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Peer influence in Educational Choices: Social Image Concerns and Same-Gender Interactions *

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Abstract

Adolescents' educational choices are shaped by their peers. Using administrative data covering the entire population of Italian middle school students, we show that exposure to high-achieving male peers in math reduces the likelihood that girls choose a scientific high school track. To understand the mechanisms behind this effect, we design a lab-in-the-field experiment. We focus on two key channels: (i) *social image concerns*, whereby students make gender-stereotypical choices, such as girls opting for literature and boys for math, and (ii) *preference for same-gender interactions*, where the expected gender composition of peers affects school track choices. Our findings reveal that, although girls' choices are not influenced by the prospect of revealing their decisions to peers, they are less likely to choose gender counter-stereotypical fields, particularly math, when they expect to be surrounded by more male classmates. In contrast, boys' choices remain unaffected by both social image concerns and the anticipated gender composition of their peers. These results offer valuable insights into the dynamics of peer influence, contributing to the understanding of the persistent gender disparity in STEM education tracks.

Keywords: gender stereotypes, peers, interactions, field of study
JEL Classification: I21, I24

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1 Introduction

Adolescents' decisions related to schooling are often strongly influenced by their peers (Bursztyn et al., 2019; Bursztyn and Jensen, 2015; Dobbie and Fryer, 2015; Joensen and Nielsen, 2021). These decisions can have long-lasting and potentially irreversible effects on their future life trajectories and career opportunities (Kirkeboen et al., 2016; Anelli and Peri, 2019). Despite its importance, there is limited empirical research on the specific mechanisms through which peers can shape educational choices. This paper seeks to fill this gap by investigating whether and how peers shape students' preferences between scientific and humanistic fields of study. This topic is particularly salient in the context of persistent gender segregation in education observed across many countries worldwide (Altonji et al., 2012; Blau and Kahn, 2017). Women remain underrepresented in high-paying fields such as science, technology, engineering, and mathematics (STEM), while men are less prevalent in fields like the humanities, education, and health (Delfino, 2020).[1] Understanding through which channels peers influence gender-stereotypical educational decisions during adolescence is essential for designing effective policies aimed at reducing the gender gap in STEM participation.

In this study, we examine two key mechanisms underlying peer influence on gendered educational choice. The first relates to *social image concerns*, where students may be sensitive to how their choices are perceived by their peer group. In contexts where gender norms are salient, students may decide not to take unconventional decisions to avoid signaling traits that deviate from these norms (Bernheim, 1994; Bursztyn and Jensen, 2015; Bursztyn et al., 2019). For example, girls may refrain from selecting STEM-oriented fields, or boys may avoid humanistic fields, fearing that these choices could be viewed as unconventional or socially undesirable. This dynamic is highlighted by Bursztyn et al. (2019), who show that single female MBA students exhibited "Acting Wife" behavior by reporting lower desired salaries and reduced willingness to travel or work long hours when they anticipated their classmates would observe their preferences. These traits were perceived as unconventional or unattractive by ambitious male peers. We investigate whether similar dynamics are already influencing teenage students. The second mechanism involves *preferences for same-gender interactions*. Students may be more inclined to choose fields that align with their gender identity or allow them to avoid being a minority among classmates (Shan, 2020). For example, girls might opt for fields where they expect greater interaction with other girls, such as the humanities, while avoiding male-dominated environments like STEM tracks. Although this mechanism has received comparatively little attention in the literature, it may play a substantial role in reinforcing gender-segregated educational trajectories.

This paper proceeds in two steps. First, we compile a rich administrative dataset from the Italian Ministry of Education covering the full population of students in Italy from grades 1 to 8 and into high school across six cohorts (2016-2021). The data include detailed information on individual demographics, standardized test scores, teacher-assigned grades in math and literature, and students' high school choices, totaling over 3 million observations. Using this data, we document the extent of the gender gap in the choice of scientific high school tracks in Italy. Across the math ability distribution, girls are systematically less likely to attend a scientific high school track, with a gender gap of 20% for high-achieving students in the top decile of the math test score in grade 8 (last grade of middle school). To assess peer influence in educational choice in our context, we test how exposure to a higher share of top-performing male classmates in math within a class influences the likelihood that boys and girls choose a scientific high school track, thereby shaping gender gaps in scientific track. We measure this peer exposure using

[1] Appendix Figure A.I illustrates the gender disparities in educational attainment across OECD countries, showing the over-representation of men in STEM and women in non-STEM disciplines.

standardized math scores from grade 5, prior to class assignment in middle school. Our results indicate that greater exposure to high-achieving male peers in math contributes to a widening gender gap in enrollment in STEM-oriented high school tracks.

Second, to identify the mechanisms through which peers affect educational choices, we designed a lab-in-the-field experiment and collected unique survey data from 1,250 Italian middle school students. We elicited students' preferences between scientific and humanistic fields by asking them to choose the subject in which they expected to answer more questions correctly on a test that included both math and literature. Their choice was incentivized: each correct answer in their chosen subject would earn double points. Before making their decision, students were randomly assigned to one of two treatment groups or a control group. In the first group, students were informed that their choice would be observed by their classmates (*Treatment 1: Disclosure to Peers*). In the second group, students were additionally told they would collaborate on an additional task with classmates who chose the same subject, either math or literature (*Treatment 2: Disclosure to Peers and Interaction*). The goal of Treatment 1 is to examine whether social image concerns influence students' choices. For instance, girls may refrain from choosing math to avoid signaling traits perceived as unconventional or undesirable by their male peers, such as competitiveness and ambition (Buser et al., 2017), while boys may avoid choosing literature to prevent signaling traits that deviate from traditional gender norms (Makarova et al., 2019). Treatment 2, instead, explores whether the desire to avoid interactions with opposite-gender peers contributes to gender segregation in the chosen field of study (Robnett and Leaper, 2013). Indeed, when students choose their field, they jointly pick the subjects and the peers they will interact with during high school. For example, by choosing a scientific area, a student will study more math but also will likely spend more time with male peers given the field's gender segregation. Similarly, by choosing a humanistic subject, the student is likely to spend more time with female peers. In addition to the experiment, we collect survey data on students' socio-economic backgrounds, implicit gender stereotypes (via a gender-science Implicit Association Test), explicit stereotypes, interests in high school tracks, and friendship networks. We match this survey data at the individual level with administrative data on teacher-assigned grades, standardized test scores (before the experiment) and with actual high school track enrollment.

Our results show that students' choices between math and humanistic fields in the experiment are strongly and positively correlated with their measured ability in these subjects before the experiment, as captured by standardized test scores, and with their actual high school track selection after the end of middle school. Students who choose the math task are more likely to enroll in scientific high schools. However, both genders systematically overestimate their comparative advantage in gender-stereotypical fields: boys are more likely than girls to choose math, even when their comparative advantage lies in literature (based on their grades from administrative data), and girls are more likely than boys to choose literature, even when they are better at math according to their grades.

Our key set of findings pertains to the experimental results. We find that students do not change their decision when informed that their classmates will observe their choice between humanistic and mathematical fields. Adolescents in our sample – both boys and girls – do not appear to be influenced by the public disclosure of their academic preferences, contrasting with findings at higher educational levels, where proximity to marriage age leads girls to avoid signaling ambition to male peers (Bursztyn et al., 2017). While public observability is not a concern for girls, interactions with peers significantly affect their choices. Female students are 8 percentage points less likely to choose math when they are required to collaborate with classmates who select the same subject. Finally, we further investigate the "Disclosure to Peers and Interaction" mechanism. We provide evidence that this effect is driven by girls who anticipate being a gender minority among math-choosing students, leading to a 35% reduction (16 percentage points) in their likelihood of choosing math. We also show that this effect is more pronounced among girls who have a higher share of close friends choosing literature, suggesting that girls are sensitive to the desire of interacting with their own friends. In sum, girls may want to avoid being a minority in a male-dominated field and may prefer to interact with their own friends that are more likely to choose literature. Overall, this same-gender interaction mechanism may play a significant role in perpetuating gender segregation in STEM and limiting progress toward gender parity.

This paper contributes to two main strands of literature. First, it enhances our understanding of the determinants of gender-stereotypical choices in students' field of study. The persistent debate centers on whether the gender gap in track choice arises from innate differences in brain functioning or abilities between boys and girls (Baron-Cohen, 2005) or from cultural and social conditioning (Guiso et al., 2008; Nollenberger et al., 2016). For the first hypothesis, factors such as gender differences in competitiveness (Buser et al., 2014; Almås et al., 2016), comparative advantage in reading versus math (Breda and Napp, 2019), self-confidence and aspiration (Kamas and Preston, 2012; Azmat et al., 2025), or interests (Bian et al., 2017) may explain why girls avoid scientific fields. However, culture, exposure to stereotypes, and role models from early childhood significantly shape preferences, interests, and associations between gender and academic fields (Tungodden and Willen, 2023; Carlana, 2019; Lavy, 2008; Breda et al., 2020; Porter and Serra, 2020; Canaan and Mouganie, 2023). This study focuses on understanding the role played by peers - key actors in adolescents' lives - and examines how expectations about gender composition in schools may exacerbate gender gaps in educational decisions. Furthermore, we introduce a novel measure of perceived comparative advantage across academic fields and demonstrate its strong correlation with actual high school track choices.

