where

$$\text{Misconfidence}_i = \text{Guessed rank}_i - \text{Real rank}_i, \tag{3}$$

Y_i are the outcome variables described in the previous section. The variable Misconfidence_i corresponds to the difference between a student's guessed ability rank and her real rank, as defined in Section 4.1. The larger this variable, the more overconfident (and the less underconfident) a student is. Importantly, by controlling for the real rank of a student, α_1 measures the influence of miscalibrated confidence keeping the actual rank constant. We include indicators for a student's honors to control for academic ability more flexibly. We only consider students in the control group to ensure that the outcome variables are unaffected by the information treatment.

Table 2: Effect of misconfidence on college applications and admissions

	Application list				Final match	
	(1) Max Prestige	(2) Min Prestige	(3) Mean Prestige	(4) One CPGE	(5) Prestige	(6) CPGE
Panel A: Effect of misconfidence						
Misconfidence	0.712***	0.111	0.479***	0.326***	0.432**	0.159***
	(0.203)	(0.093)	(0.139)	(0.076)	(0.186)	(0.055)
True rank	1.798***	0.308**	1.363***	0.627***	1.934***	0.260***
	(0.268)	(0.123)	(0.188)	(0.098)	(0.237)	(0.073)
Panel B: Effect of underconfidence						
Underconfidence	-0.534*	-0.258	-0.522**	-0.531***	-0.477	-0.275***
	(0.306)	(0.175)	(0.265)	(0.145)	(0.345)	(0.098)
True rank	1.441***	0.297***	1.165***	0.536***	1.763***	0.224***
	(0.244)	(0.111)	(0.173)	(0.089)	(0.216)	(0.062)
Panel C: Effect of overconfidence						
Overconfidence	0.929***	0.021	0.508***	0.220***	0.465**	0.089*
	(0.286)	(0.109)	(0.161)	(0.080)	(0.207)	(0.049)
True rank	1.711***	0.240**	1.254***	0.497***	1.832***	0.188***
	(0.260)	(0.114)	(0.177)	(0.091)	(0.216)	(0.065)
Bac Grade FE	✓	✓	✓	✓	✓	✓
Observations	1047	1047	1047	1047	914	914

Notes: Overconfidence is the difference between the guessed rank and the true rank. In Column (1), the dependent variable is the z-standardized maximal prestige (in terms of average mention) of the application list, in Column (2), minimum prestige of the application list, in Column (3) the average prestige of the application list, and in Column (4) an indicator whether at least one CPGE is included in the list. In Column (5) the prestige of the final match and in Column (6) it is an indicator of whether the final match is a CPGE. Only the control group and students from Bac Generale are included. Robust standard errors in parentheses. Significance levels are indicated by $^{*} < .1, ^{**} < .05, ^{***} < .01$.

Results Table 2 shows the regression results for the misconfidence variable (the guessed rank minus the actual rank) and the true rank for the control group. Note that if a student's confidence did not matter for college choices, i.e., if students applied only based on their academic ability, then students' real rank should be the only variable that predicts applications, and the misconfidence variable would have no effect. However, this is not what we observe.[32]

Panel A shows that, holding ability constant, miscalibrated confidence strongly predicts application behavior. More confident applicants apply to less prestigious top programs (Max Prestige), and the magnitude of the effect is large. Being ten percentiles more confident is associated with a 0.07 standard deviations higher prestige of the top program.[33] In line with these findings, more confident students are significantly more likely to apply to one of the very prestigious CPGEs. Being ten percentiles more confident raises the probability of applying to an elite track (CPGE) by 3.3 percentage points. Interestingly, overconfidence does not affect the prestige of the "safe" program (see Min Prestige). These first results, therefore, suggest that lack of confidence lowers the ambition and prestige of students' top choices, but does not affect the prestige of the "safe" program on their portfolio.

Our results so far show that higher confidence makes students apply to more prestigious programs, but does it also lead to better college admissions? Our results show that higher confidence indeed affects the prestige of the final match. Controlling for grades, being ten percentiles more confident, raises the prestige of the final match by 0.04 standard deviation, and the likelihood of enrolling in a CPGE by 1.6 percentage points (Columns (6) and (7) of Table 2).

Finally, we investigate whether the effect of misconfidence on college choices is driven more by underconfident or overconfident students. In Panel B of Table 2, we replace the misconfidence variable with zero for underconfident students. The *overconfidence* variable is therefore equal to the difference between the guessed rank and the real rank for overconfident students (and zero for underconfident students). Conversely, in Panel C, the *underconfidence* variable is equal to the difference between the true rank and the guessed

[32]We note that, in this section, our findings cannot be interpreted as a causal effect yet. In the next section, we use our randomized intervention to establish that the relationship between misconfidence and college application behavior is indeed causal.

[33]The misconfidence variable ranges from -1 to 1. The coefficients report the effect of moving from well-calibrated confidence (misconfidence = 0) to maximum overconfidence (misconfidence = 1). Dividing the coefficient by 10 indicates the effect of becoming 0.1 (10 percentiles) more confident.

rank for underconfident students. It is equal to zero for overconfident students. The coefficients reported in Panel B (C) of Table 2 correspond to the effect of moving from no underconfidence (resp. overconfidence) to maximum underconfidence (resp. overconfidence).

We find that both underconfidence and overconfidence affect the prestige of the program selected by students. Underconfidence affects the likelihood of applying to an elite track more than overconfidence does. Being 10 percentiles more underconfident reduces the chances of applying to a CPGE by 5.3 points, whereas being 10 percentiles more overconfident "only" increases the chance by 2.2 points. This asymmetric effect is not surprising given that only the best students apply to CPGE, and these high-achieving students are precisely those suffering from larger underconfidence. The asymmetric effect of under- and overconfidence on applications to the elite track directly translates into the same asymmetry in terms of admission chances. Underconfidence affects admissions to CPGE significantly more ($-0.275, p < 0.01$) than overconfidence does ($-0.089, p < 0.10$).

6 Effect of correcting misconfidence on college choices

6.1 Misconfidence no longer matters after feedback

Estimation strategy. In this section, we study whether correcting students' misconfidence by providing feedback on their real rank in the ability distribution has a causal effect on their application behavior.[34]

To measure the effect of correcting misconfidence, we randomly allocated students to either a treated group that received feedback on their correct rank in the grade distribution or a control group that did not receive any feedback. Table A.1 shows that student demographic characteristics are balanced between the 1,055 students in the control group

[34]We pre-registered the experimental intervention and the main hypotheses in the AEA RCT Registry, project number AEARCRT-0007218. We mostly followed the pre-registration but deviated in two respects. First, the survey had two treatment interventions. The second treatment provided advice on strategic behavior in the Parcoursup mechanism. We decided to move the results of the second treatment to a separate paper, which focuses on students' strategies within the matching mechanism. Second, our focus on high-achieving students was not specified in the pre-registration as we did not expect most of the variation in confidence and prestige of the applications to happen among high-achieving students. Further pre-registered analyses, which are not presented in this paper, will be published as an online appendix.

and the 1,002 students in the treatment group.[35] We use the following specification to estimate the effect of correcting misconfidence on college choices:

$$\begin{aligned} \text{Y}_i = &\beta_0 + \beta_1 \text{Misconfidence}_i + \beta_2 \text{Feedback}_i \times \text{Misconfidence}_i \\ &+ \beta_3 \text{Feedback}_i + \beta_4 \text{Real rank}_i + \beta_5 X_i + \epsilon_i, \end{aligned} \tag{4}$$

Y_i is the outcome. Feedback_i is a dummy variable that is equal to one for the randomly-selected group of students who receive information on their real rank in the ability distribution. Feedback_i is equal to zero for students in the control group. As previously, Misconfidence_i is defined as the difference between a student's guessed and real rank. This variable ranges from -1 (for full underconfidence) to 1 (for full overconfidence). A value of 0 corresponds to students who correctly guess their rank in the ability distribution. We refer to these students as having "well-calibrated" beliefs. All regressions control for a student's real rank. β_1 measures how much misconfidence affects college choices for students who do not receive feedback. This coefficient indicates whether, conditional on real rank, over- and underconfidence is relevant for college choices, replicating our analysis from Section 5. The coefficient β_2 measures how much providing feedback affects the relevance of overconfidence on application behavior. Moreover, β_3 estimates the effect of providing feedback for students who are neither overconfident nor underconfident as they correctly guessed their rank. Finally, X_i includes honors fixed effects to control for ability differences more flexibly.

Effect of feedback. Table 3 reports the effect of providing feedback on students' application list (in columns 1 to 4) and on their final match (in columns 5 and 6). The top coefficient shows that for students who do not receive feedback on their rank, being more confident leads to more ambitious applications and more prestigious admissions, controlling for true ability.[36] The second coefficient (Rank feedback) shows that, unsurprisingly, correcting misconfidence has no effect on students who are neither overconfident nor underconfident (i.e., students who correctly guess their rank in the ability distribution).

[35] One exception is the share of the highest honor students, which is slightly higher in the control group. To address this, we control for honors fixed effects in all regressions.

[36] This top misconfidence coefficient is slightly different from the one reported in Table 2 because we only use the control group in Table 2.

The story is completely different for students who are initially overconfident or underconfident (as shown by the coefficient on Rank Feedback × Misconfidence). For them, correcting the initial misconfidence drastically reduces how much misconfidence matters for college choices. The treatment effect is large. Without feedback, a student whose misconfidence is 10 percentiles higher applies to a top program that is 0.06 SDs more prestigious. Providing feedback reduces this boosting effect by 0.05 SDs, to the point that it makes misconfidence irrelevant for college choices. Table A.4 reports correlations between misconfidence and college applications for students who receive feedback. The coefficients clearly show that a student's misconfidence no longer plays a role for college choices once we provided the feedback to students. This conclusion carries over to most of the other outcomes we consider. Feedback reduces the role played by misconfidence in the likelihood of applying (-39%) and being admitted (-72%) in an elite track (CPGE).[37]

Summing up, our treatment intervention shows that self-confidence has a causal effect on college choices and matches—one of the highest stakes evidence of the causal effect of beliefs. Thus, misconfidence is costly in terms of the stability of the outcome. Our easy-to-implement intervention, while creating winners and losers, moves the outcome closer to the optimal allocation, i. e. the stable match.

Given that primarily the best students (who are more likely to be underconfident) apply to elite tracks, our intervention might be particularly effective at mitigating how much underconfidence drives students' college choices, especially elite college choices. To shed light on this, we check next whether correcting students' misconfidence has the same effect for students who are initially underconfident and those who are initially overconfident. The results reported in Table A.3 show that the treatment reduces the impact of miscalibrated confidence both for underconfident and overconfident students (with the coefficients being more precisely measured for overconfidence). However, the results also confirm that boosting the confidence of students who are initially underconfident has a large effect on their likelihood of applying to an elite track program (CPGE) and of being admitted to one, whereas decreasing the confidence of students who are initially overconfident has no statistically significant effect on their likelihood of applying to an elite track and of being admitted to one. To illustrate the magnitudes, in the absence of feedback, being 10 percentiles more underconfident reduces the chance of applying to elite tracks by 4.7 per-

[37]Finally, we have discussed earlier the fact that students over- and underconfidence does not affect the prestige of their safe choice. Consistent with this finding, providing feedback has no effect for well-calibrated students, and it has no effect on the influence of misconfidence on the prestige of their safe choice.

Table 3: Effect of correcting misconfidence on college applications and admissions

	Application list				Final match	
	(1) Max Prestige	(2) Min Prestige	(3) Mean Prestige	(4) One CPGE	(5) Prestige	(6) CPGE
Misconfidence	0.634***	0.101	0.437***	0.274***	0.429***	0.149***
	(0.169)	(0.080)	(0.118)	(0.064)	(0.159)	(0.046)
Rank feedback	0.050	0.007	0.036	-0.010	0.002	0.025
	(0.044)	(0.024)	(0.034)	(0.019)	(0.045)	(0.015)
Rank feedback × Misconfidence	-0.505***	-0.024	-0.268**	-0.107	-0.105	-0.107**
	(0.180)	(0.085)	(0.127)	(0.069)	(0.175)	(0.054)
True rank	1.604***	0.268***	1.269***	0.520***	1.682***	0.220***
	(0.180)	(0.087)	(0.131)	(0.070)	(0.167)	(0.052)
Constant	1.390***	-0.812***	0.072	-0.057**	-0.547***	-0.066***
	(0.076)	(0.035)	(0.050)	(0.025)	(0.064)	(0.018)
Bac Grade FE	✓	✓	✓	✓	✓	✓
Adj. R2	0.219	0.120	0.330	0.198	0.464	0.102
Observations	2034	2034	2034	2034	1793	1793

Notes: Overconfidence is the difference between the guessed rank and the true rank. In Column (1), the dependent variable is the z-standardized maximal prestige (in terms of average mention) of the application list, in Column (2), minimum prestige of the application list, in Column (3) the average prestige of the application list, and in Column (4) an indicator whether at least one CPGE is included in the list. In Column (5) the outcome is the prestige of the final match and in Column (6) it is an indicator whether the final match is a CPGE. Only students from Bac Generale are included. Robust standard errors in parentheses. Significance levels are indicated by $^{*} < .1, ^{**} < .05, ^{***} < .01$.

centage points. With feedback, increasing underconfidence by 10 percentiles only reduces the chance by 1.7 points. The role played by underconfidence has dropped by 63%.

This last result raises an important question. If boosting the confidence of underconfident students raises their ambition, does that help to close the gender and social aspiration gaps we document in section 4.1 among high-achieving students?

6.2 Correcting misconfidence reduces aspiration gaps

To test whether rank feedback helps to close the aspiration gap among high-achieving students, we focus on the students who receive the highest honors. For the far majority of these students, our rank feedback informs them that their GPA rank is better than they thought.[38] Moreover, the feedback treatment confirms that they are at the top of the

[38] 92% of the students who receive the highest honors are underconfident.

distribution, which may give an additional boost to students with high but imprecise prior beliefs. Recall that among top achievers, female and low-SES students lack confidence much more than male students and high-SES students. This suggests that providing feedback may have the largest impact on this particular group of students. We, therefore, test whether the feedback treatment helps closing the gender and social gap.

Estimation strategy. To do so, we use the following specifications:

$$\begin{aligned} \text{Y}_i =& \gamma_0 + \gamma_1 \text{Feedback}_i \times \text{Female}_i \\ &+ \gamma_2 \text{Feedback}_i + \gamma_3 \text{Female}_i + \gamma_4 X_i + \epsilon_i, \end{aligned} \tag{5}$$

and

$$\begin{aligned} \text{Y}_i =& \gamma_0 + \gamma_1 \text{Feedback}_i \times \text{Low SES}_i \\ &+ \gamma_2 \text{Feedback}_i + \gamma_3 \text{Low SES}_i + \gamma_4 X_i + \epsilon_i. \end{aligned} \tag{6}$$

Feedback_i is a dummy variable that is equal to one for the randomly-selected group of students who receive information on their real rank in the ability distribution. Feedback_i is equal to zero for students who do not receive feedback. Low SES_i and Female_i are dummy variables indicating whether a student is from a low socio-economic background and female, respectively. X_i is a vector of control variables for honors. γ_2 estimates the treatment effect for males (in Eq 5) and for high SES students (in Eq 6). We are interested in the coefficient γ_1, which estimates the differential effect of providing rank feedback for female students compared to male students (in Eq 5) and for low-SES students compared to high-SES students (in Eq 6). We run these regressions on the sample of students who receive the highest honors.