Second, we contribute to the extensive literature on the effect of peer influence and horizontal socialization on educational outcomes (De Giorgi et al., 2010; Black et al., 2013; Hill, 2015; Born et al., 2022; Dobbie and Fryer, 2014; Carrell et al., 2018), particularly track choices (De Giorgi et al., 2010; Black et al., 2013; Hill, 2015; Born et al., 2022; Dobbie and Fryer, 2014; Carrell et al., 2018). Brenøe and Zölitz (2020) show that in Denmark, having a higher proportion of female peers reduces women's likelihood of enrolling in or graduating from STEM programs. This exposure also has long-term effects, with women earning less, being less likely to work in STEM occupations, and having more children. Similarly, Zolitz and Feld (2021) demonstrate that women randomly assigned to business school sections with more female peers are less likely to pursue male-dominated majors like finance and more likely to choose female-dominated majors like marketing. Anelli and Peri (2019) find that male students attending a high school class with 80% or more male classmates have a probability of choosing a male-dominated college major, but they did not find any statistically significant effect of gender composition on females' college decisions. Overall, evidence suggests that female students in female-dominated peer groups tend to shy away from male-dominated fields. Our contribution to this literature is twofold. First, prior research primarily examines high school students who have already decided on their field of study, often influenced by their choice of high school, which in many contexts largely determines their academic path. In contrast, this paper focuses on decisions made at the onset of puberty, in middle school, a developmental stage where peer influence is particularly pronounced. Compared to previous studies, our approach provides deeper insights into the role of peers in shaping gendered educational trajectories during this critical period. Second, to the best of our knowledge, this study is the first attempt to disentangle different channels through which peers influence students' choices, going beyond mere exposure to same-gender peers to uncover deeper dynamics of peers' influence. Same-gender peers can indeed influence field choice through several channels (e.g. aspiration, role models, conformity to prevailing norms, etc.). We focus on shedding light on two potential mechanisms: conformity to norms and preferences for interactions with same-gender peers. On conformity, students may adjust their choices to align with peer group expectations, signaling desirable traits in societies with strong gender roles (Bernheim, 1994; Bursztyn and Jensen, 2015; Bursztyn et al., 2019). It is also possible that educational choices may be driven by a desire to avoid interactions with the opposite gender or by concerns about being a minority status in male-dominated fields (Robnett and Leaper, 2013; Robnett, 2016). Recent evidence in economics shows that women are less likely to enter male-dominated fields when they experience minority status in study groups (Shan, 2020; Booth et al., 2018). Our experimental design enables us to disentangle these mechanisms by isolating the effects of public disclosure and peer interactions on adolescents' educational choices.

The remainder of the paper is organized as follows. Section 2 describes data and experimental design. Section 3 provides descriptive statistics and correlations of students' perceived comparative advantage in math versus literature with real-world outcomes, such as track choice and ability. Section 4 presents the empirical strategy and the main findings of the experiment, and Section 5 concludes and discusses policy implications.

2 Data and Experimental Design

To explore the mechanisms underlying peer influence on educational choices, we construct a unique dataset by merging individual-level data from two sources: (i) administrative records from the Italian Ministry of Education and the National Evaluation Center (INVALSI), and (ii) lab-in-the-field experimental data combined with a student questionnaire. Our sample consists of students enrolled in grades 6, 7, and 8 (aged 11-14) across 163 classes in 14 middle schools located in seven provinces of Italy: Milan, Como, Perugia, Ancona, Reggio Calabria, Bari, and Palermo.[2] The average class size was 19 and each school had on average 14 classes. Appendix Figure A.II illustrates the geographic distribution of the schools in our sample, spanning northern, central, and southern regions.

2.1 Administrative data

Through a five-year agreement between the Laboratory for Effective Antipoverty Policies (LEAP) at Bocconi University, the Italian Ministry of Education, and the National Evaluation Center (INVALSI), we obtained comprehensive administrative data on all Italian students who completed middle school between 2016 and 2021. During this period, approximately 500,000 students were enrolled in each grade in each year. The Italian Ministry of Education provided data on students' socio-demographic characteristics, teacher-assigned grades in math and literature for students in grades 7 and 8, recorded prior to our data collection in June 2019.[3] Finally, we obtained information on students' high school track choices for the 2021 - 2022 academic year, after the conclusion of our experiment and data collection. INVALSI data include standardized test scores from grade 5 (last year of primary school), as a measure of students' ability at the beginning of middle school.

We leverage these administrative data in two main ways. First, we use them to document gender gaps in the selection of scientific high-school tracks in Italy and to examine how track choices are

[2] The schools in the sample were selected by our implementing partners, Centro Italiano Aiuti all'Infanzia - CIAI and Action Aid, as part of a broader intervention aimed at reducing dropout rates in disadvantaged schools in Italy.

[3] Teacher-assigned grades are unavailable for students who were in grade 6 at the time, as they were still attending elementary school.

influenced by exposure to high-ability peers, differentiated by gender, during middle school. Indeed, after completing middle school (around ages 13-14), students self-select into one of three distinct high school tracks: academic (*liceo*), technical, or vocational. The academic-oriented high school is divided between scientific and humanistic tracks.[4] This decision determines the subjects students study over the following five years and the peers they interact with, as each track typically operates in separate school buildings. Second, we merge the administrative data at the individual level with our survey and experimental data to validate the reliability of survey-based measures, showing strong correlations between survey responses and administrative records.

2.2 Experimental Data

We conducted the experiment and collected survey data on students between November and December 2019, during regular school hours. Each student completed the experiment and the survey on tablet, which took approximately 45 minutes.[5] To ensure the integrity of individual responses, two enumerators per class supervised the students and minimized communication between them during data collection. Parents were informed about the research project and they provided signed informed consent for their children to participate. Although no incentives were offered, around 85% of the students were present in class on the survey day and participated after obtaining parental consent.

The data collection process consisted of two main components: an experiment and a student questionnaire. Details of these components are provided below, and detailed instructions of the experiment are included in Appendix B.

2.2.1 The Experiment

Causal estimation of peer effects on educational outcomes poses significant challenges due to the endogenous nature of peer exposure (Manski, 1993) and the difficulty in disentangling the mechanisms behind its influence. To address these challenges, we designed a lab-in-the-field experiment. Our goal was to explore two key mechanisms through which peers may shape students' gender-stereotypical choices. First, we examine the role of social image concerns, exploring whether students are more likely to make choices aligned with gender stereotypes, such as associating math with boys and literature with girls, when their decisions are visible to their peers (Bursztyn et al., 2019). Second, we assess whether gender-stereotypical choices are driven by a preference to avoid interactions with the opposite gender in traditionally gendered contexts (e.g., girls preferring to engage with other girls in humanistic fields/tasks and boys preferring to interact with other boys in mathematical fields/tasks).[6]

In this experiment, students were incentivized to choose between a male-stereotypical field (math) and a female-stereotypical field (literature), selecting the task they believed they were better at. We informed students that they must complete six multiple-choice questions: three in math and three in literature, with equally difficult questions for each subject.[7] Before answering the multiple-choice

[4] In our analysis, we consider scientific track the following academic high school: scientific high school with traditional track, applied science track, or sport science track. We consider humanistic high school the following tracks: classic, human sciences, linguistic, and artistic tracks.

[5] We excluded 35 students who did not speak Italian and 225 students with severe disabilities that could have impacted their understanding of the experiment and survey. However, including these students in the analysis does not materially alter the results.

[6] In this paper, we focus on investigating the role played by peers in educational decisions. A companion paper focuses on the role of parents in affecting students' choices. The results are reported in Carlana and Corno (2024).

[7] We selected questions from past national standardized tests (INVALSI) administered to middle school children in Italy. Their answers can therefore represent a proxy of students' ability. Given that INVALSI has been administered only in grades 6 and 8, for students in grade 7, we prepared equally difficult questions with the support of middle school teachers.

questions, students had to choose the field for which they expected to give a higher number of correct questions: they would get two points for each correct answer in the chosen field and one point in the other field. For example, if a student chose math, she would get two points for each correct question in math and one point for each correct question in literature. The choice of the task (math or literature) is the key outcome of interest in the experiment and reflects the subject in which students believe they have a comparative advantage.[8] Importantly, in section 3.2, we delve deeper into the relationship between the choices made in our experiment and real-world outcomes, such as actual high school track selection, using administrative data.

Before choosing either the task in literature or in math, students were randomly divided into equally-size treatment groups and a control group.

- *"Disclosure to Peers"* (Treatment 1): In this treatment, students were informed that their peers would observe their choice between the math and the literature task.[9]
- *"Disclosure to Peers and Interaction"* (Treatment 2): In this treatment, students were told that their peers would observe their choice and that they would also need to collaborate and interact in solving the multiple choice questions with classmates who selected the same subject.[10]

In the control group, students selected their preferred task without receiving any additional information. Randomization was conducted at the individual level using computer software. To preserve the validity of the experiment, all instructions for each treatment were displayed exclusively on each student's tablet, ensuring that participants were unaware of the details of other treatment groups. At the conclusion of the questionnaire, the final screen on each student's tablet prominently displayed their initial decision – either MATH or LITERATURE – in capital letters.

2.2.2 Student questionnaire

The student questionnaire was administered immediately after the lab-in-the-field experiment. A detailed list of the questions we asked can be found in Appendix B.2. Specifically, we collected information on the following key variables:

- *Beliefs about peers' choices.* At the end of the experiment, we asked students to share their beliefs about the choices their male and female classmates made between math and literature. This was intended to assess whether students' perceptions of being a minority in a gender-stereotypical field influenced their own choices, particularly when they were aware of the interaction with peers who selected the same field.[11]

- *Gender-Science Implicit Association Test (IAT).* To capture gender stereotypes, we administered an Implicit Association Test (IAT). The IAT is an experimental method introduced by Greenwald and Banaji (1995) and Greenwald et al. (1998), based on the idea that reaction times in a rapid categorization task may reveal how strongly an individual associates two concepts. In our case, we are interested in the

[8] More precisely we asked: "In which subject do you want to get double points? To get a higher score, choose the subject in which you think you are better. Which subject do you choose?". For ethical reasons, the schools in our sample did not allow us to provide monetary or in-kind gifts to children to incentivize their choice and performance in the task.