Effect of feedback on the gender aspiration gap. The results, reported in Table 4 show that the feedback treatment helps to close the gender and social aspiration gaps. Starting with the gender gap, Panel A of Table 4 shows stronger treatment effects for high-achieving females than for high-achieving males. While the treatment does not significantly affect the college applications of high-achieving male students, high-achieving females apply

Table 4: Effect of correcting misconfidence on gender and social aspiration gaps

	Application list				Final match	
	(1) Max Prestige	(2) Min Prestige	(3) Mean Prestige	(4) One CPGE	(5) Prestige	(6) CPGE
Panel A: By gender						
Female	-0.505***	-0.100	-0.541***	-0.326***	-0.440***	-0.283***
	(0.087)	(0.125)	(0.122)	(0.065)	(0.168)	(0.080)
Grade feedback	-0.077	-0.041	-0.227	-0.121	-0.145	-0.066
	(0.063)	(0.149)	(0.138)	(0.078)	(0.206)	(0.104)
Grade feedback × Female	0.411***	0.037	0.467***	0.196*	0.374	0.206*
	(0.118)	(0.170)	(0.174)	(0.102)	(0.262)	(0.120)
True rank	1.625***	0.780***	2.145***	0.756***	3.442***	0.351
	(0.501)	(0.273)	(0.451)	(0.240)	(0.905)	(0.219)
Constant	2.026***	-0.796***	0.285	0.206	-0.595	0.136
	(0.447)	(0.228)	(0.417)	(0.223)	(0.819)	(0.206)
Observations	320	320	320	320	298	298
Panel B: By SES						
Low SES	-0.643***	-0.266**	-0.693***	-0.299***	-0.829***	-0.226***
	(0.187)	(0.114)	(0.154)	(0.088)	(0.228)	(0.056)
Grade feedback	0.126*	-0.032	0.058	-0.043	0.021	0.042
	(0.072)	(0.081)	(0.092)	(0.059)	(0.138)	(0.061)
Grade feedback × Low SES	0.412*	-0.009	0.098	0.335**	0.278	0.214*
	(0.228)	(0.146)	(0.210)	(0.140)	(0.360)	(0.122)
True rank	1.573***	0.721**	2.052***	0.729***	3.329***	0.354
	(0.441)	(0.281)	(0.429)	(0.248)	(0.897)	(0.233)
Constant	1.843***	-0.757***	0.123	0.060	-0.622	-0.017
	(0.393)	(0.235)	(0.381)	(0.223)	(0.798)	(0.208)
Observations	315	315	315	315	294	294

Notes: In Column (1), the dependent variable is the z-standardized maximal prestige (in terms of average mention) of the application list, in Column (2), minimum prestige of the application list, in Column (3) the average prestige of the application list, and in Column (4) an indicator whether at least one CPGE is included in the list. In Column (5) the outcome is the prestige of the final match and in Column (6) it is an indicator whether the final match is a CPGE. Only students from Bac Generale are included. Robust standard errors in parentheses. Significance levels are indicated by $^{*} < .1, ^{**} < .05, ^{***} < .01$.

more ambitiously when receiving feedback.[39] Among high-achieving students, the top program that female students apply to is 0.51 SDs less prestigious than the top program that male students apply to, and female students are 32.6% points less likely to apply to an elite track (CPGE) than male students. Our intervention closes 81% of the gender prestige gap, and 57% of the gender gap in elite track applications. Boosting confidence does not only close the gender application gap; it also reduces the gender gap in admissions. While, without feedback, high-achieving female students are 28.3% points less likely to attend an elite track than males, correcting underconfidence closes 73% of this initial gap (feedback increases women's admissions to elite track by 20.6% points more than men's). All in all, our results show that informing high-achieving female students that their GPA rank is in the top of distribution has a larger effect on them than on high-achieving male students, which reduces the application and admission gap.

Effect of feedback on the social aspiration gap. We reach similar conclusions on the effect of our intervention on the social aspiration gap. Panel B of Table 4 reports heterogenous treatment effects by student social background. Here again, we find that correcting underconfidence has a larger effect for high-achieving low-SES students than for high-achieving high-SES students. Providing feedback on real rank closes 69% of the gap in the top program prestige, and it completely closes the gap in applications to an elite track (CPGE). Moreover, the treatment closes 97% of the social gap in the probability of being accepted to an elite track (CPGE).

Summarizing the results of our intervention, we observe large effects on the highest honor female and low SES students. Thus, we show that a simple intervention can reduce the gender and SES gap in aspiration for the students for which we found the largest gaps: the highest honor students.

7 Mechanism: Confidence and perceived admission chances

In this section, we use our survey data to shed light on the relationship between confidence, offer beliefs, and college applications. In doing so, we directly build on recent work

[39]Interestingly, although male highest-honors students also mostly receive positive information on their rank, we find mostly negative treatment effects for male students. However, these treatment effects do not differ from zero at conventional significance levels.

that shows that students have incorrect beliefs about their admission chances, and that, as a result, providing feedback on admission chances can be an effective way of influencing college choices (Agarwal and Somaini, 2018; Kapor et al., 2020; Tincani et al., 2022; Larroucau et al., 2021; Arteaga et al., forthcoming). Our analysis investigates how much student self-confidence affects their beliefs about admission chances.

Outcomes We use three outcomes to analyze student offer beliefs:

1. Beliefs. First, in the survey, we ask students how they evaluate the probability (in percent) that they will receive an offer from each program they have listed. We refer to this outcome as "Belief."[40] Of course, we may not find any correlation between confidence and offer belief if confident students have higher offer beliefs but they also apply to more competitive programs in which admission chances are lower. To control for this last effect, we look at offer beliefs for two groups of programs that are relatively homogenous in terms of prestige: (i) programs in the top 10% of the prestige distribution and (ii) elite track programs (CPGE).

2. Optimism. Second, we construct a variable that compares students' stated offer chances with their actual offers. We refer to this outcome as "Optimism" and we construct it as follows:

$$\text{Optimism}_i = \frac{1}{j}\sum_j [\text{Belief on offer chance}_{ij} - \text{I(Offer received)}_{ij}], \tag{7}$$

where i indexes students and j the programs on their list. The belief on offer chances is bounded between 0 and 1. Hence, the Optimism variable is equal to 1 when a student is sure to receive an offer from every program on her list (mean offer belief of 1), but receives no offer. The variable is equal to -1 when a student assigns offer beliefs of 0 to all program on her list, but she receives offers from all programs. On average, if students had realistic offer expectations, the variable would have a mean of zero. This optimism variable, by comparing beliefs to real offers, accounts for differences in program competitiveness between students.

[40] We asked students about their perceived admission chances before we randomized the information treatment. We did not ask again after the intervention, so we cannot look at the feedback effect on these admission beliefs.

Table 5: Correlation between confidence and perceived admission chances

	(1) Belief (only Top10%)	(2) Belief (only CPGE)	(3) Overoptimism	(4) Prestige of bet
Misconfidence	14.714**	10.481	0.069*	0.594**
	(6.225)	(8.550)	(0.042)	(0.243)
True rank	22.546***	37.227***	0.127**	1.830***
	(8.703)	(10.580)	(0.049)	(0.309)
Honors	-1.153	-5.377	-0.071***	0.003
	(4.403)	(6.906)	(0.019)	(0.100)
High honors	-1.226	-4.206	-0.149***	0.163
	(5.362)	(7.775)	(0.027)	(0.154)
Highest honors	-2.210	-9.253	-0.254***	0.686***
	(6.640)	(9.090)	(0.037)	(0.226)
Constant	36.187***	37.566***	0.272***	-0.106
	(4.307)	(6.807)	(0.020)	(0.105)
Adj. R2	0.017	0.060	0.050	0.267
Observations	691	381	2034	832

Notes: The dependent variable is the stated belief to receive an offer from a respective program: In Column 1, only programs in the top 10% of the prestige distribution are included and in Column 2 only CPGEs. The unit of observation are respondents and if a respondent applied to more than one program meeting the restrictions, we take the average belief. Only students from Bac Generale are included. Robust standard errors in parentheses. Significance levels are indicated by $^{*} < .1, ^{**} < .05, ^{***} < .01$.

3. Guessed match. Finally, in the very last part of the survey (i.e., after the information treatment), we asked students to bet on the program they think they will enroll in at the end of the admission process. We compute the prestige of this program as the average GPA of the students enrolled in this program. We refer to this prestige of the guessed match as "Prestige of bet" in tables and figures.

Correlation between confidence and perceived admission chances. To answer this question, we check whether individuals who are more confident about their GPA rank think that their admission chances are higher. We use the following simple regression in which the outcome (Y_i) can be student beliefs on admission chances, student optimism on admission chances, or the prestige of the guessed match:

$$\mathrm{Y}_i = \beta_0 + \beta_1 \text{Misconfidence}_i + \beta_2 \text{Real rank}_i + \beta_3 X_i + \epsilon_i, \tag{8}$$

Table 5 reports the results. In Column (1), we look at students' beliefs on their chances of receiving an offer from one of the top 10% most prestigious programs or from an elite track program (in Column (2)).[41] A 10 percentile higher confidence increases by 14.7 percentage points a student's belief that she will receive an offer from one of the top 10% most prestigious programs.[42] In line with this result, Column (3) shows that students who are more confident about their relative GPA rank are more optimistic about their admission chances ($p < 0.10$). Finally, the results reported in column (4) show that confidence raises the prestige of the program students think they will end up attending.[43] A 10 percentile higher confidence is associated with a bet on a 0.06 SD more prestigious program.

All in all, our results show that, above and beyond a student's ability, the more confident a student is, the larger she perceives her college admission chances at competitive programs to be. This suggests that our intervention, by correcting under- and over-confidence, may have affected students' applications primarily by changing their perceived admission chances. To bring one more piece of evidence on this channel, we show next how our intervention affected students' guessed outcomes.

Effect of feedback on perceived admission chances. Table A.2 shows how much the prestige of the guessed match is shifted by our feedback treatment.[44] Replicating our results from Table 5, higher confidence leads to higher prestige of the guessed match, controlling for true ability. However, the feedback treatment reduces the impact of misconfidence by 67%. This final result confirms that increased perceived admission chances are one of the driving forces that explains why correcting student misconfidence leads to more ambitious college applications.

8 Conclusion

We show that underconfidence plays a fundamental role in college choice, an extremely high-stake environment. We document striking differences in aspirations between male

[41] If a student applied to more than one program from the respective category, we take the average belief, and analyze the correlation at the applicant level.

[42] We also find a positive correlation between confidence and offer belief from an elite track, but due to a smaller sample size, the correlation is not statistically significant at conventional levels.

[43] For some students, we were unable to match the programs they reported in the survey to the programs in the administrative data, which explains the smaller sample size.

[44] For this analysis, we exclude participants that indicated an offer belief of 0 or 100 since the extent to which beliefs can be shifted for these participants is bounded.

and female students and between students from high and low socioeconomic status. While there might be many reasons for these differences, including preferences, information asymmetries, and budget constraints, we investigate the understudied channel of academic self-confidence. We present our results in three building blocks. First, using unique survey data we collect, we show large gender and SES gaps in self-confidence, especially for high-ability students, a group of students for whom underconfidence is particularly costly, as they have high admission chances in top programs. Second, we show that misconfidence strongly predicts college applications. Third, based on this observation, we design a simple, cheap, and easily scalable intervention, which consists of providing feedback to students on their relative rank in the national test score distribution. This intervention drastically decreases how much misconfidence matters for college applications. Most strikingly, our intervention closes between 57% to 77% of the gender and 69% to 100% of the social gap in the prestige of applications, and in the likelihood of applying to elite programs (CPGE). These results show that misconfidence has a clear and large causal effect on the prestige of students' applications and on their final assignments. Confidence gaps between males and females and between students from high and low SES are thus one of the driving forces of the gender and social aspiration gaps.

Finally, our results suggest that correcting underconfidence is more critical than correcting overconfidence. Thus, a natural policy recommendation is to target feedback to the best students to encourage them to apply to the best programs, hence mitigating the gender and SES gap in elite programs. On the other hand, informing students that they are overconfident might be particularly useful when the chances that they aim too high and end up unassigned are high, typically in countries where most colleges are oversubscribed. In such an environment, providing feedback to both under- and overconfident students is important.

Our strong feedback effect raises questions about when and why we can expect effects of similar size. A key consideration is whether a country has a standardized nationwide college entrance test, which implies that students have a more accurate knowledge of their position in the nationwide distribution. There is no college entrance test in France, which is true in many other countries, like Austria, Belgium, Canada, Italy (except for some subjects), Mexico, the Netherlands, Germany, Denmark, Finland, and others.[45] In these countries, we expect that our intervention should have an effect of similar size, if not

[45]We use the information about college admission practices in different countries from the excellent recent survey in Immorlica et al. (2020)

larger, as students, contrary to France, are often not aware of their class GPA rank, which might increase student misperception of their position in the national distribution.[46] For instance, in Germany, students only know their own GPA. They do not have information on the GPA of other students.

In contrast, in many countries, students know their scores in a centralized exam before they start college applications, for instance, in Hungary, Chile, China, Brazil, and Australia. Thus, students might easily infer their rank, and the misconfidence is likely to be smaller than in our context. The rank is sometimes even communicated directly to students with the results of the centralized exam, as in China.[47] In these environments, our intervention might have a smaller effect.[48]

Our results are relevant for policymakers who design school and college admission processes. If the design of admission markets is often limited to the selection of an appropriate mechanism, our results suggest that stopping there is not enough. Policymakers also need to carefully consider which information should be provided to students to allow them to fully express their preferences. Otherwise, the desired market outcomes (e.g., stability) might not be reached. With this conclusion, we build on a rich literature that shows the importance of providing historical cutoff grades (Immorlica et al., 2020; Hakimov et al., 2021), information about the quality of programs (Hastings and Weinstein, 2008), or admission chances (Kapor et al., 2020). Our easy-to-scale intervention adds to the options of the designer and allows for cheap mitigation of the pre-existing gender and social inequalities among high-achieving students.

[46]Remember than French students receive, three times a year, a one-page document summarizing their average grades in each subject. This sheet also indicates the rank of the student within their class.

[47]In China, students have access to the exact rank of their score nationwide and in the province. The latter is relevant due to the regional quotas of universities. See for example, https://www.gk100.com/read_70367.htm (in Chinese, retrieved 7.11.2022).

[48]Although the existence of a centralized exam is likely to be a key factor determining how well our results would replicate in different countries, other features of the college admission process might also play a role, such as how much colleges rely on test scores as admission criteria (versus geographical preferences, legacy, or others), whether universities use quotas for certain groups of students, whether all universities use the same admission criteria or not, and whether these criteria are transparent.