[9] Students in Treatment 1 received the following information: "After the questionnaire, we will divide students into two groups. Those who choose math will stand up and move to the right side of the classroom, while those who choose literature will stand up and move to the left."

[10] Students in Treatment 2 received the following information: "After the questionnaire, we will divide the students into two groups. Those who choose math will stand up and move to the right side of the classroom, while those who choose literature will stand up and move to the left. The two groups will then discuss together and review the answers they provided for the multiple-choice questions."

[11] The question asked was: "Which subject do you think your male/female classmates chose?" Students earned two points for each correct answer.

association between gender (male/female) and subjects (scientific/humanistic). A slower reaction time in associating certain pairs (e.g., scientific subjects with female names) denotes mental processes that tend to perceive those pairs as less common and more difficult to associate. IATs are particularly useful in contexts where individuals are uncomfortable revealing or are unaware of having certain attitudes or stereotypes. Details of the IAT we designed are reported in Appendix B.2.1.

Despite being a noisy measure surrounded by debate (Blanton et al., 2009; Oswald et al., 2013; Olson and Fazio, 2004), this tool has been widely employed in social psychology (Kiefer and Sekaquaptewa, 2007) and economics (Carlana, 2019; Corno et al., 2022) to understand implicit cognition, that is, cognitive processes of which an individual may not be aware and that include, among others, perception and stereotyping. In our analysis, to ease the interpretation of coefficients, we standardize this variable to have mean zero and standard deviation one in our sample of students. Higher values of the IAT index reflect a stronger association between girls and literature and boys and math.

- *Explicit Gender Stereotypes.* We also elicited beliefs about explicit gender norms by asking them to agree or disagree with seven statements on gender differences.[12] For the empirical analysis, we created an index of explicit gender stereotypes by extracting one factor using principal component analysis and standardizing the variable to have mean zero and standard deviation one in our sample of students.

- *Friendship Networks.* We collected information on the friendship network of each student, asking for the name and surname of their five best friends in the classroom. We use this information to calculate the share of friends choosing math in our lab-in-the-field exercise: the number of nominated friends who chose the math task out of the total number of friends mentioned.

- *Socio-Demographic Characteristics.* We concluded the survey by collecting information on socio-economic characteristics of students and their families.

2.3 Summary Statistics and Balance Tables

Table I reports descriptive statistics of the main outcome and other characteristics for the experimental data (Panel A), the student questionnaire (Panel B), and administrative data (Panel C). Column 2 shows the means in the overall sample, while columns 3 and 4 separately report statistics for girls and boys, respectively. In our experiment, approximately 54% of the students choose the task in math with substantial gender differences: 44% of girls and 63% of boys. Around half of the students of both genders believe that more boys will choose math in our experiment compared to girls, reflecting expectations on minority status of girls in scientific subjects. 52% is the share of friends choosing the math task, 48% for girls and 56% for boys again reflecting the gender gap in the field of study due to the homophily of the networks. Looking at students' socio-economic characteristics, we show that 14% of students are immigrants and 49% live in the south of Italy. Mothers are more likely to be college graduates than fathers (17% versus 14%), but they are less likely to work (71% versus 97%).

[12] The statements included were i) there are biological differences in men's and women's innate math abilities; ii) earning money to support the family is a father's responsibility; iii) taking care of the house and children is a mother's responsibility; iii) a psychologist is not a job suitable for women; iv) a computer programmer is not a job suitable for women; v) even if they work hard, women cannot be good at football; and v) even if they work hard, men cannot be good at cooking.

Table I. Summary Statistics

	(1) Obs	(2) All	(3) Females	(4) Males	(5) Difference
Panel A: Experiment data					
Student chose math	1,250	0.537	0.440	0.629	-0.189***
		(0.499)	(0.497)	(0.484)	[0.000]
Student thinks: More Boys in math	1,250	0.484	0.488	0.480	0.007
		(0.500)	(0.500)	(0.500)	[0.800]
Share friends in math	1,196	0.522	0.480	0.563	-0.083***
		(0.316)	(0.305)	(0.321)	[0.000]
Panel B: Students' characteristics					
Immigrant	1,250	0.146	0.151	0.140	0.011
		(0.353)	(0.358)	(0.348)	[0.594]
Student from the South	1,250	0.487	0.478	0.496	-0.018
		(0.500)	(0.500)	(0.500)	[0.519]
Mother's education: high school	1,211	0.373	0.408	0.340	0.067**
		(0.484)	(0.492)	(0.474)	[0.015]
Mother's education: university	1,211	0.171	0.164	0.177	-0.013
		(0.377)	(0.371)	(0.382)	[0.540]
Father's education: high school	1,211	0.362	0.387	0.337	0.050*
		(0.481)	(0.488)	(0.473)	[0.068]
Father's education: university	1,211	0.135	0.129	0.140	-0.012
		(0.341)	(0.335)	(0.348)	[0.550]
Lives with both parents	1,211	0.844	0.838	0.850	-0.012
		(0.363)	(0.369)	(0.357)	[0.552]
Mother works	1,172	0.707	0.701	0.714	-0.013
		(0.455)	(0.458)	(0.452)	[0.622]
Father works	1,033	0.965	0.958	0.972	-0.014
		(0.183)	(0.201)	(0.166)	[0.225]
Occupation of mum: medium or high wage	816	0.339	0.348	0.332	0.016
		(0.474)	(0.477)	(0.471)	[0.633]
Occupation of dad: medium or high wage	987	0.321	0.334	0.309	0.025
		(0.467)	(0.472)	(0.463)	[0.407]
Std IAT	1,208	0.011	0.174	-0.151	0.325***
		(0.999)	(0.996)	(0.977)	[0.000]
Std Explicit Gender Index	1,231	-0.010	-0.174	0.145	-0.319***
		(0.983)	(0.878)	(1.049)	[0.000]
Panel C: Administrative Data					
Teacher assigned grade: math	701	7.106	7.213	7.003	0.211*
		(1.435)	(1.482)	(1.383)	[0.052]
Teacher assigned grade: literature	702	7.189	7.420	6.969	0.450***
		(1.128)	(1.199)	(1.009)	[0.000]
Scientific High-School	618	0.233	0.223	0.243	-0.020
		(0.423)	(0.417)	(0.429)	[0.560]
Std grade (INVALSI): italian	1,013	60.221	62.043	58.417	3.627**
		(20.191)	(20.357)	(19.881)	[0.004]
Std grade (INVALSI): math	1,017	55.943	54.995	56.859	-1.863
		(20.257)	(19.699)	(20.760)	[0.143]

Notes: In columns 2–4 we report the mean and standard deviation in brackets for the entire sample, for girls and for boys, respectively. In the last column, we report the gender difference and p-value of the difference in square brackets. Missing variables are not included in this table, and the number of observations vary as described in the first column. The index of explicit stereotypes is constructed using the first principal component from the following seven questions: i) there are biological differences in men's and women's innate math abilities; ii) earning money to support the family is a father's responsibility; iii) taking care of the house and children is a mother's responsibility; iv) psychologist is not a job suitable for women; v) a computer programmer is not a job suitable for women; vi) even if they work hard, women cannot be good at football; and vii) even if they work hard, men cannot be good at cooking. A low-wage job is considered as being a construction worker, sales person, hairdresser, cook, or similar type of job for both mothers and fathers. The mother's occupation skill level is also set to one if she is living with someone employed in a job of that skill level.

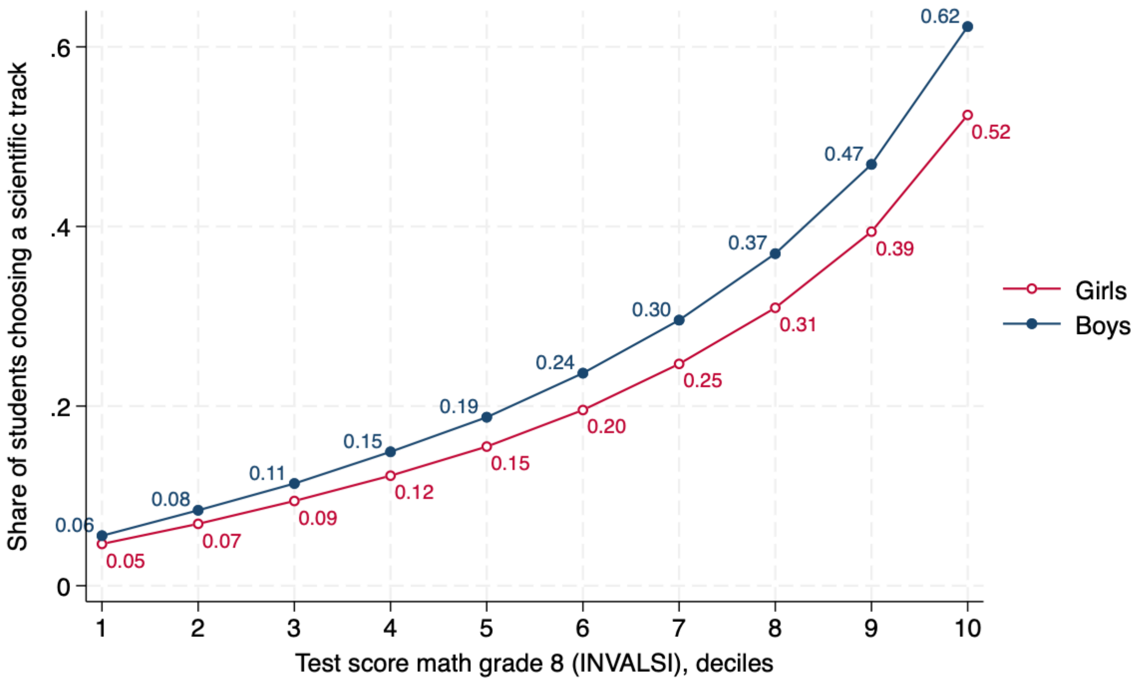
Table A.I in Appendix reports differences in summary statistics of the main variables of interest for the students in our sample, measured at baseline and separately by treatment arm (columns 1-3). Columns 4 and 6 show the p-values of the difference in means between Treatment 1 and the Control group and between Treatment 2 and the Control group. Columns 5 and 7 report the corresponding normalized difference.[13] We report variables collected among the students during the survey in Panel A and administrative data in Panel B.

Overall, baseline characteristics are well balanced between treatments and control groups. We find some imbalances in the educational and occupational level of mothers and fathers. However, for all variables, the normalized difference is well below the threshold of 0.25 suggested by Imbens and Wooldridge (2009). In our empirical analysis, we nevertheless control for baseline characteristics to provide evidence that the results are not driven by these slight imbalances.

3 Descriptive Evidence: Gender Gap and Peers' Influence in Track Choice

3.1 Gender Gap and Peers' Influence: Administrative Data

Figure 1. Gender Gaps in Scientific Track



Notes: Source: Authors' elaboration on 2016-2021 data from the Italian Ministry of Education (excluding cohort 2019/20).

[13] Imbens and Wooldridge (2009) suggest using the following normalized difference as a scale-free measure of the difference in distributions:

$$\Delta = \frac{\overline{X}_A - \overline{X}_B}{\sqrt{S_A^2 + S_B^2}}$$

where $\overline{X}_A$ and $\overline{X}_B$ are the means of covariates X in groups A and B, and S_A^2 and S_B^2 are the corresponding sample variances of X.

In many countries around the world, women are systematically underrepresented in STEM fields, while men are underrepresented in humanistic fields (OECD, 2014; Delfino, 2020). Similarly, in Italian high schools, there are large gender gaps with girls being more likely to enroll in humanistic tracks and boys in STEM-oriented tracks. Appendix Figure A.III reports the gender composition across different high school tracks in Italy, highlighting a greater concentration of males in the more scientific tracks, particularly in the Scientific high school and, even more so, in the Scientific track with an Applied Science focus.

This gender disparity persists even when accounting for student ability, measured by test scores. Figure 1 shows the share of students choosing a scientific high school track by gender and for each decile of the math test score in grade 8. Even among students in the top 10% of the math test score, the share of boys choosing a scientific track exceeds that of girls by approximately 10 percentage points, which corresponds to almost 20% higher probability for boys compared to girls.

Does the gender composition of high-achieving peers influence the choice of scientific high school, and thus gender gap? While prior research offers mixed results, some studies suggest that exposure to high-achieving same-gender peers can reduce gender gaps, leading to higher educational achievement and job satisfaction for women (Cools et al., 2019; Feld and Zölitz, 2022).

To provide suggestive evidence in our context, we investigate how the exposure to a higher share of boys among top-performing students in math in a class influences the likelihood of choosing a scientific high school track. We define high achievers as students in the top 50% of baseline math scores in grade 5, measured before middle school class assignments. To account for potential confounding factors, we include school fixed effects and cohort fixed effects and exploit within-school, within-cohort and across classes variation in the share of boys among the top math achievers at baseline, following the approach of Hoxby (2000) and Pischke and Ammermueller (2021). Thus, our identification for this exercise relies on variation across classes, within schools and within cohorts, which we argue are formed roughly randomly.

The results, presented in Table II, show that greater exposure to boys among the top math achievers significantly decreases the likelihood that girls choose a scientific track (columns 1-3) while increasing the likelihood for boys (columns 4-6). This pattern holds across two measures of exposure: the share of boys in the top 50% of the baseline math score distribution (Panel A) and a binary indicator equal to one if boys outnumber girls among the top performers (Panel B). Overall, these findings suggest that exposure to high-achieving male peers contributes to a widening gender gap in enrollment in STEM-oriented high school tracks.

This result may reflect several underlying mechanisms. First, observing a higher proportion of boys excelling in math could lead girls to anticipate a more competitive environment in scientific high schools, as suggested by previous research (Niederle and Vesterlund, 2010; Tungodden and Willen, 2023) or they may be discouraged by the prospect of being a minority in a male-dominated setting. Second, being surrounded by top-performing boys could reinforce societal stereotypes that associate math and science excellence with males, causing girls to doubt their own abilities even when they are equally capable. Third, the lack of visible female success stories in their immediate peer group could make it harder for girls to envision themselves in scientific roles. These are just few examples of potential factors that could contribute to girls opting for more gender-stereotypical educational choices when facing decisions shaped by peer dynamics. With our experiment we will be able to disentangle some of the mechanisms behind peer influence in track choice.

Table II. Correlation between Gender composition of Top 50% and Scientific High School Choice

Outcome: Scientific High School Track	Girls			Boys		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
Share Boys Top 50% in math	-0.024***	-0.024***	-0.009***	0.029***	0.028***	0.033***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Constant	0.230***	1.070***	0.808***	0.271***	1.770***	1.293***
	(0.001)	(0.015)	(0.020)	(0.001)	(0.019)	(0.024)
Panel B						
More Boys Top 50% in math	-0.009***	-0.009***	-0.006***	0.007***	0.007***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.222***	1.062***	0.807***	0.283***	1.781***	1.319***
	(0.000)	(0.015)	(0.020)	(0.000)	(0.019)	(0.024)
Observations	1,572,738	1,572,738	1,572,738	1,606,762	1,606,762	1,606,762
R-squared	0.041	0.044	0.046	0.075	0.085	0.089
Mean dep. var.	0.22	0.22	0.22	0.29	0.29	0.29
Individual controls	No	Yes	Yes	No	Yes	Yes
Peers controls	No	No	Yes	No	No	Yes
School FE	Yes	Yes	Yes	Yes	Yes	Yes
Cohort FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is a dummy equal to one if the student chooses a high school scientific track. The Top 50% is computed on the INVALSI math score distribution in grade 5 at the class level for all 8th grade students in cohorts 2015-2021. Standard errors in parentheses are clustered at the school level. Individual controls include immigration status, generation of immigration, and age at the beginning of grade 8. Peers controls include the share of female students and the share of immigrants within the class, mean age at test, class size, and average socio-economic status of peers of student i. All peers variables are the sample moments of the *leave-own-out* distribution of students. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.2 Gender Gap: Experimental Data and Correlation with Administrative Outcomes

The gender gap in track choice observed in the previous section mirrors the girls-boys gap in our experiment. We observed a substantial gender disparity in the choice between the traditionally male-typed task (math) and female-typed task (literature): on average, 63% of boys in our sample selected math compared to only 44% of girls (Column 1, Table III).

Column 2 of Table III examines the relationship between selecting math in the experiment and the decision to enroll in a scientific high school in the administrative data.[14] We find that boys that select a scientific track at high school are, ceteris paribus, 14.5 percentage points more likely to choose math in our experiment. Girls that do not choose a scientific high school are on average 19 percentage points less likely to select math in our experiment, but the gender gap is completely closed among girls choosing the scientific track. Overall, this result shows that the main outcome of the experiment is a good predictor of future track choice of students.

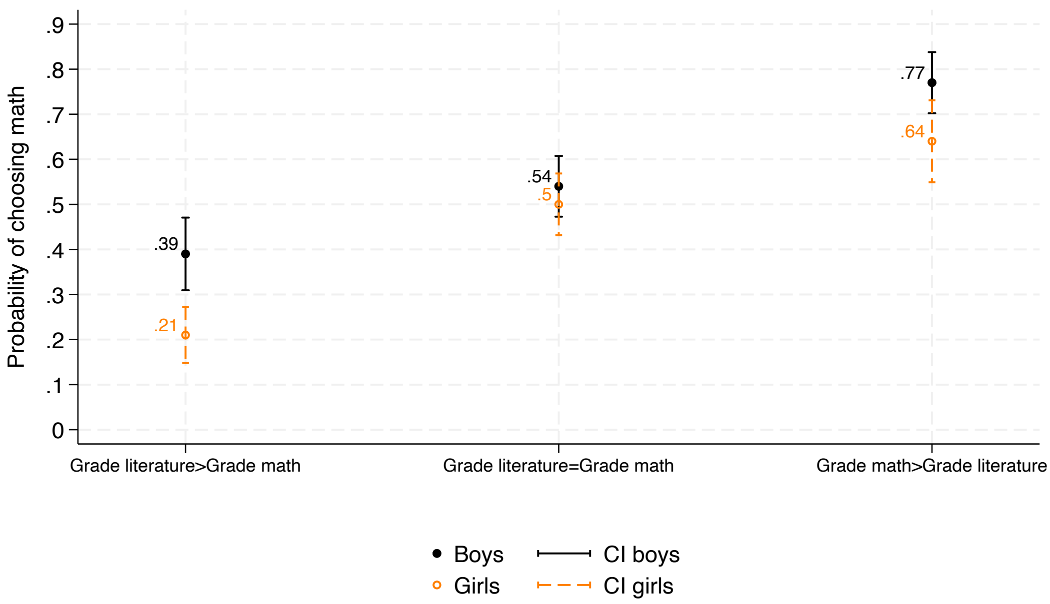
Columns 3 and 4 provide further evidence that students in the experiment select a field consistent with their relative ability: students that have higher grades assigned by teachers (Column 3) or in test scores (Column 4) in math compared to literature are more likely to choose math. This tendency is