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Appendix

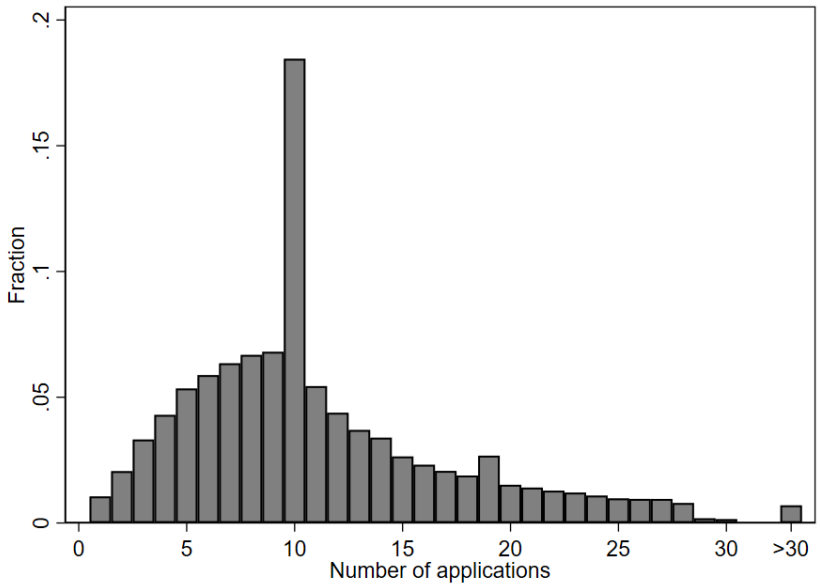
A Additional Tables and Figures

Table A.1: Balance table

		Main survey			
	Admin data	Total	Control	Feedback	Difference (p-value)
Female	0.558	0.618	0.625	0.612	(0.717)
Age	17.539	17.525	17.518	17.532	(0.750)
Low SES	0.259	0.307	0.309	0.305	(0.873)
Risk preference		7.634	7.658	7.609	(0.603)
GPA		13.707	13.714	13.700	(0.882)
Honors (Bac)					
No honors	0.258	0.234	0.235	0.233	(0.873)
Honors	0.336	0.340	0.326	0.355	(0.184)
High honors	0.263	0.270	0.269	0.272	(0.831)
Highest honors	0.144	0.156	0.170	0.141	(0.071)
Region (*Académie*)					
Ile-de-France	0.195	0.209	0.197	0.222	(0.171)
Share disadvantaged	0.378	0.378	0.377	0.378	(0.762)
Survey pre-treatment					
Number of programs		4.969	4.960	4.959	(0.996)
Avg. offer probability		0.602	0.599	0.605	(0.530)
Number of observations	420,745	2,057	1,055	1,002	

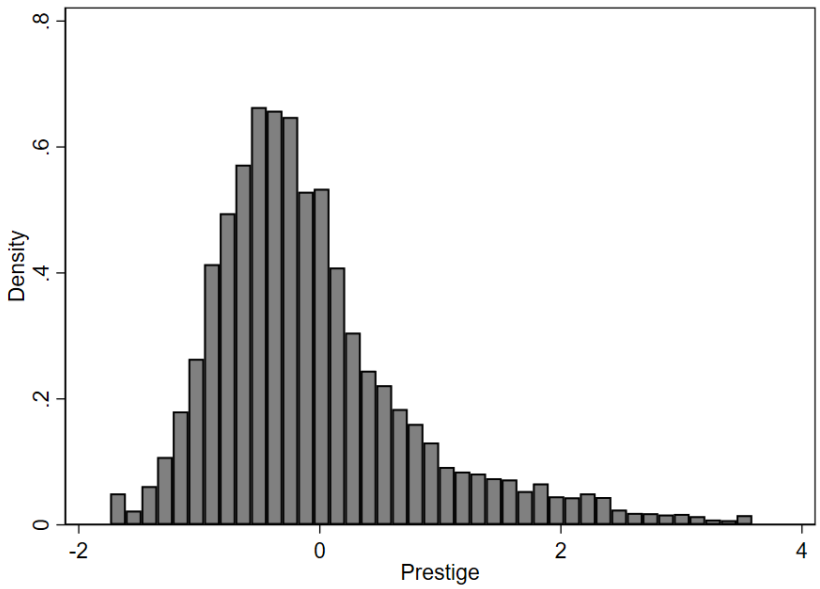
Notes: The table shows the balance of descriptive statistics in the administrative data and in the survey (total, control, and grade feedback treatment). The final column shows the p-value of a t-test comparing treatment and control group. For comparability, only Bac Général students are considered who graduated in 2021. Region refers to educational districts (*académie*), in which the respondent went to high school. Disadvantaged is measured as the share of individuals that receive a state scholarship for studying in that district.

Figure A.1: Number of applications



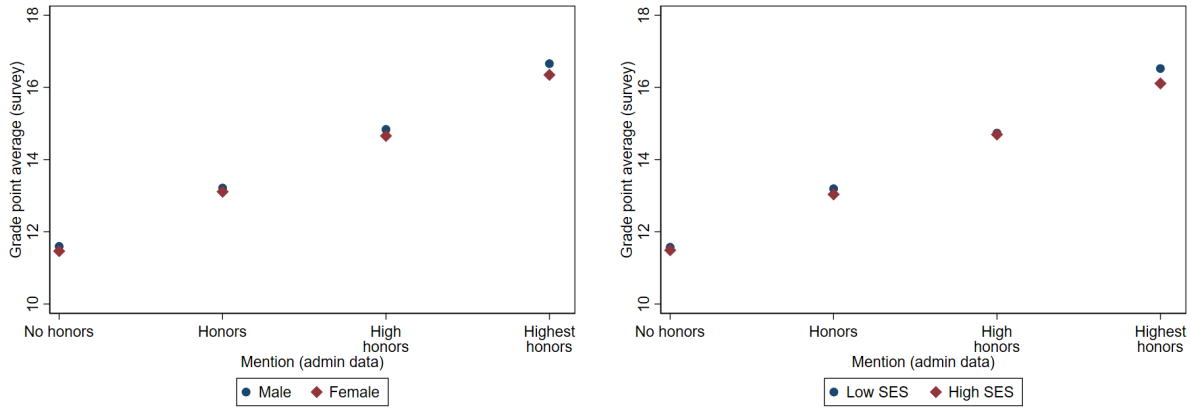
Notes: The figure shows a histogram of the number of applications that students submit in 2021 (using the administrative data). We group together choices that are considered as one choice by the platform.

Figure A.2: Distribution of prestige measure



Notes: The figure shows a histogram of the prestige measure. The unit of observation are programs. Prestige is defined at the program level as the mean Bac grade of all admitted students. Prestige is z-standardized by subtracting the mean among all programs in the dataset and dividing by their standard deviation.

Figure A.3: Reported GPA (in the survey) by Bac grade honors (in the admin data)

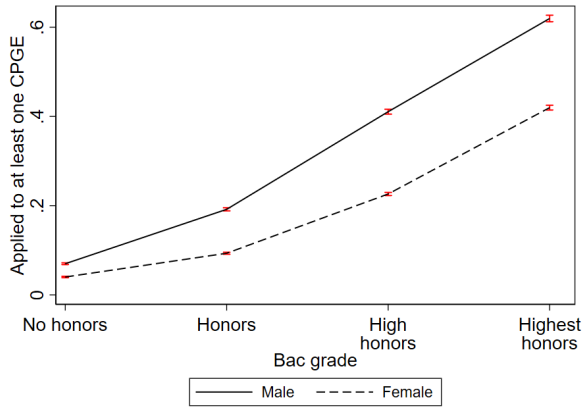


(a) By gender

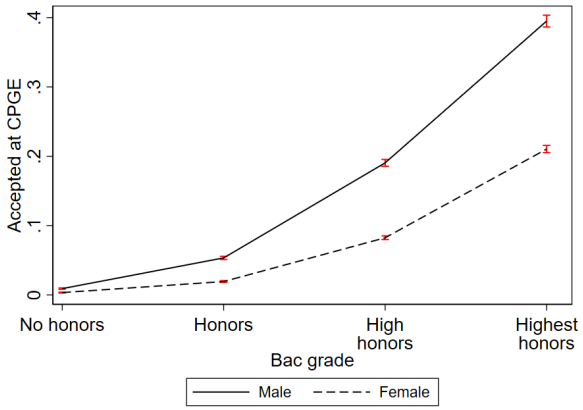
(b) By SES

Notes: The figures show the self-reported GPA in the survey by the overall bac grade in the admin data.

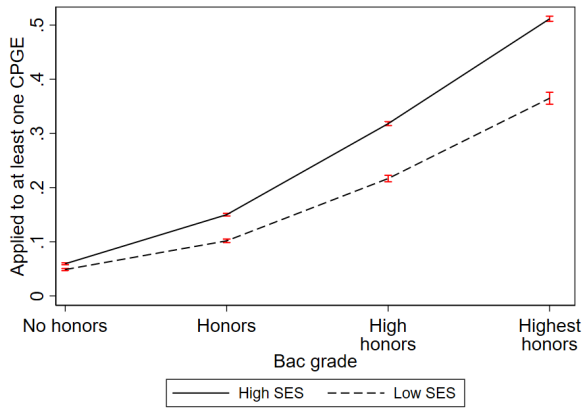
Figure A.4: Applications and match to CPGE by honors and gender/SES



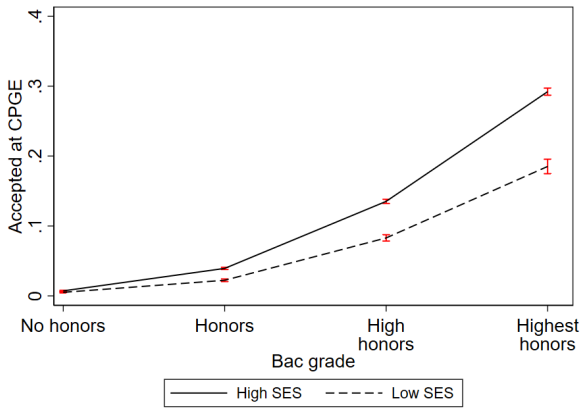
(a) Applied to CPGE by gender



(b) Matched to CPGE by gender



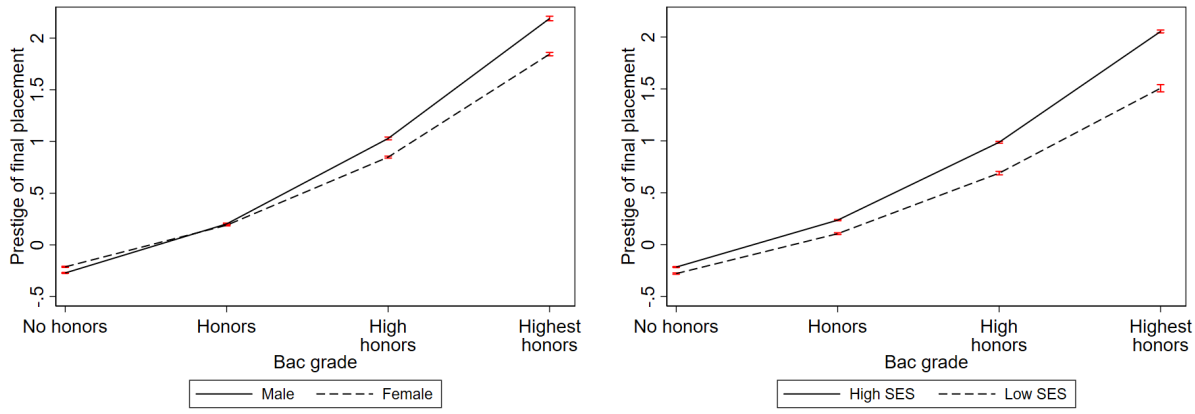
(c) Applied to CPGE by SES



(d) Matched to CPGE by SES

Notes: The figures show the propensity to apply to a preparatory class (CPGE) and to be ultimately matched to a CPGE by honors level and gender/SES. 99% confidence intervals are based on predicted values from a regression on the interaction of honors level and female/low SES.

Figure A.5: Prestige of accepted program by honors and gender/SES

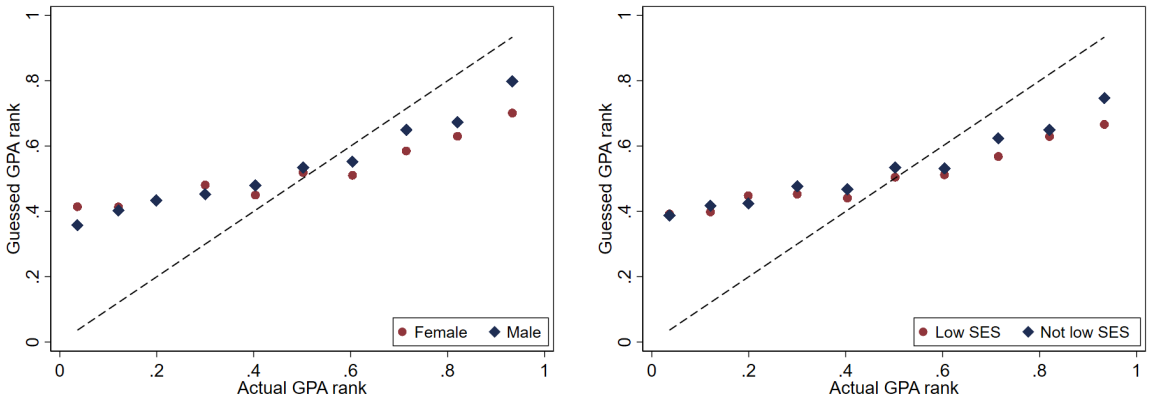


(a) Prestige by gender

(b) Prestige by SES

Notes: The figures show the prestige of the final match by honors level and gender/SES. Prestige of a program is defined as the mean grade level of all enrolled students. 99% confidence intervals are based on predicted values from a regression on the interaction of honors level and female/low SES.

Figure A.6: Average guessed GPA rank by actual rank



(a) Guesses by gender

(b) Guesses by SES

Notes: The figure shows the guessed GPA rank by actual GPA rank. The dots are mean guesses in bins of 10 ranks each. If respondents' stated guesses were accurate, they would be on the dotted 45 degree line.

Table A.2: Regression of the prestige of the outcome bet on misconfidence and treatment indicator

	(1)
	Prestige of bet
Treatment grade feedback	0.073
	(0.057)
Misconfidence	0.577***
	(0.209)
Grade feedback	
× Misconfidence	-0.389*
	(0.222)
True rank	1.819***
	(0.219)
Bac Grade FE	✓
Observations	1567

Notes: The dependent variable is the prestige of the guessed outcome (based on the incentivized bet on the final match). Robust standard errors in parentheses. Significance levels are indicated by * < .1,** < .05,*** < .01.

Table A.3: Treatment effect of Grade feedback on outcomes (by under-/overconfidence)

	Application list				Final match	
	(1) Max Prestige	(2) Min Prestige	(3) Mean Prestige	(4) One CPGE	(5) Prestige	(6) CPGE
Panel A: Only underconfidence						
Underconfidence	-0.683**	-0.236	-0.562**	-0.477***	-0.525*	-0.278***
	(0.275)	(0.161)	(0.237)	(0.131)	(0.312)	(0.086)
Grade feedback	-0.009	-0.001	-0.002	-0.034*	-0.003	0.002
	(0.051)	(0.023)	(0.036)	(0.019)	(0.044)	(0.014)
Grade feedback						
× Underconfidence	0.569*	0.103	0.408	0.302*	0.047	0.254*
	(0.329)	(0.191)	(0.290)	(0.172)	(0.411)	(0.138)
True rank	1.424***	0.267***	1.155***	0.451***	1.554***	0.195***
	(0.163)	(0.075)	(0.118)	(0.063)	(0.151)	(0.044)
Panel B: Only overconfidence						
Overconfidence	0.793***	0.050	0.483***	0.208***	0.438**	0.107**
	(0.245)	(0.095)	(0.144)	(0.074)	(0.189)	(0.046)
Grade feedback	0.122**	0.009	0.070*	-0.005	0.024	0.031
	(0.053)	(0.030)	(0.042)	(0.023)	(0.056)	(0.019)
Grade feedback						
× Overconfidence	-0.750***	-0.019	-0.359**	-0.071	-0.208	-0.091
	(0.273)	(0.114)	(0.170)	(0.085)	(0.226)	(0.059)
True rank	1.505***	0.239***	1.198***	0.445***	1.564***	0.181***
	(0.174)	(0.079)	(0.124)	(0.066)	(0.156)	(0.046)
Bac Grade FE	✓	✓	✓	✓	✓	✓
Observations	2022	2022	2022	2022	1793	1793

Notes: Overconfidence (Underconfidence) is the difference between the guessed rank and the true rank, and is zero for underconfident (overconfident) students. In Columns (1), the dependent variable is the z-standardized maximal prestige (in terms of average mention) of the application list, in Column (2), minimum prestige of the application list, in Column (3) the average prestige of the application list, and in Column (4) an indicator whether at least one CPGE is included in the list. In Column (5), the outcome is the prestige of the final match and in Column (6) it is an indicator whether the final match is a CPGE. Only students from Bac Generale are included. Robust standard errors in parentheses. Significance levels are indicated by $^{*} < .1, ^{**} < .05, ^{***} < .01$.