[14]This information is derived from administrative data collected after the students completed middle school.

slightly stronger for girls when using standardized test scores as a proxy for ability. Students with higher teacher-assigned grades in math relative to literature should be more likely to choose math in our lab-in-the-field experiment as it offers the potential for higher rewards. As expected, students, both boys and girls, who have higher teacher-assigned grades in math compared to literature at baseline are more likely to select math in our lab-in-the-field experiment, while the opposite is true for students who have higher grades in literature compared to math. Figure 2 provides a visual representation of this result. Girls are systematically less likely to choose math, regardless of their relative grades in math or literature subjects. Among students with higher grades in math compared to literature, 77% of boys perceive themselves as having a comparative advantage in math, compared to only 64% of girls. Similarly, among students with higher grades in literature than math, 39% of boys still choose math, while this share drops to 21% for girls. Across all groups, boys consistently exhibit a higher likelihood of selecting math, highlighting a gender stereotypical choice even when controlling for relative ability. Gender-stereotypical choices, i.e., math for boys and literature for girls, generate a cost for students of both genders who are talented in counter-stereotypical fields.

In Columns 5 and 6 of Table III, we focus on the correlation between the choice of math in the experiment and implicit stereotypes, as measured by the IAT score: a one standard deviation increase in the association between males and scientific subjects raises boys' probability to select math by 3.8 percentage points and decreases the probability of girls selecting math by 2.3 percentage points, suggesting that implicit gender bias could influence educational stereotypical decision. However, the correlation with the explicit stereotypes is not statistically significant.

Figure 2. Student Choice by Gender and Performance



Notes: This figure shows the probability that the student chooses math after splitting the sample by gender. The optimal choice is considered math if their last end-of-semester grade was higher in math compared to literature. The optimal choice is indifferent if they got the same score in both subjects. The sample is restricted to students in grades 7 and 8 with available baseline grades in math and literature in the administrative test.

Appendix Table A.II reports additional correlations between the choice of math in our lab-in-the-field experiment and additional outcomes. In line with the previous literature (Kamas and Preston,

Table III. Actual Outcomes in the Administrative and Survey Data

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var. = Student chose math					
Female	-0.189***	-0.190***	-0.095**	-0.160***	-0.183***	-0.193***
	(0.029)	(0.046)	(0.037)	(0.031)	(0.030)	(0.030)
Scientific High School		0.145**				
		(0.061)				
Scientific High School * Girl		0.212**				
		(0.085)				
Grade math-Grade lit			0.598***			
			(0.086)			
Grade math-Grade lit * Girl			0.009			
			(0.116)			
INV. math-INV. ita				0.157***		
				(0.038)		
INV. math-INV. ita * Girl				-0.097**		
				(0.048)		
Std IAT					0.038**	
					(0.018)	
Std IAT*Female					-0.061**	
					(0.027)	
Std Explicit Gender Index						-0.022
						(0.018)
Std Explicit Gender Index * Girl						-0.010
						(0.028)
Constant	0.629***	0.546***	0.554***	0.611***	0.627***	0.631***
	(0.022)	(0.032)	(0.025)	(0.024)	(0.022)	(0.022)
Observations	1,250	1,250	1,250	1,250	1,250	1,250
R-squared	0.036	0.068	0.105	0.052	0.041	0.040
Mean X var – Boys	,	0.27	0.02	0.07	-0.14	0.14
Mean X var – Girls		0.26	-0.05	-0.13	0.17	-0.17

,

Notes: The dependent variable indicates whether the student chose math versus literature in our lab-in-the-field experiment, i.e., if they believe they are better in math than literature."Grade math-Grade literature" is the difference between the grades assigned by the teachers in the two subject at the end of the year. "INV. math - INV. lit" is the difference between the INVALSI scores in the two subjects. Before computing the differences, both grades and INVALSI scores have been standardized to have zero mean and standard deviation equal to one. For each of the control variables, an indicator controlling for when the answer is missing is included and interacted by the female variable. Robust standard errors, clustered at the class level, are in parentheses. Significance levels: *** p< 0.01, ** p< 0.05, * p< 0.1.

2012), students who are overconfident in their own skills in a particular subject are more likely to choose it (Columns 1 and 2).[15] Furthermore, when looking at students' preferences between a logic and a communication task elicited in the survey, we find that a perceived comparative advantage in math is consistently positively correlated with the preferences for the logic task compared to the communication task (Column 3). In column 4 we explore the geographic pattern in students' choices. As shown, among others by Campa et al. (2011), gender norms tend to be more conservative in the south of Italy compared to the north. While boys are equally likely to choose math in the different parts of the country, girls

[15] We measure overconfidence with a dummy variable equal to one if the student perceives to have answered to a higher number of correct questions compared to the actual number of correct answers in our multiple-choice test score. In our sample, 51% of boys and 40% of girls are overconfident in math, while 63% of boys and 58% of girls are overconfident in literature.

tend to be 12 percentage points less likely to believe they are better in math if they live in the south of Italy compared to girls living in the North. The role modeling example of working mothers seems to be qualitatively associated with a decrease in gender gaps in the choice of math, even if the impact is imprecisely estimated (column 5).[16]

Lastly, we elicited information on the friendship network of students by asking them to nominate their five best friends in the classroom. The last two columns of Appendix Table A.II show that, for both genders, a higher share of friends or classmates choosing math is correlated with a higher probability of choosing math themselves.

To summarize, gender-stereotypical perceptions on the comparative advantage impose a "cost" on students by distorting their choices: girls may opt for literature even when math would better align with their abilities, while boys may choose math even when literature would be a more suitable fit.

4 Experimental Results

4.1 Empirical Strategy

To evaluate the mechanisms behind peer influence in task choices, we estimate the following OLS regression separately for boys and girls, anticipating that gender norms may drive stereotypical influences in opposite directions:

$$Y_{is} = \beta_0 + \beta_1 T1_{is} + \beta_2 T2_{is} + \gamma_s + \varepsilon_{is}, \quad (1)$$

where Y_{is} is a binary variable equal to 1 if the student i attending school s selects math in our lab-in-the-field experiment (indicating a perception of greater ability in math relative to literature) and equal to 0 if she/he chooses literature. $T1_{is}$ and $T2_{is}$ are indicators for whether the student was assigned to Treatment 1 (*Disclosure to Peers*) or Treatment 2 (*Disclosure to Peers and Interaction*) and 0 if in the control group. γ_s denotes school fixed effects, and ε_{is} is the error term. We estimate robust standard errors clustered at the class level. In addition to the baseline specification, we report results with controls for individual and family characteristics. Student controls include baseline grade in math and literature, an indicator for being an immigrant, and measures of implicit and explicit stereotypes. Parent controls include parental education levels, employment status and whether the student lives with both parents. In the heterogeneity analysis, we correct p-values for multiple hypothesis testing using the Westfall-Young step-down-adjusted p-values, which also control the family-wise error rate (FWER) and allow for dependence among p-values.

4.2 Treatment Effects: the Influence of Peers

In our experiment, we investigate two specific channels through which peers influence behavior, going beyond mere exposure to same-gender peers. First, we examine the role of social image concerns, exploring whether students are more likely to make stereotypical choices when their decisions are observed by peers. This behavior may reflect a desire to signal traits deemed socially desirable and to conform to prevailing norms. The treatment "Disclosure to Peers" is designed to activate this mechanism. Through this treatment, we assess whether peer observability contributes to the emergence of gender-stereotypical

[16]Unfortunately, we do not have precise information on parents' field of study, nor whether their occupations are in STEM-related sectors.

choices during early adolescence. Second, we study whether the desire to avoid interaction with opposite-gender peers amplifies the gender gap in stereotypical choices. Indeed, when choosing a specific field, students are aware that they will select both the subjects they will study and peers they will socialize with. The treatment "Disclosure to Peers and Interaction" is designed to activate this mechanism by explicitly informing students that they will engage with peers who make the same choice.

By isolating and testing these two channels – social image concerns and avoidance of cross-gender interaction – our lab-in-the-field experiment provides deeper insights into the social dynamics that shape gendered educational choices during early adolescence.

Table IV reports our main results. Our main outcome is a binary variable that equals one if the student selected math as the subject in which she would earn double points for each correct answer in the test conducted during our experiment (i.e., the subject they perceive as having a comparative advantage). Note that, in Table III we show that this choice is strongly correlated with actual high school track choice and performance using real-world data.