Table A.4: Effect of misconfidence on college applications and admissions in the treatment group

	Application list				Final match	
	(1) Max Prestige	(2) Min Prestige	(3) Mean Prestige	(4) One CPGE	(5) Prestige	(6) CPGE
Misconfidence	0.043	0.066	0.124	0.113	0.323	0.029
	(0.196)	(0.096)	(0.139)	(0.073)	(0.198)	(0.066)
True rank	1.414***	0.225*	1.175***	0.415***	1.441***	0.183**
	(0.241)	(0.122)	(0.181)	(0.100)	(0.236)	(0.073)
Constant	1.497***	-0.782***	0.142**	-0.038	-0.523***	-0.029
	(0.102)	(0.050)	(0.069)	(0.036)	(0.088)	(0.027)
Bac Grade FE	✓	✓	✓	✓	✓	✓
Adj. R2	0.244	0.116	0.341	0.198	0.471	0.111
Observations	987	987	987	987	879	879

Notes: Misconfidence is the difference between the guessed rank and the true rank. In Columns (1), the dependent variable is the z-standardized maximal prestige (in terms of average mention) of the application list, in Column (2), minimum prestige of the application list, in Column (3) the average prestige of the application list, and in Column (4) an indicator whether at least one CPGE is included in the list. In Column (5) the outcome is the prestige of the final match and in Column (6) it is an indicator of whether the final match is a CPGE. Only the treatment group and students from Bac Generale are included. Robust standard errors in parentheses. Significance levels are indicated by $^{*} < .1, ^{**} < .05, ^{***} < .01$.

B Alternative measures to program prestige

In the first column of Table B.1, we show the 16 most prestigious programs denoted by their type.[49] As expected, the CPGEs account for the majority of the most prestigious programs. The list also includes renowned engineering schools, Sciences Po, and a few specialized public universities.

Table B.1: List of 16 most prestigious programs

	Program type	
	Most prestigious	Lowest access rate
1	Licence - Sciences humaines et sociales	D.E secteur sanitaire
2	Formations des écoles d'ingénieurs	Licence - Droit-économie-gestion
3	Classe préparatoire scientifique	Licence - Sciences humaines et sociales
4	Licence - Droit-économie-gestion	Licence - Sciences - technologies - santé
5	Classe préparatoire scientifique	Licence - Sciences - technologies - santé
6	Classe préparatoire scientifique	BUT - Service
7	Sciences politiques	D.E secteur sanitaire
8	Formations des écoles d'ingénieurs	BTS - Services
9	Classe préparatoire scientifique	BTS - Services
10	Classe préparatoire scientifique	Licence - Sciences - technologies - santé
11	Classe préparatoire scientifique	BUT - Service
12	Classe préparatoire scientifique	Licence - Sciences - technologies - santé
13	Classe préparatoire scientifique	Licence - Sciences humaines et sociales
14	Classe préparatoire littéraire	DN MADE
15	Classe préparatoire scientifique	Licence - STAPS
16	Classe préparatoire scientifique	Licence - Sciences humaines et sociales
Average prestige	3.547	1.838
Average access rate	0.167	0.056

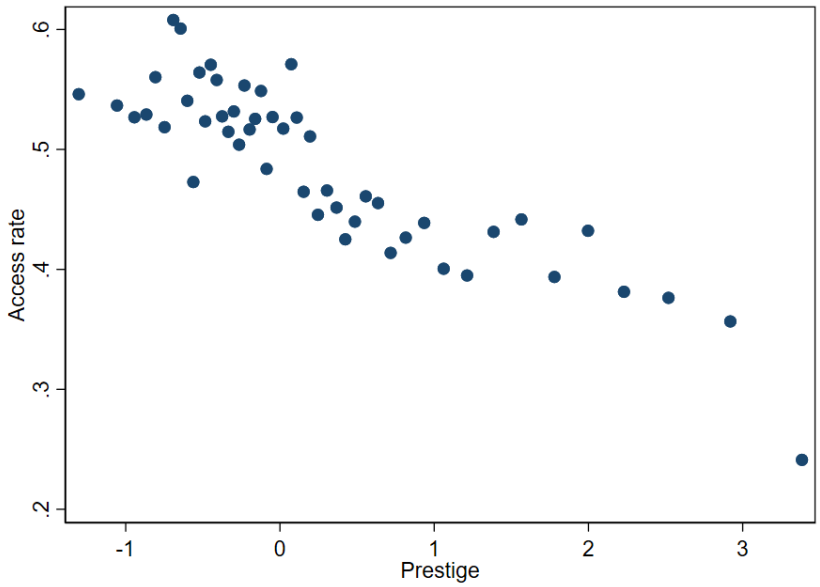
Notes: The table shows the program type of the 16 most prestigious programs (according to the average Bac grade of the admitted students) and the 16 programs with the lowest access rate. Only programs are considered to which at least 10 survey participants applied. The bottom row shows the average prestige and access rate of the programs in the column.

A potential alternative measure for the quality of a program is the access rate (the number of seats divided by the number of applications). This access rate is strongly correlated with the prestige, as we show in Figure B.1. However, the programs with the lowest access rates are not those typically considered as very prestigious. In the second column of Table B.1, we show the 16 programs with the lowest access rate, which include technical high-schools (BTS), nursing schools, sports programs, specialized public university degrees, and design classes. These programs have an average access rate of 5.6 percent, but the average prestige is only 1.84 SDs. Hence, they are overdemanded, but they do not attract the best students.

[49] For data protection reasons, we cannot show the names of the institutions and programs along with the calculated prestige score.

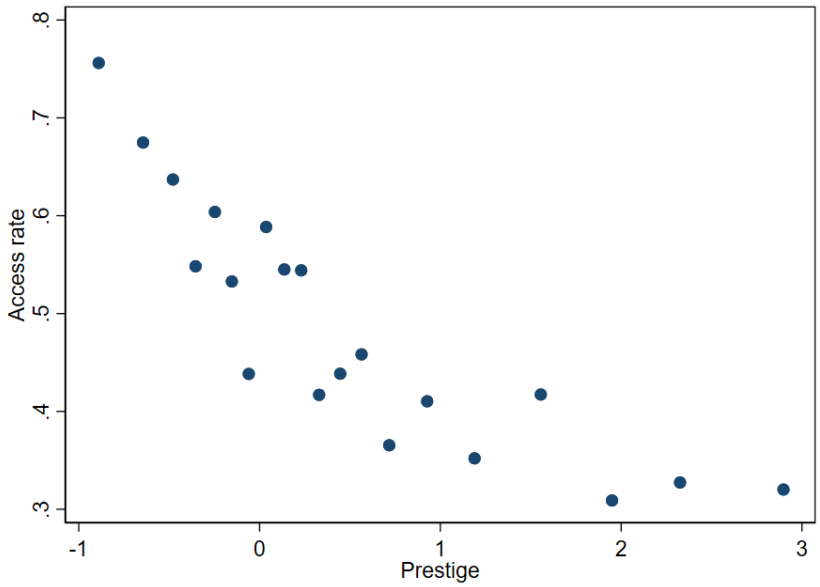
Figure B.2 illustrates this argument for health-related degrees, including nursery schools and health-related unversity degrees (while Figure B.1 illustrates the argument across all sectors). Overall, there is a strong correlation between access rate and prestige but this is less true for the best programs (in terms of prestige) where the access rate does not distinguish well between the most prestigious programs.

Figure B.1: Access rate by prestige measure



Notes: The figure shows a binned scatterplot of the access rate (number of applications by number of seats) as given on the Parcoursup platform by the prestige measure (z-transformed average Bac grade).

Figure B.2: Access rate by prestige measure (only health programs)



Notes: The figure shows a binned scatterplot of the access rate by the prestige measure focussing on health-related programs (nursery programs and health-related university degrees).

C Data collection

We conducted a large-scale survey of students participating in the French college admission procedure in 2021. We recruited our sample using social media ads (Instagram, Snapchat, and Facebook). Individuals who clicked on the ad were redirected to the Qualtrics survey.

On the landing page, respondents were informed about the survey and asked for consent regarding the raffle terms and the privacy policy. Of the 14,590 respondents that consented to participate, 48% dropped out when asked for their name, demographics, and contact details (see Table C.1).[50] Another 24% dropped out when asked to state the programs (city, institution, and program) they plan to apply for in Parcoursup in free-text form. In the end, 3,446 completed the survey. While the completion rate may appear low, it is not surprising for several reasons (cf. Allcott et al., 2020). First, the sample does not consist of participants who signed up for a survey panel and, thus, showed a general interest in sharing their data. Participants may have clicked on the link out of curiosity but decided to opt out after finding out that the survey asked for personal information. Second, respondents clicked on the ad while browsing social media, hence, they may not have been prepared to complete a 12-minute survey that contains a number of reasonably tedious free-text responses (such as the application list). Although we tried to keep the survey concise, it is arguably less entertaining and requires a longer attention span than the content typically consumed on social media.

Our final sample contains 3,294 students. Among those, approximately 1,140 were recruited via Instagram and Facebook, and approximately 2,140 via Snapchat. The remaining participants were recruited via alternative channels.[51]

We cleaned the data from duplicate entries that we identified based on mail address, phone number, and name.[52] If a respondent completed the survey more than once, we consider their pre-treatment answers from the first entry and their post-treatment answers from the final entry. The treatments are cumulated. That is, a respondent who received one treatment in the first attempt, and another treatment in the second attempt, is treated as receiving both treatments. Overall, we applied the described procedure to 81 duplicate entries.

[50] Subjects were informed that all analyses will be anonymized and that their personal information would only be used to match their responses to the administrative records and to contact them in case that they won a gift card.

[51] We also bought a small number of ads on Twitter and Google, but stopped these ads soon as the response rate from our target group was low. Moreover, we had a banner campaign on the website l'Etudiant (which provides information targeted to French high school students). The response rate was also low.

[52] Some students may have taken the survey multiple time to maximize their chances to win gift cards (although we explicitly stated in the consent form that students could only enter the raffle once).

Figure C.1: Social media ad

Notes: This Figure shows the social media ad we used to recruit students. The ad targets students in the final year of high school, who are about to submit their college applications on the Parcoursup platform. The ad offers the chance to win a 100 Euro giftcard for completing the survey.

Matching of survey and admin data We match the survey data with the administrative data. To do so, we asked survey respondents their national student number (INE).[53] Based on the INE, we can match 1,730 respondents. For students, who did not provide their INE, we matched the survey and admin data based on school, postal code, birth date, and gender. When these characteristics do not identify an observation uniquely, we compare the application lists reported in the survey and in the admin data of the potential matches. Using this combination of characteristics, we can match another 1,537 respondents with the administrative data. In total, this procedure allows us to match 3,267 respondents successfully. Students whom we could not match are excluded from our analysis.

[53]The INE is an 11-digit, unique identifier which is, for example, given on their report cards. As students also needed the INE to sign up on the college application platform (Parcoursup), many of them knew where to look it up.

Table C.1: Sample size of main survey

Number of students	Step
14,969	Started questionnaire
14,590	Consented to participate
7,577	Entered demographics
4,101	Entered application list
3,653	Assigned to treatment
3,446	Completed survey
3,387	Valid observations
2,070	In Bac général

D Data collection - Survey of GPA

In January and February 2021, we aimed to recruit at least 1,000 students in Baccalauréat général that were planning to take part in Parcoursup 2021. The goal of the pre-survey was to form a reference group to which we could compare the grades of students in the main survey.

The pre-survey was fielded between January 20 and February 1, 2021. We recruited subjects via ads on Instagram and Facebook (targeted to French users aged 17 or 18). The ad is displayed in Figure D.2. It addressed students in the final year of the bac, who are prospective participants of Parcoursup. The ad offered the chance to win a 50 Euro gift card for completing a 3-minute survey.

On the landing page, subjects were pre-screened according to whether they are in the final year of the Baccalauréat, whether they plan to take part in Parcoursup in 2021, and whether they are at least 16 years of age. After we decided that we will form the reference group out of students in Baccalauréat général, we added a corresponding screening question.[54]

Table C.1 shows that 4,464 subjects started the questionnaire, of which 2,600 subjects were screened in. Among those, 1,264 participants completed the questionnaire. After removing respondents who were not in bac général, duplicates and invalid responses (e.g., nonsense entries or a grade point average of 0.0), the final sample to calculate the grade distribution consisted of 1,001 participants. Among the participants, 57.4% were female, they were on average 17.4 years old, and the average GPA was 13.960.[55] These characteristics are very similar to our main survey and the population in the admin data (cf. Table A.1).

[54]On January 26, we had more than 70% of respondents from bac général and realized that it will be very costly to obtain a meaningful sample size for bac technologique and bac professionelle. Hence, we decided to focus the reference group on bac général students.

[55]Since we cannot match the pre-survey to the administrative data, we do not know the share of low SES students in this sample.

Figure D.2: Screenshot of ad for pre-survey

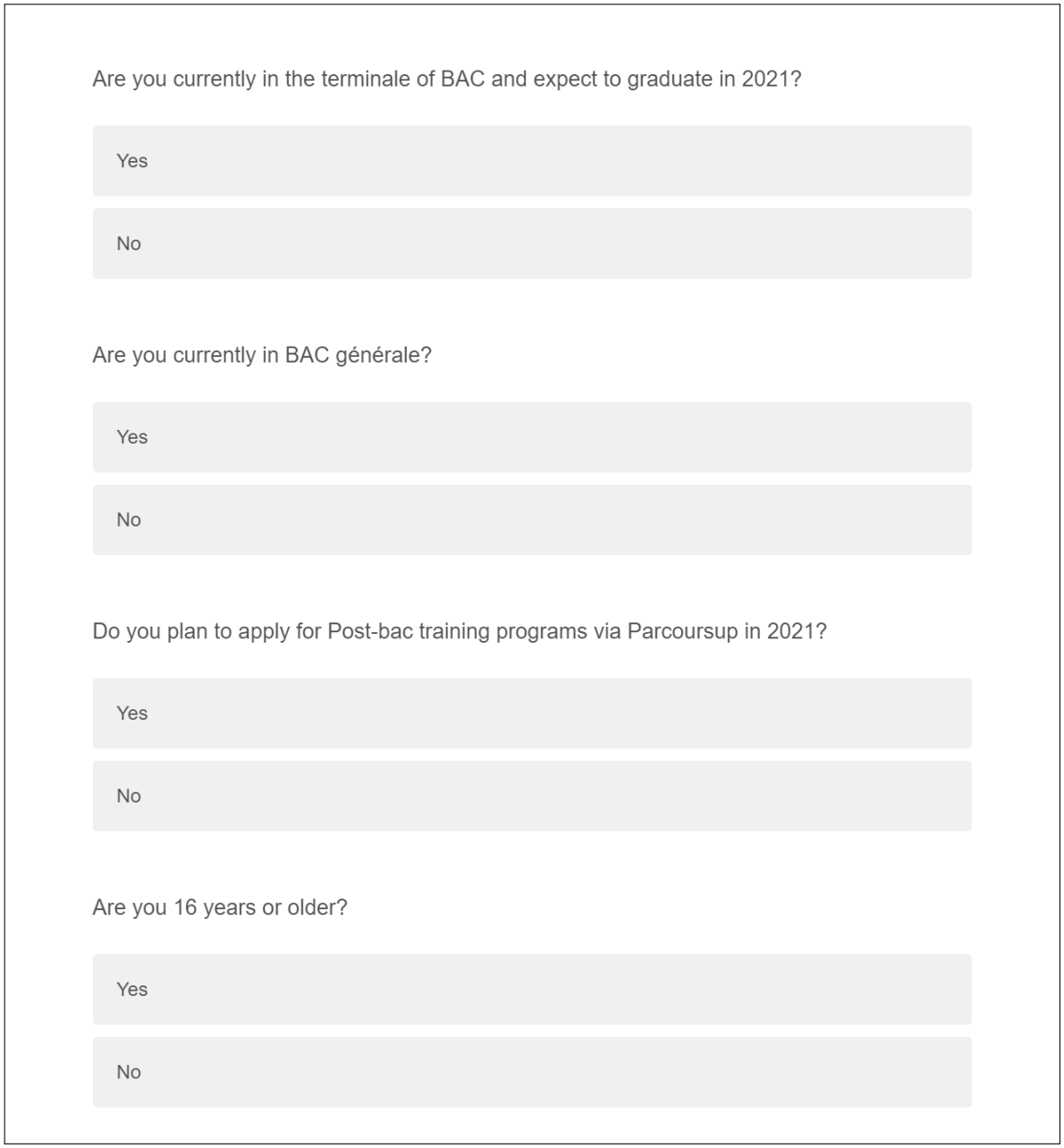
Notes: The screenshot shows the Facebook ad for the pre-survey. It addresses students in the final year of the bac, who participate in Parcoursup this year, and offers the chance to win a 50 Euro giftcard for completing a 3-minute survey. The Instagram ads used the same picture and text.

Table D.2: Sample size of pre-survey

Number of students	Step
4,464	started questionnaire
2,600	passed pre-screening
2,523	consented to participate
1,311	entered demographics
1,264	completed survey
1,001	in Bac général and valid

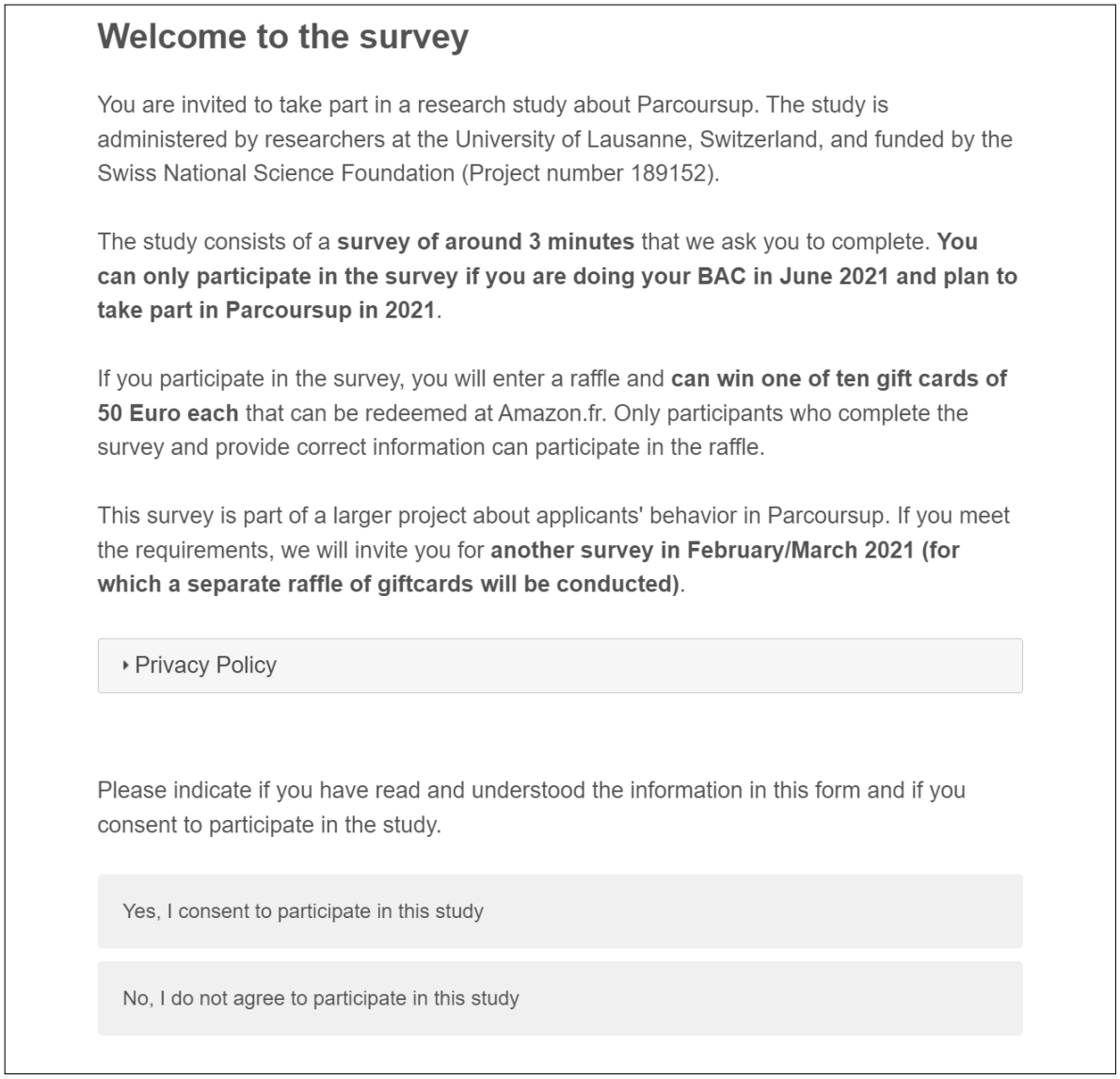
E Instructions of pre-survey (translated from French)

Figure E.1: Screenshot of pre-screening questions



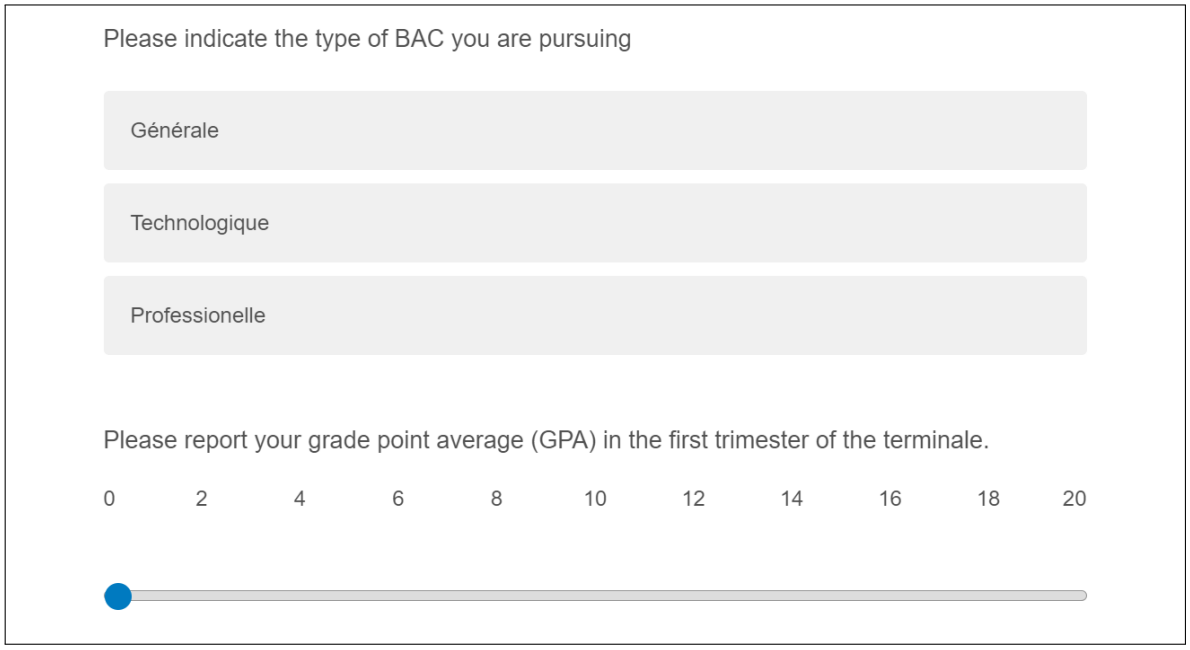
Notes: Subjects are pre-screened as to whether they belong to the target group. The survey only continues if they affirm all questions.

Figure E.2: Screenshot of welcome screen and consent form



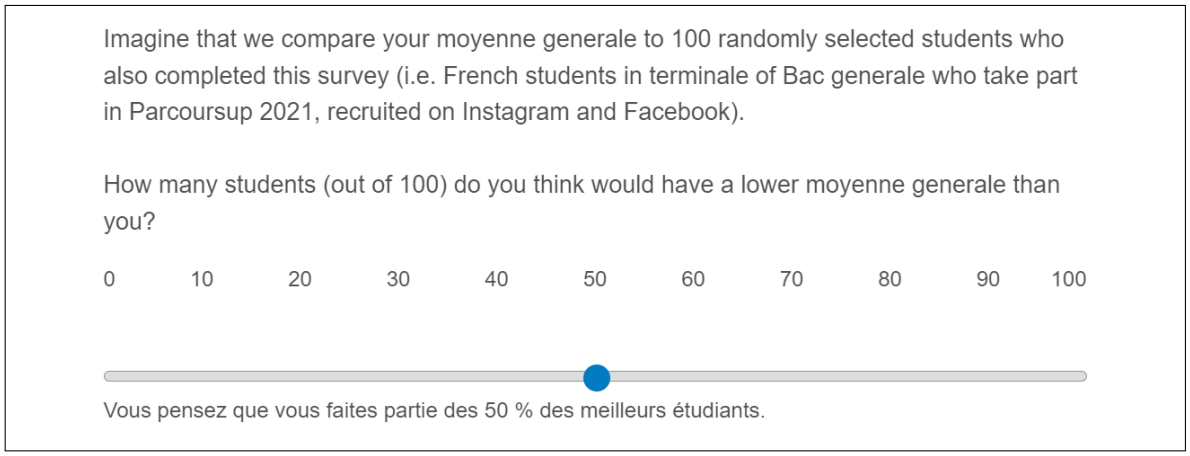
Notes: Subjects are welcomed and asked for consent to the privacy policy. The privacy policy informed that their responses will be matched to administrative data and pseudonymized afterwards. On the next screen, they are asked for their demographic details similar to Figure F.2 below (omitted here).

Figure E.3: Screenshot of question on bac type and GPA



Notes: Subjects are asked for their bac type and their GPA in the previous trimester.

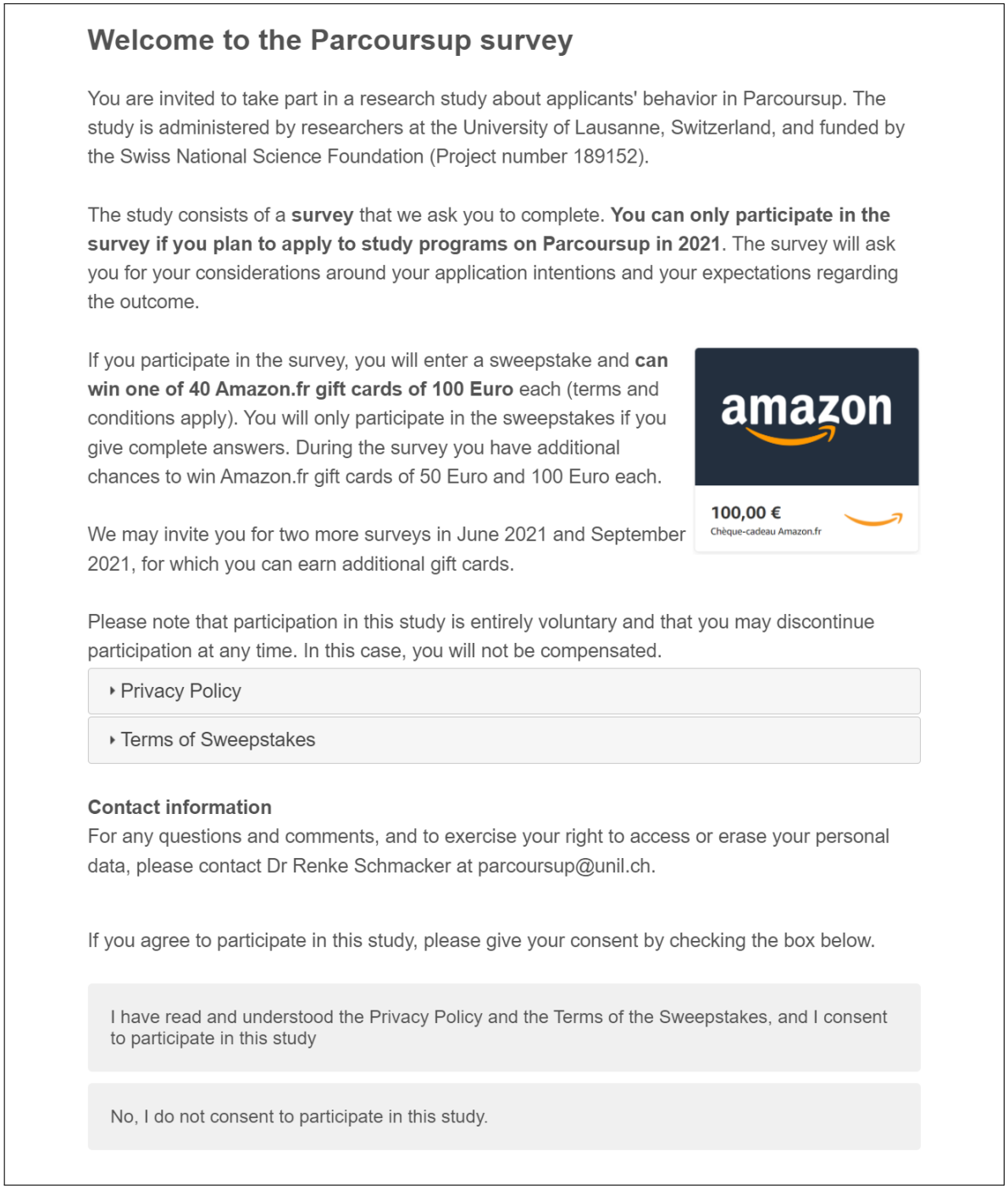
Figure E.4: Screenshot of question on guessed rank in the GPA distribution



Notes: Subjects are asked to guess their rank in the GPA distribution (only hypothetical).