Table IV. Treatment Effects

Outcome: Student chose math	Boys	Girls	All students		
	(1)	(2)	(3)	(4)	(5)
Disclosure to Peers	0.047	-0.001	0.047	0.051	0.048
	(0.046)	(0.051)	(0.046)	(0.047)	(0.045)
Disclosure + Interaction	0.056	-0.079*	0.056	0.061	0.081*
	(0.047)	(0.042)	(0.047)	(0.047)	(0.043)
Girl			-0.126***	-0.130***	-0.123***
			(0.048)	(0.048)	(0.045)
Disclosure to Peers x Girl			-0.049	-0.050	-0.027
			(0.073)	(0.072)	(0.067)
Disclosure + Interaction x Girl			-0.135**	-0.135**	-0.121**
			(0.066)	(0.064)	(0.060)
Constant	0.594***	0.469***	0.594***	0.674***	-0.044
	(0.035)	(0.032)	(0.035)	(0.066)	(0.219)
Observations	641	609	1,250	1,250	1,250
R-squared	0.003	0.006	0.040	0.049	0.163
Mean dep. var. control group	0.59	0.47	0.54	0.54	0.54
School FE	No	No	No	Yes	Yes
Controls	No	No	No	No	Yes
P-value(T1 + T1 x Girl)			0.978	0.979	0.665
P-value(T2 + T2 x Girl)			0.064	0.081	0.346

Notes: The dependent variable indicates whether the student chose math versus literature in our lab-in-the-field experiment. Columns 4–5 control for school fixed effects. Column 5 adds controls for the student: baseline grades in math and literature (for students in grades 7 and 8 of our experiment), standardized math and literature scores in grade 5, an indicator for whether the student is an immigrant, the IAT score, and an indicator of explicit stereotypes as described in the footnote of Table I. In addition, it adds a set of parental controls that include the following: if the student lives with both parents, dummy variables indicating the parents' level of education, and employment and job skill category as described in the footnote of Table I. Robust standard errors, clustered at the class level, are in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Columns 1 and 2 report treatment effects separately by gender. When students are informed that their choice of the task will be observed by their peers (Treatment 1 - "Disclosure to Peers"), neither boys nor girls exhibit statistically significant changes in behavior. This indicates that during adolescence, simply revealing to peers a perceived comparative advantage in math or literature does not necessarily signal undesirable traits or significantly alter choices. However, the point estimates suggest a slight shift towards gender-stereotypical behavior, with boys becoming more likely to choose math (Column 1). In contrast, when focusing on Treatment 2 "Disclosure to Peers + Interaction", we do find evidence that girls shy away from male-dominated fields when they have to interact with peers who choose the same field (Column 2). On average, female students decrease their probability of choosing math by 7.9 percentage points when assigned to Treatment 2 compared to the control group, representing an economically significant decrease by 17%. Boys, however, do not exhibit a statistically significant response, although the point estimate suggests a modest 5.6 percentage points increase in math selection (or 9% compared to the mean in the control group), consistent with the same mechanism but lacking statistical precision.

In Column 3, we pool together the entire sample to increase statistical power and look at the interactions between treatments and a binary variable indicating students' gender. Once again we show that girls in the control group are systematically less likely than boys to select the math task with a reduction of 12.6 percentage points. Notably, the coefficient on the interaction term between "Girl" and "Disclosure to Peers and Interaction" reveals that the gender gap in math selection more than doubles when girls know they will have to interact with peers choosing the same subject. In contrast, the coefficient on the interaction between "Girl" "Disclosure to Peers" remains statistically insignificant.

Finally, in Columns 4 and 5 we show that the results are robust to the inclusion of school fixed effects and an extensive set of controls, such as parental education and occupation, baseline grades, and test scores in math and literature. These additional controls confirm that the findings are both statistically and economically significant.

4.3 Mechanisms: Girls avoid math when need to interact with classmates

4.3.1 Avoiding Minority Status in Male-dominated Fields

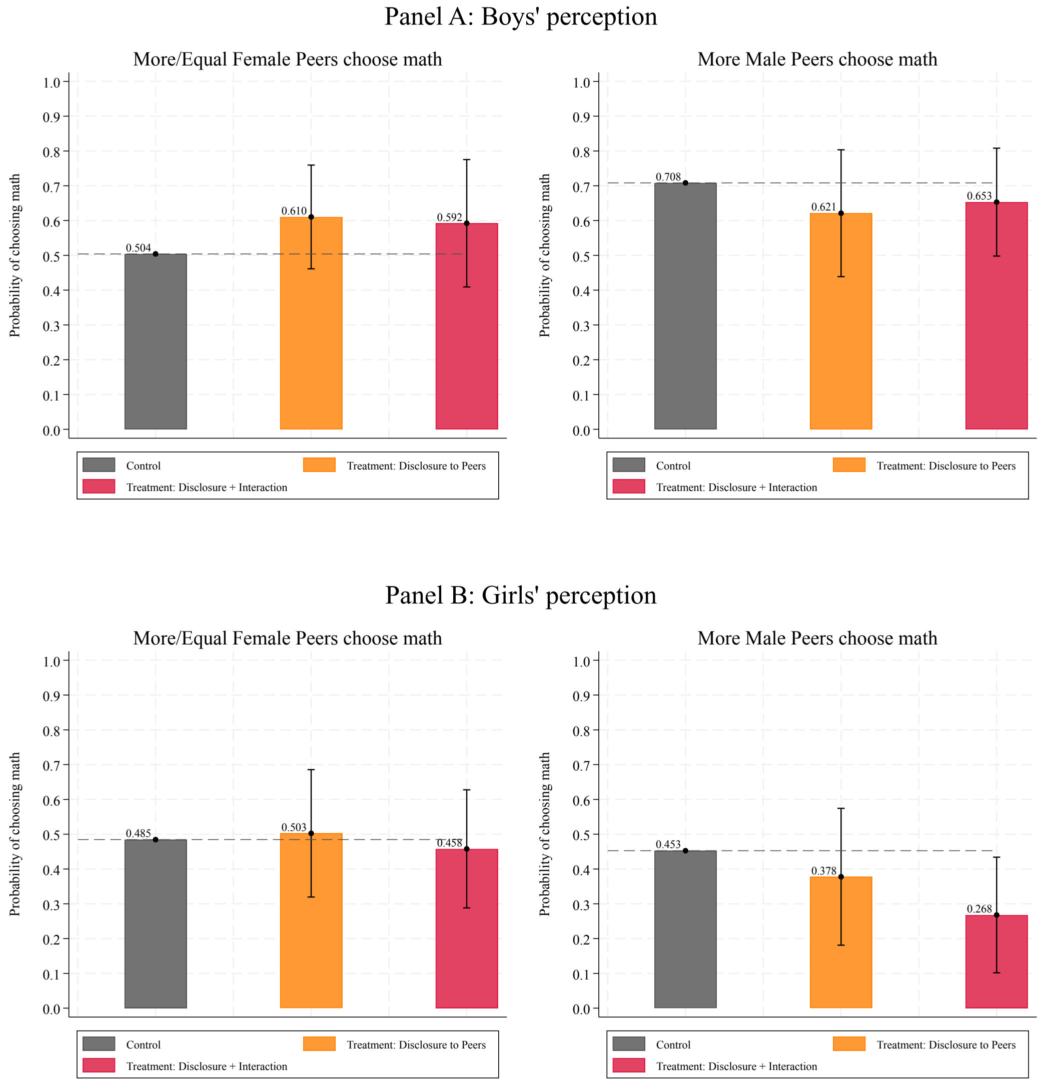
Are girls less likely to choose math because they anticipate having to interact with male peers? If gender-stereotypical choices are driven by a desire to avoid such interactions, then the effect of the "Disclosure to Peers and Interaction" treatment should be stronger among girls who expect a higher proportion of boys in their class to choose math. This hypothesis is testable using the detailed data we collected on students' expectations about the subject choices of their male and female classmates.

Figure 3 visually illustrates this key finding. The treatment effects are shown separately for boys (Panel A) and girls (Panel B) based on whether they believe more boys than girls in their class will choose the math task (right panel) or not (left panel). The effect of Treatment 2 is entirely driven by girls who expect a higher proportion of male peers to select math.[17] Among these girls, the likelihood of choosing the male-dominated field decreases significantly - from 45.3% in the control group to 29% -when they are informed they will interact with classmates making the same choice (Figure 3, bottom right). Conversely, for girls who perceive at least equal representation of boys and girls in math, their choices remain unaffected compared to the relevant control group (Figure 3, bottom left).

This result may reflect different aspects. Girls might anticipate a more competitive environment in

[17] Only 14% of girls and 16% of boys expect that more girls than boys will choose math in our lab-in-the-field experiment. Due to the small sample size, we observe similar effects for this group as for those expecting equal gender representation in math. Therefore, we report these results jointly.

Figure 3. Heterogeneous Treatment Effects by student's perception of classmates' choice



Notes: This figure shows the mean of the probability of choosing math for students in the control group, treatment group 1 ("Disclosure to Peers"), and treatment group 2 ("Disclosure to Peers and Interaction"), divided by gender and the child's perception of peers' choice. Standard errors are clustered at the class level. We also report the 95% confidence intervals for each estimate.

male-dominated fields, as suggested by previous research (Niederle and Vesterlund, 2010). They may also be deterred by the prospect of being a minority among the peers selecting the same subject (Shan (2021)). Both factors could contribute to their decision to opt for a more gender-stereotypical choice when faced with the possibility of peer interaction.

For boys, Treatment 1 "Disclosure to Peers" has no statistically significant effect, regardless of whether they believe the majority of their classmates selecting math are male or female (Figure 3, top panel). Appendix Table A.III provides the regression coefficients corresponding to Figure 3, with adjustments for multiple hypothesis testing using Westfall-Young step-down-adjusted p-values.

An important correlation to test is whether students' beliefs about their classmates' choice - beliefs that play a central role for the "Disclosure to Peers and Interaction" treatment - align with actual classmates' choice. In our survey, we elicited students' expectations about the task choices of their classmates. Among respondents, 49% of girls and 48% of boys expected that more boys would choose the math task; 13% of girls and 15% of boys anticipated an equal gender split; while the remaining 37% of girls and 36% of boys believed boys would be a minority among those choosing math.

Appendix Table A.V reports the correlation between students' beliefs and their classmates' actual choices, where both variables are defined as a dummy equal to one if more boys than girls chose the math task. Across all specifications, we find a positive and statistically significant correlation, indicating that studentsâ beliefs are predictive of actual peer choices. This association does not differ across gender (Column 2) and remains robust when controlling for classmates' academic performance (Column 3) and students' characteristics (Column 4). These findings suggest that students form reasonably accurate expectations about the gender composition of classmates selecting the math versus literature task.

We also correlate the survey-based indicator of students' beliefs about whether boys are more likely to choose math in the experimental task with the share of boys in the top 50% of math ability in administrative data. The results, presented in Table A.VI, show a strong and statistically significant correlation between the share of top-achieving boys in math and students' beliefs about peer choices in the experiment (Panel A, Column 1). This relationship holds consistently across genders (Panel A, Columns 2 and 3), and remains robust after controlling for individual math ability (Panel A, Column 3). Moreover, in Panel B, we show that beliefs about peer choices are significantly correlated with a binary indicator identifying classes where boys constitute the majority of top math achievers. These findings suggest that exposure to a higher proportion of top-achieving boys in math (compared to a higher share of top-achieving girls) within a class shapes students' expectations about the gender composition of peers in scientific tracks. Consequently, these expectations may influence girls' decisions to opt out of STEM tracks, further perpetuating gender disparities in these fields.

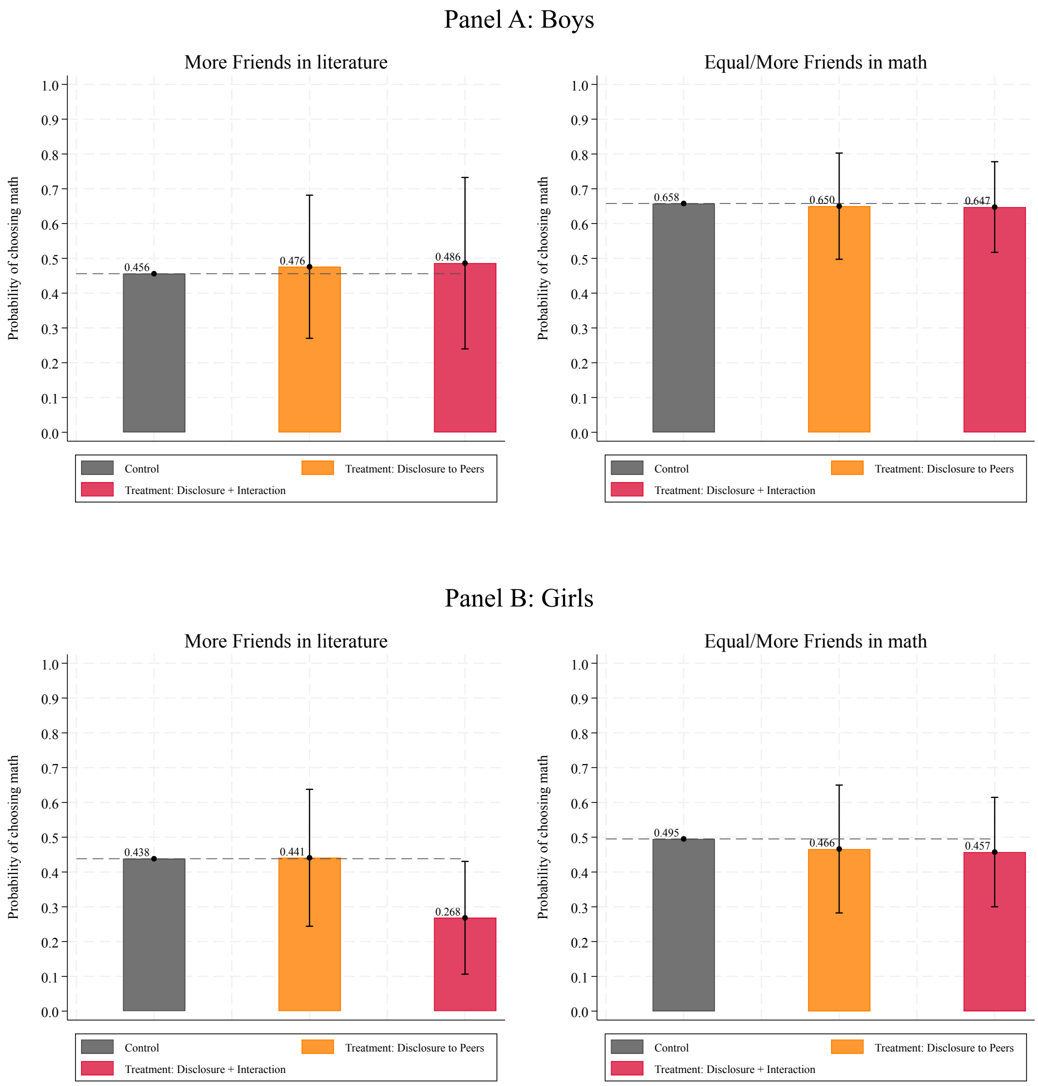
4.3.2 Desire to Interact with Friends

An alternative mechanism that may induce girls to select literature when they know they will interact with peers selecting the same field is the desire to interact with their own friends. Indeed, if girls are more likely to choose literature, and if social networks exhibit gender homophily (Stehlé et al., 2013; De Gioannis et al., 2023), we may expect this mechanism to drive our result.

To explore this, we complement our data on students' expectations about peers' task choices with information on their friendship networks. Specifically, students were asked to name their five closest friends. The resulting network data reveal a strong degree of gender homophily: students were significantly more likely to form friendships with peers of the same gender. Consequently, girls were more likely to be friends with classmates who selected the literature task in our experiment.

To test whether this social dynamic mediates treatment effects, we examine whether the impact of Treatment 2 ("Disclosure to Peers and interaction") varies according to the actual choices made by a student's friends (information that was not observed by students when making their own decisions). Figure 4 illustrates that girls with a higher number of friends selecting literature were significantly more influenced by Treatment, substantially increasing their likelihood of choosing literature (Panel B, bottom left). No statistically significant effects were observed for other groups. Appendix Table A.IV reports the regression coefficients. The evidence is qualitatively consistent with an alternative interpretation: girls with more friends opting for literature may conform to gender stereotypes to align their choices with their close friends and enhance opportunities for social interaction within their preferred peer group.

Figure 4. Heterogeneous Treatment Effects by the Choice of Student's Friends



Notes: This figure shows the mean of the probability of choosing math for students in the control group, treatment group 1 (Disclosure to Peers), and treatment group 2 (Disclosure to Peers and Interaction), divided by gender and the choice of the child's closest friend. The coefficients are obtained from a regression including class fixed effects. We also report the 95% confidence intervals for each estimate.

5 Conclusions and Discussion

Gender segregation in education – where men are underrepresented in fields such as humanities and women are underrepresented in STEM – remains a major challenge in many countries. This imbalance not only reinforces inequality but also leads to talent mismatches that reduce overall productivity. In systems where students are tracked into specific educational paths early, such segregation often emerges during adolescence and shapes future educational and career outcomes.

In this paper, we first exploit administrative data on the universe of all Italian middle school students to confirm the important role of peers in educational choices. Second, we design a novel lab-in-the-field experiment in middle schools to examine the mechanisms though which peers influence students' choices between scientific and humanistic fields, proxied with the choice of tasks in math or in literature. We focus on two main mechanisms: social image concerns and aversion to interacting with peers of the opposite gender. We find that making students' choices visible to peers does not significantly change behavior. However, girls are less likely to choose math when they know they will collaborate with peers who choose the same subject. There may be two possible explanations for this result: (i) girls may wish to avoid being in the minority within male-dominated fields; (ii) girls may prefer to be in environments where they can interact with their own friends. We first find that the results are driven by girls who believe that more male peers choose math, leading to a self-fulfilling prophecy, with a lower share of female students who end up choosing the male-typed field. Second, the results are also stronger for girls with more friends that choose literature. These findings underscore the importance of peer interactions in shaping academic choices and reveal how they can lead to suboptimal matches between students' talents and their educational paths.

We also document that students' choices in the experiment are highly predictive of actual high school track enrollment and correlate strongly with their measured academic ability, as recorded in the administrative data. Students who select a scientific track at high school and have higher standardized grades in math are more likely to choose math in our experiment. This evidence makes our experimental choice a meaningful proxy for real-world behavior.

Our findings have several policy implications. First, boosting girls' math ability or confidence alone may not be enough to close the gender gap in STEM. Instead, policies should address the peer environment. For example, programs that promote gender balance within STEM tracks, or that create spaces where girls can study STEM subjects alongside female peers, could reduce the perceived cost of being in the minority. In countries with early tracking, students are often separated in different school buildings based on their chosen field, which limits interactions across tracks. Because choosing a track means also choosing one's peer group, this can further discourage girls from entering male-dominated fields like STEM. Rethinking how tracks are designed - for instance, by creating different tracks in the same building, shared classes, or extracurricular activities across fields - might help reduce these barriers. Although more evidence is needed, public policies in these directions may help to reduce gender gaps in students' field of study.

In sum, our study shows that educational inequality is not just about individual ability or preferences. Social dynamics – especially peer interactions – play a key role in shaping students' choices. Addressing these dynamics offers a powerful, and often overlooked, opportunity to reduce gender gaps in STEM and create more inclusive learning environments.