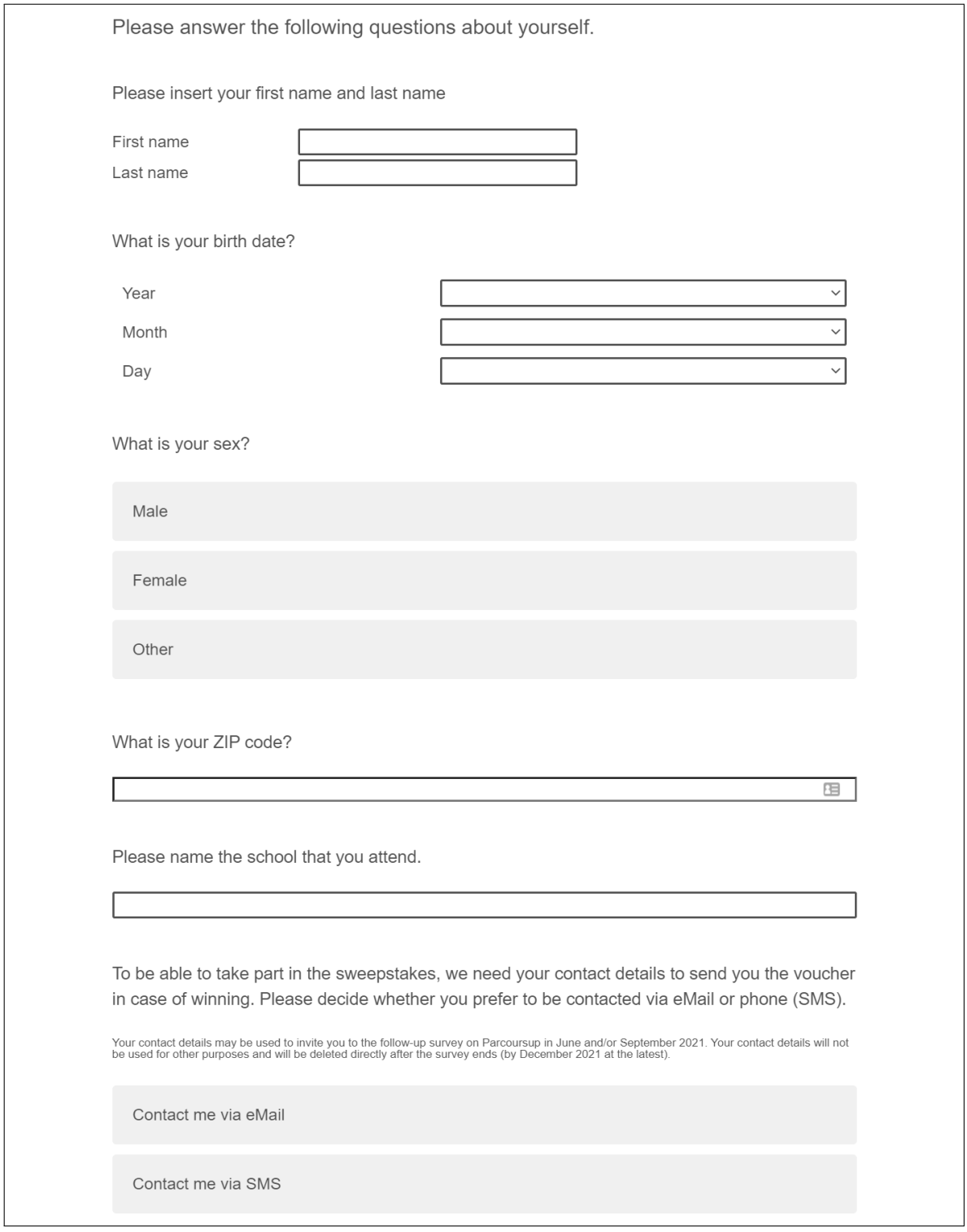
F Instructions of main survey (translated)

Figure F.1: Screenshot of welcome screen and consent form



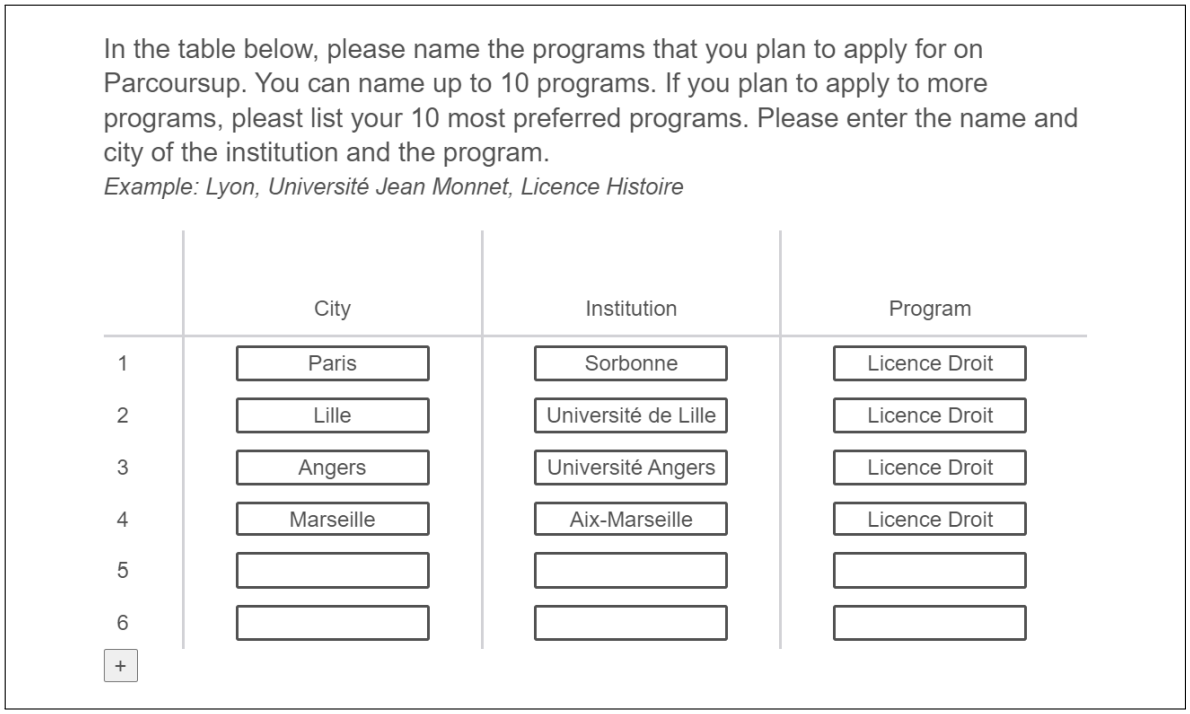
Notes: Subjects are welcomed and asked for consent to the privacy policy and terms of participation. The privacy policy informed that their responses will be matched to administrative data and pseudonymized afterwards.

Figure F.2: Screenshot of demographic questionnaire



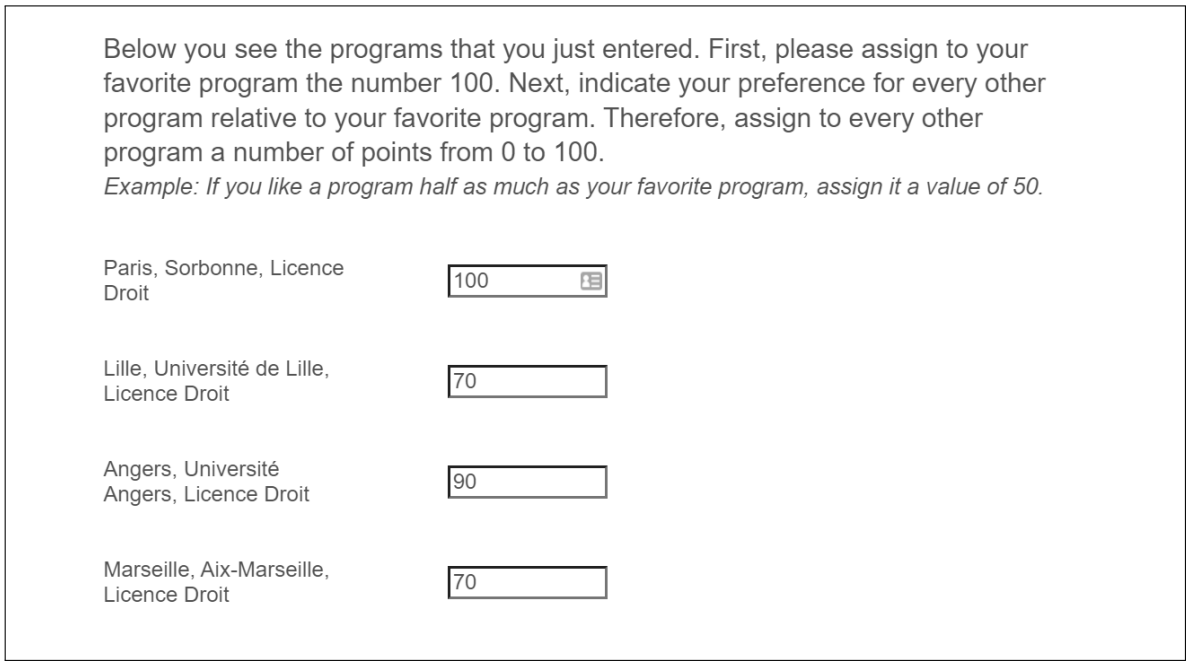
Notes: Subjects are asked for their demographic characteristics and contact details.

Figure F.3: Screenshot of elicitation of application list



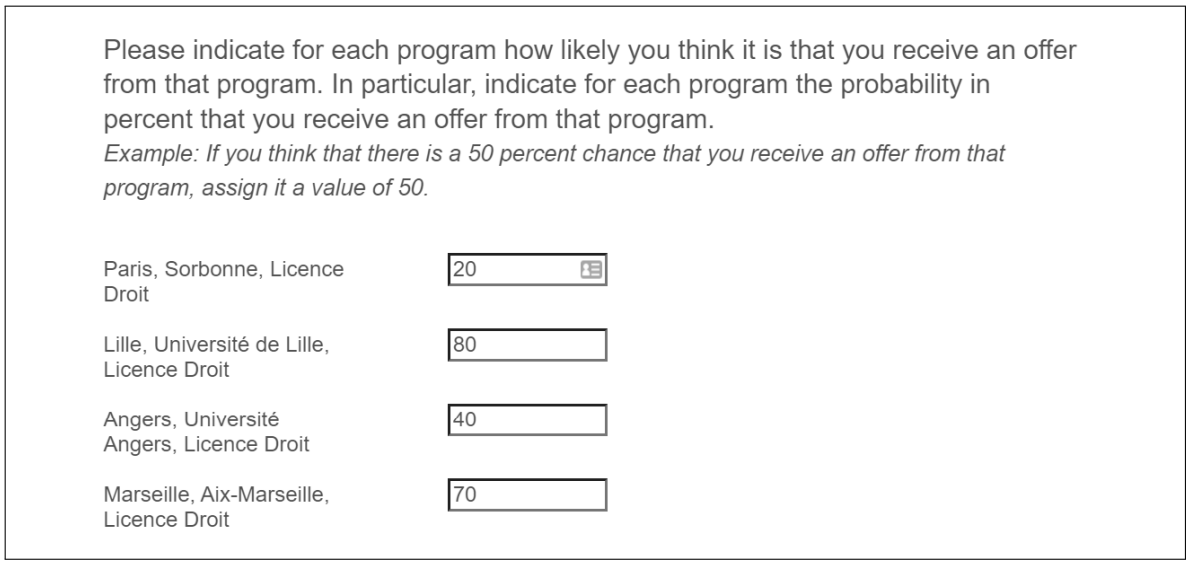
Notes: Subjects are asked to indicate the programs they plan to apply to in Parcoursup. By clicking on [+], they could extend the list and enter a maximum of 10 programs.

Figure F.4: Screenshot of preference elicitation



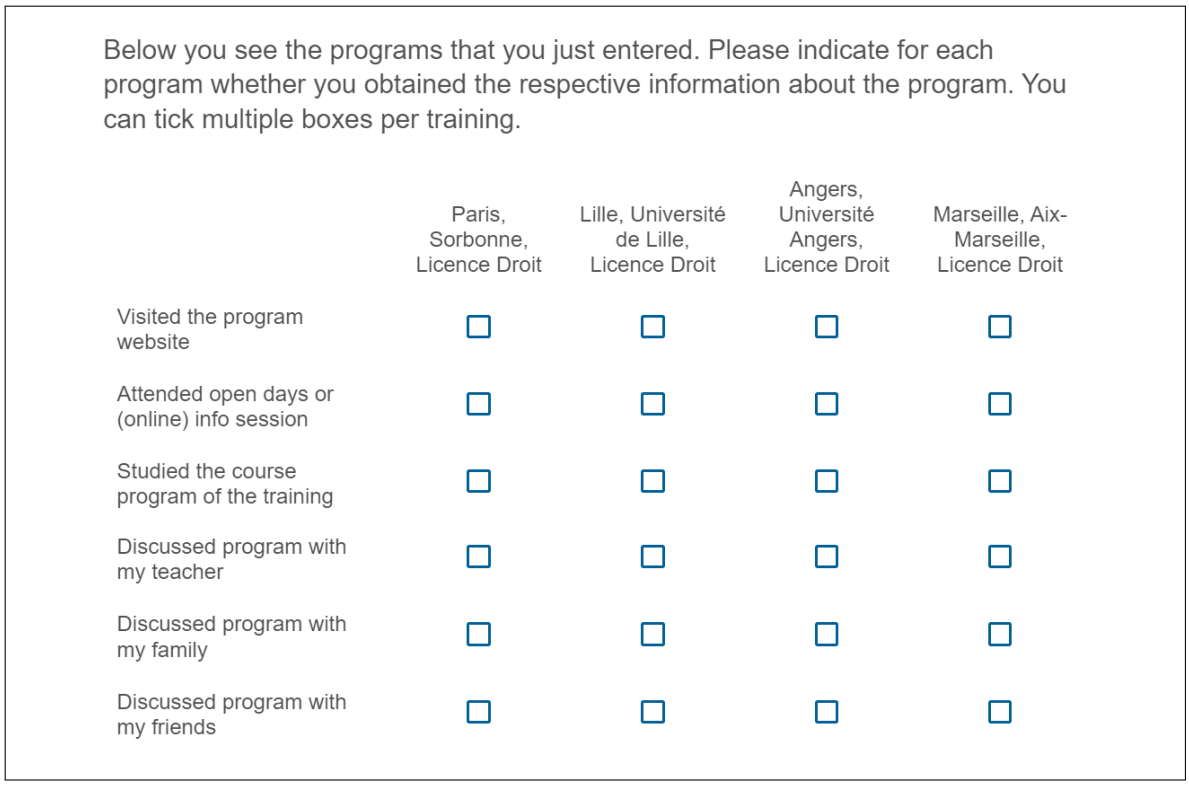
Notes: Subjects are asked for their relative preferences for the programs they indicated on the previous screen.

Figure F.5: Screenshot of belief elicitation about offer probability



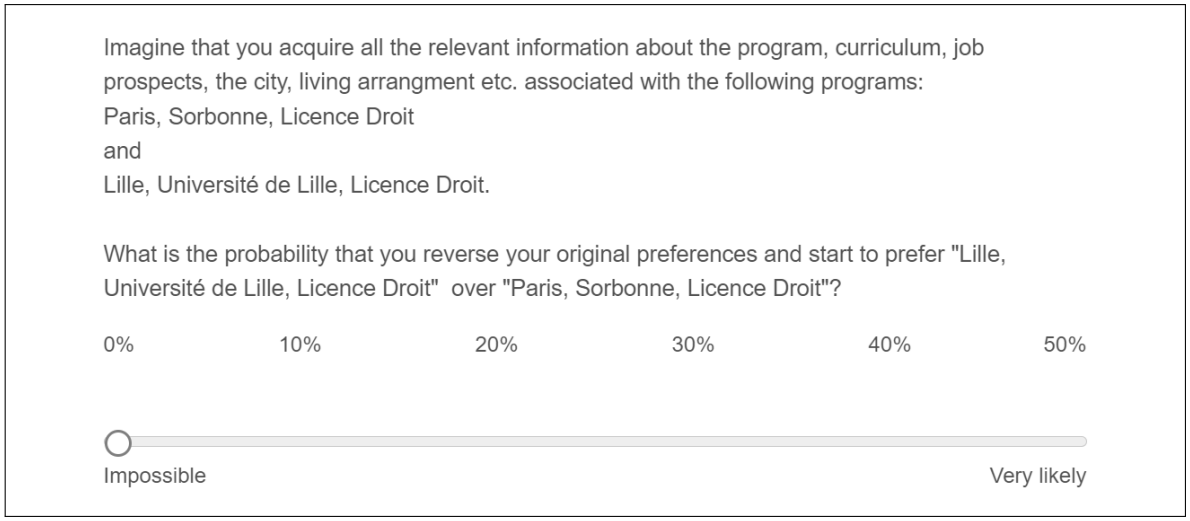
Notes: Subjects are asked for their beliefs about receiving an offer from the programs they indicated in Figure F.3.

Figure F.6: Screenshot of question for information acquisition



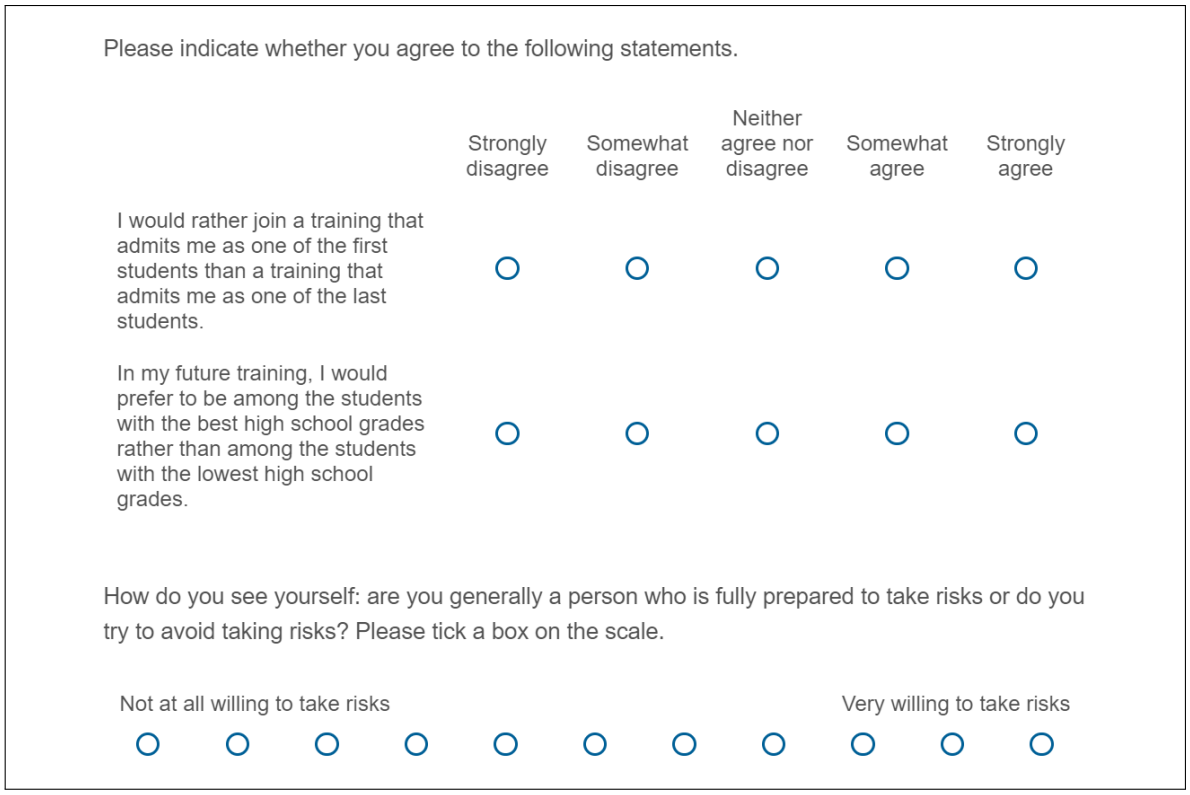
Notes: Subjects are asked whether they acquired information about the programs they indicated on the screen in Figure F.3.

Figure F.7: Screenshot of question for certainty of preferences



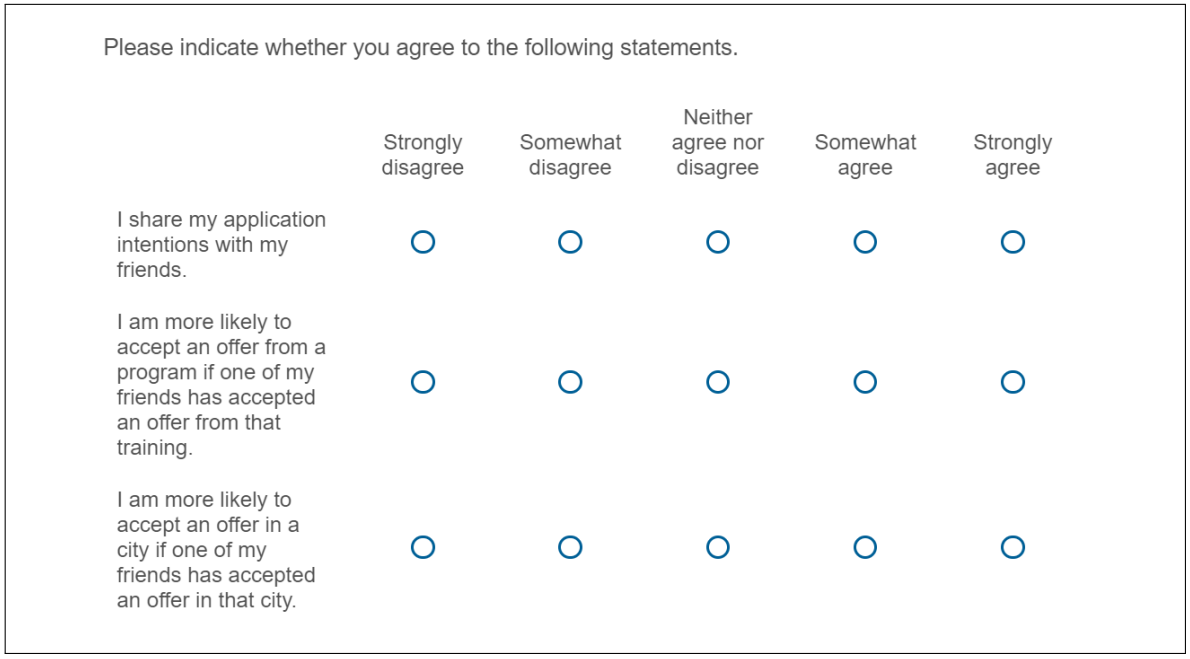
Notes: Subjects are asked how likely they think it is that they would start to prefer their second most preferred program over their most preferred program once they acquired all information.

Figure F.8: Screenshot of question for importance of being among the best and risk



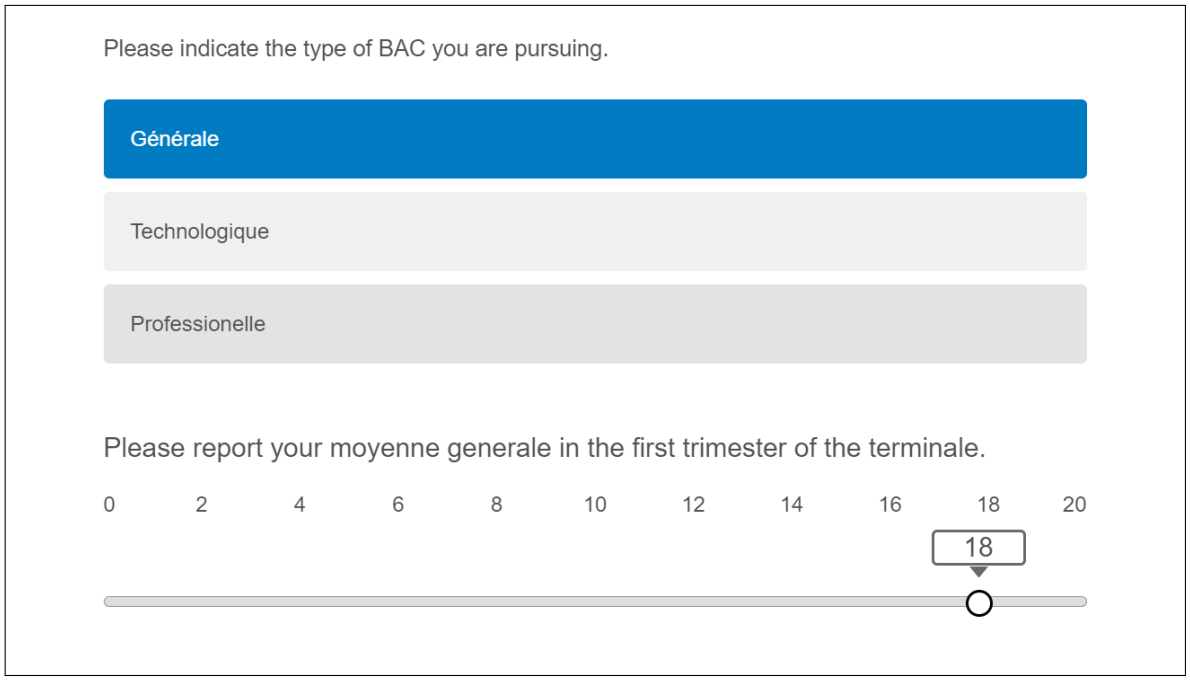
Notes: Subjects are asked for importance of being among the best students and for their risk preferences.

Figure F.9: Screenshot of question for coordination with peers



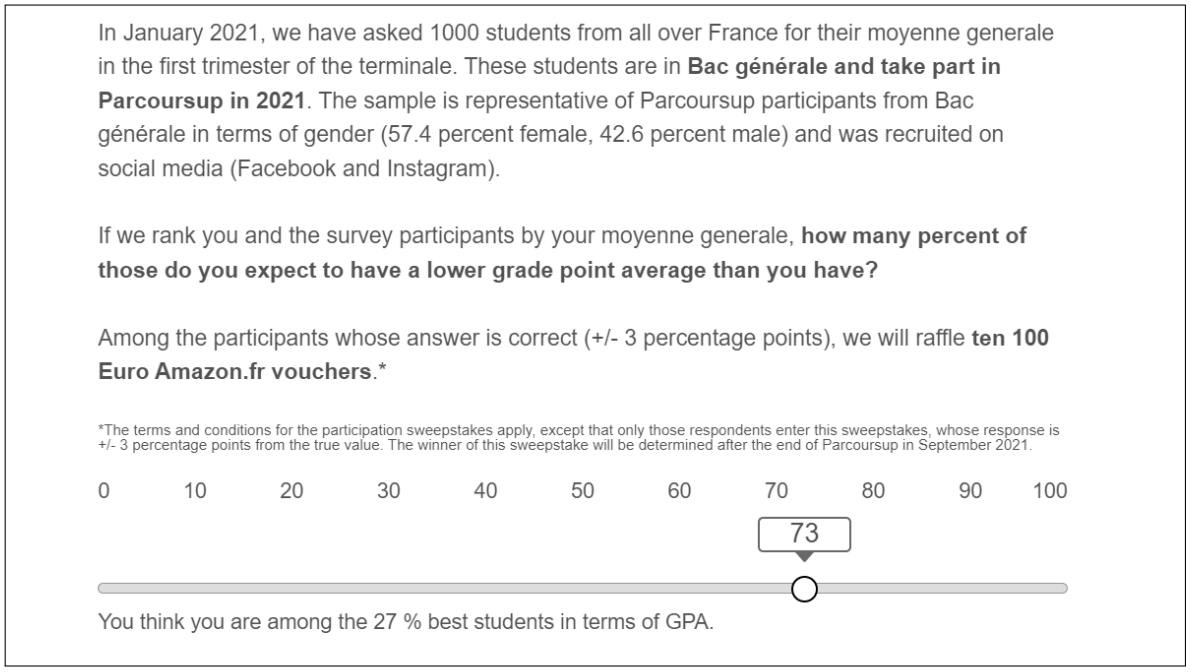
Notes: Subjects are asked whether they coordinate their applications with their peers.

Figure F.10: Screenshot of question for GPA and type of bac



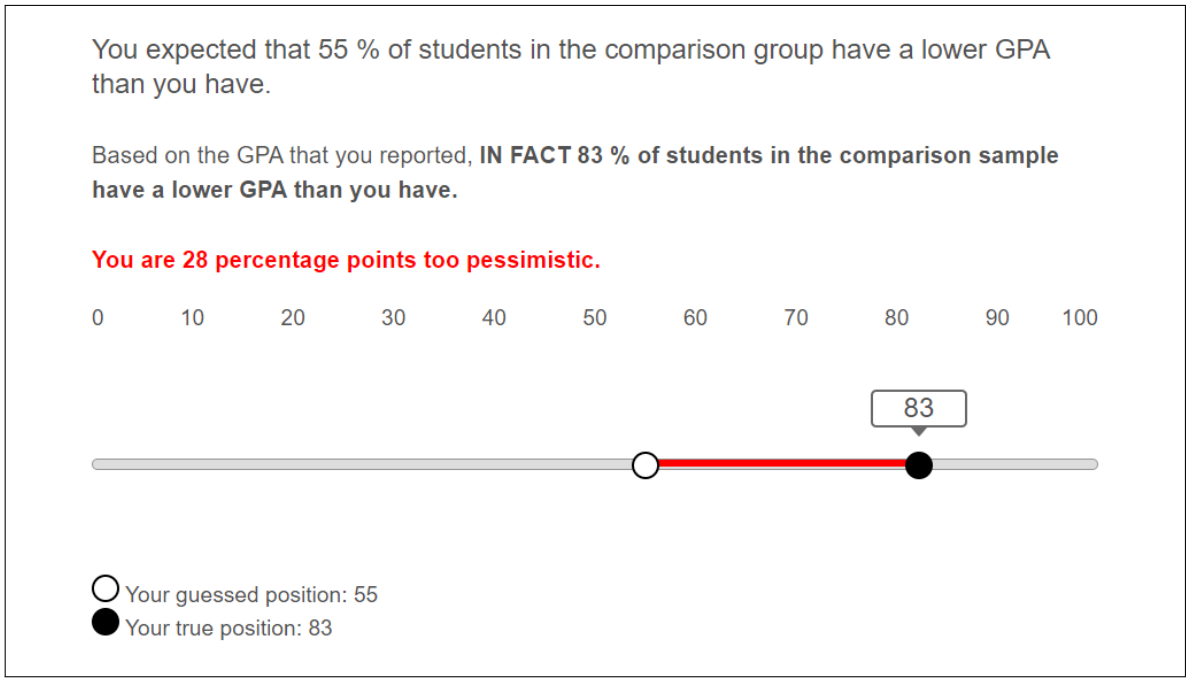
Notes: Subjects are asked for their bac type and their GPA in the previous trimester.

Figure F.11: Screenshot of question for rank in the GPA distribution



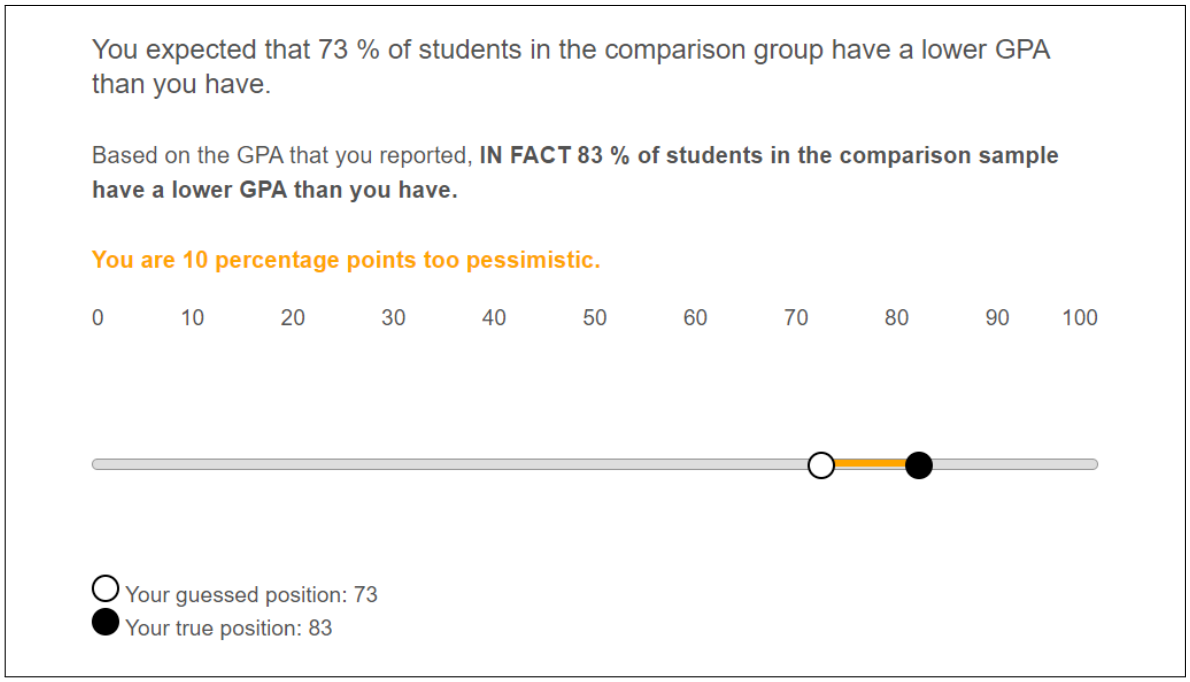
Notes: Subjects are incentivized to guess their rank in the GPA distribution.

Figure F.12: Screenshot of grade feedback (red)



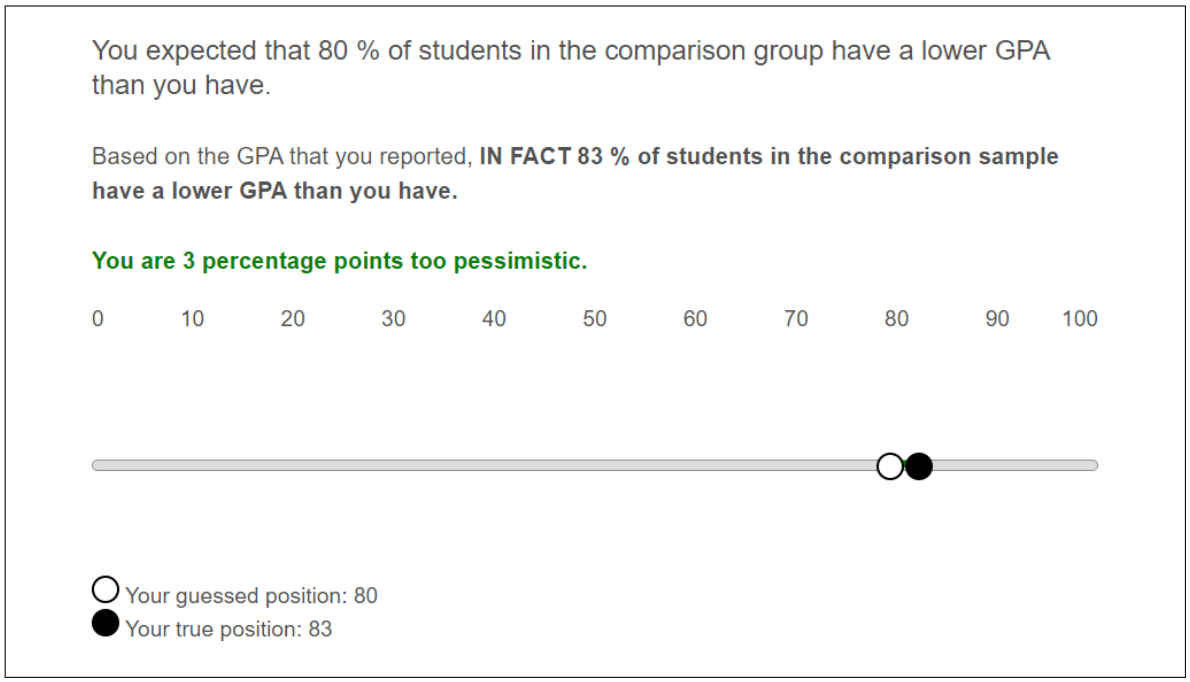
Notes: In this example, the subject underestimated their rank by more than 10 percentiles.

Figure F.13: Screenshot of grade feedback (yellow)



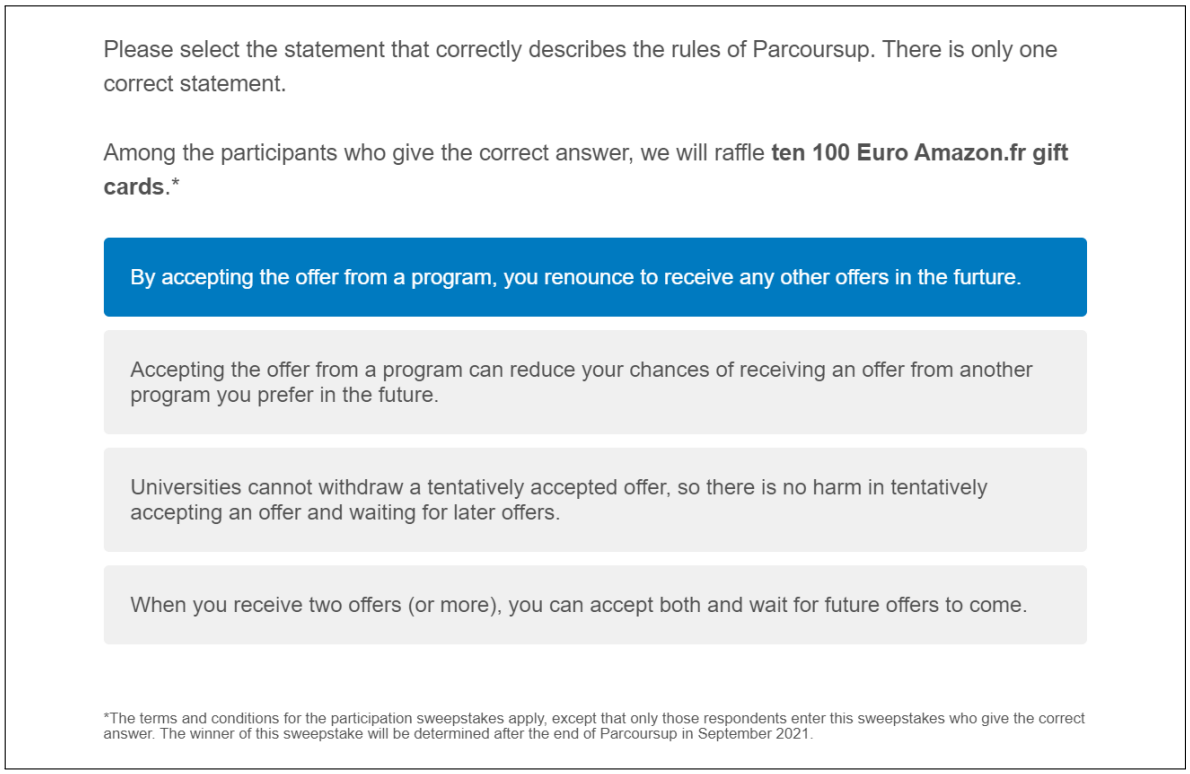
Notes: In this example, the subject underestimated their rank by 10 percentiles.

Figure F.14: Screenshot of grade feedback (green)



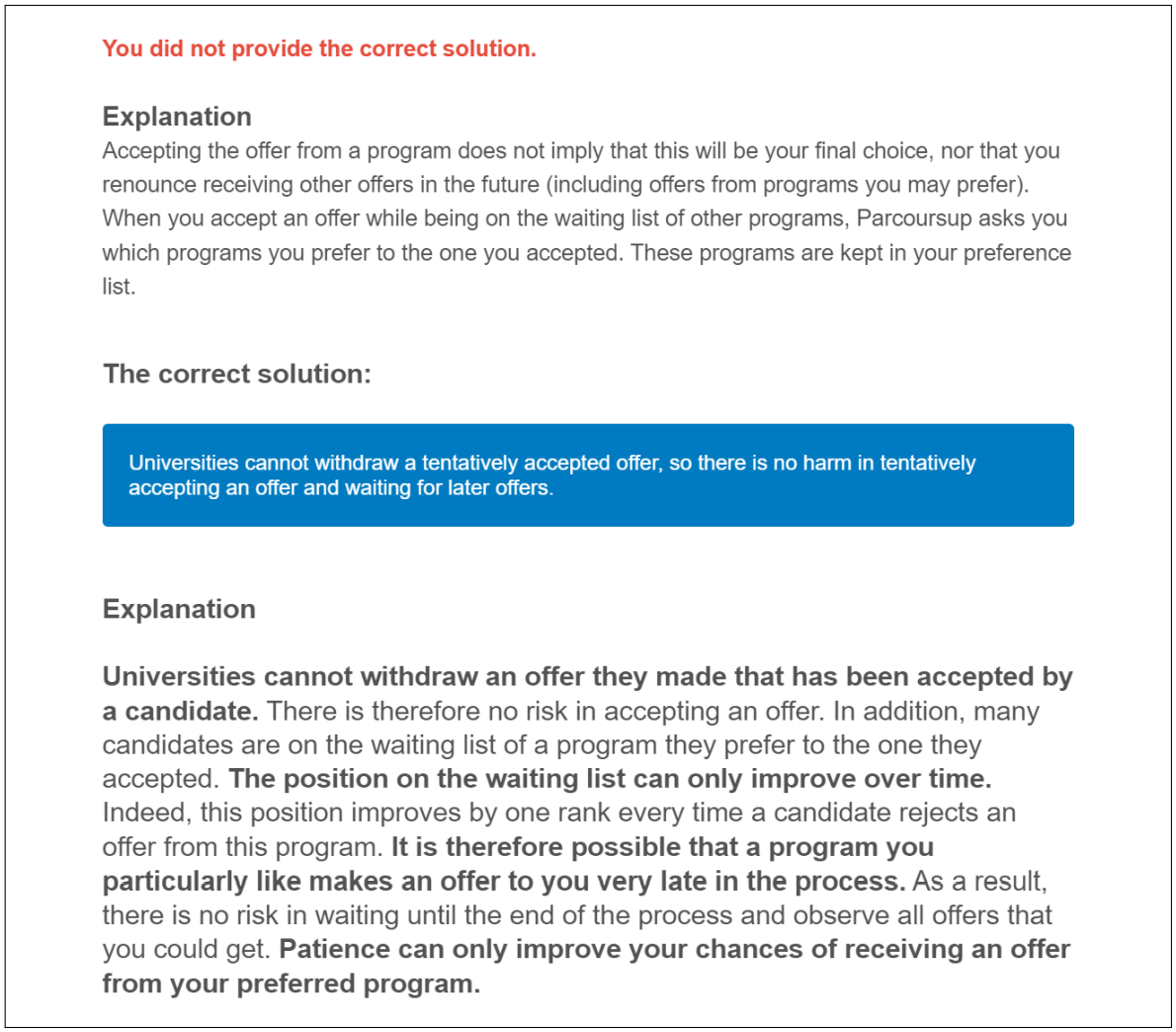
Notes: In this example, the subject underestimated their rank by less than 3 percentiles.

Figure F.15: Screenshot of mechanism knowledge quiz



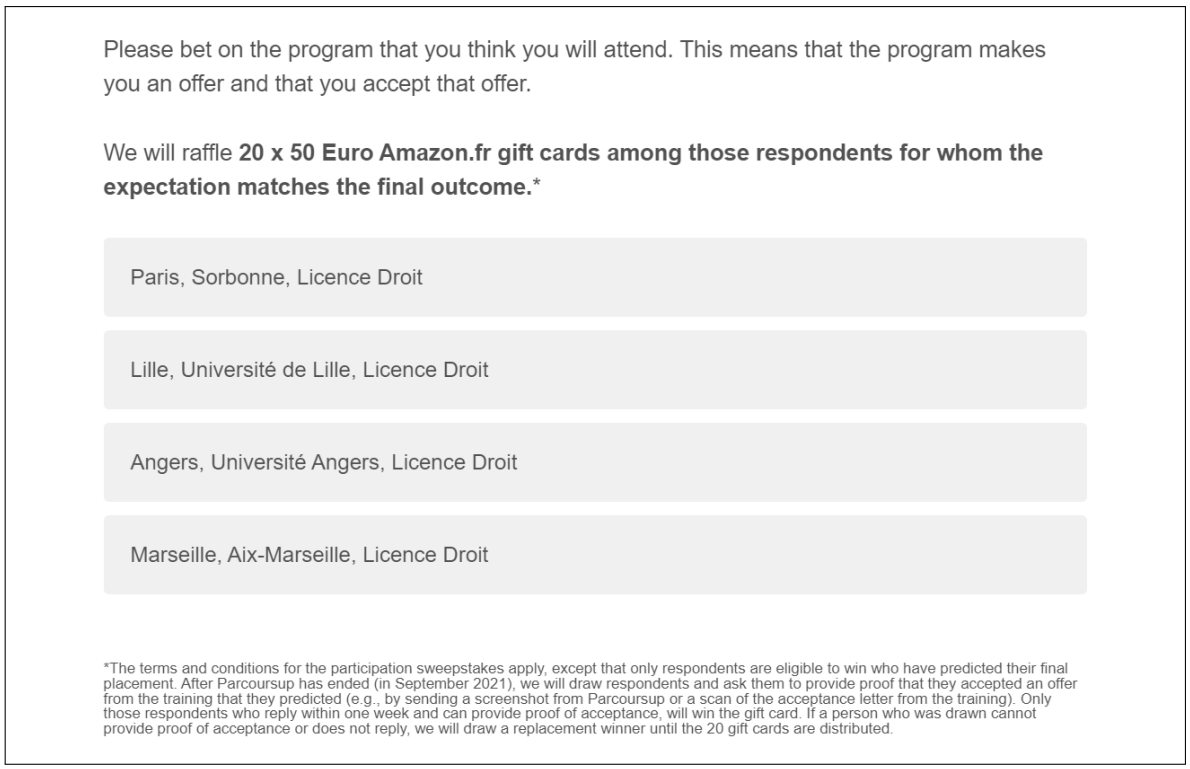
Notes: Subjects are incentivized to choose the correct statement.

Figure F.16: Screenshot of mechanism knowledge feedback



Notes: In this example, the subject chose the wrong answer.

Figure F.17: Screenshot of bet on outcome



Notes: Subjects are incentivized to bet on the program they expect to attend.