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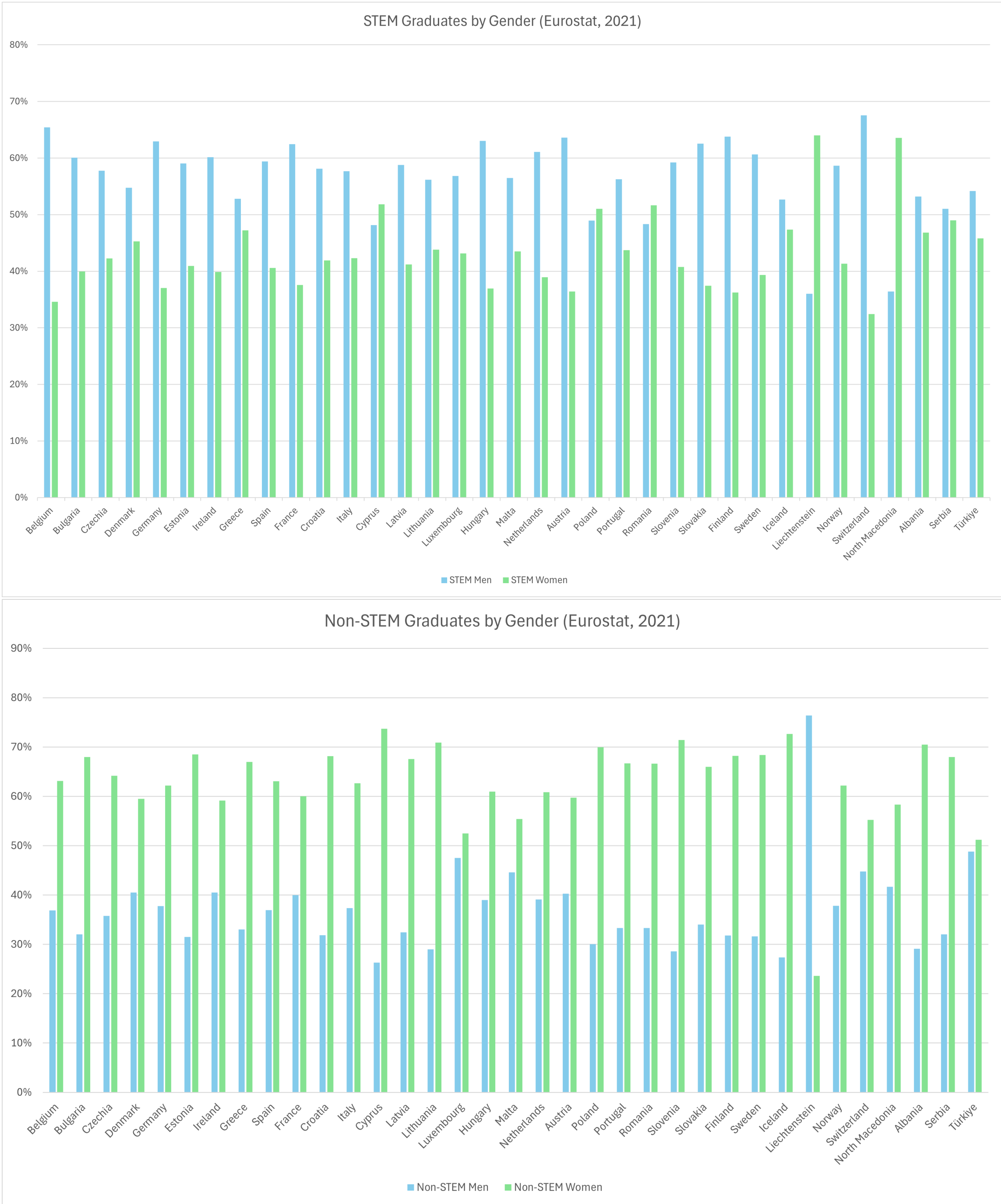
A Appendix Figures and Tables

Figure A.I. Gender Segregation in STEM and Non-STEM Fields



Notes: STEM = natural sciences, mathematics, statistics, engineering, manufacturing, and construction. Non-STEM = education, arts, social sciences, journalism, information, business, administration and law, information and communication technologies, agriculture, forestry, fisheries and veterinary, health and welfare, and services. Source: http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

Figure A.II. Geographic Distribution of Participating Schools

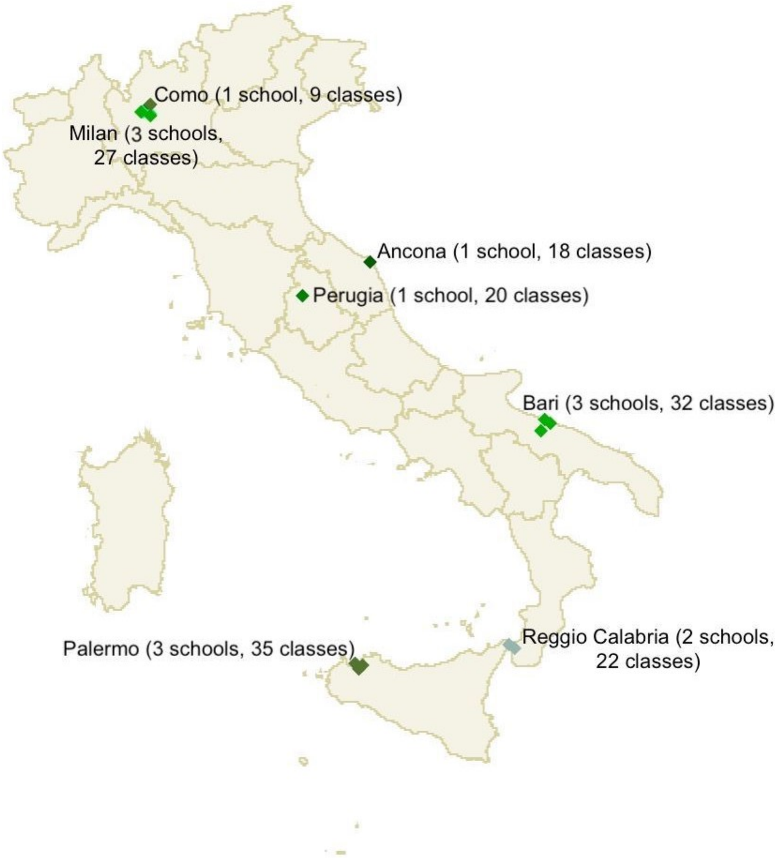
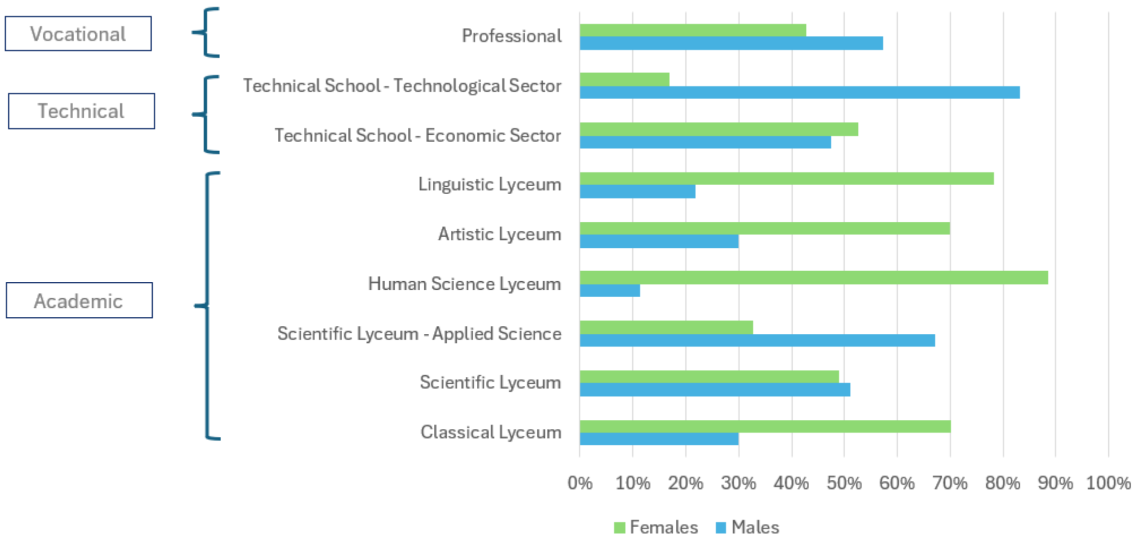


Figure A.III. Gender Composition of High School Tracks in Italy



Notes: This figure shows the gender composition of each sub-track of high school in Italy. Source: Authors' elaboration on data from the Italian Ministry of Education.

Table A.I. Balance Table: Student characteristics

	(1) **Control** (C)	(2) **Disclosure to Peers** (T1)	(3) **Disclosure + Interaction** (T2)	(4) **P-value** (T1-C)	(5) **Norm diff.** (T1-C)	(6) **P-value** (T2-C)	(7) **Norm diff.** (T2-C)
Panel A: Student Characteristics							
Female	0.469	0.481	0.511	0.755	0.016	0.200	0.058
	(0.500)	(0.500)	(0.500)				
Immigrant	0.144	0.150	0.143	0.809	0.011	0.954	-0.003
	(0.352)	(0.357)	(0.350)				
Student from the South	0.484	0.452	0.525	0.338	-0.046	0.271	0.057
	(0.500)	(0.498)	(0.500)				
Mother's education: high school	0.384	0.314	0.386	0.045	-0.104	0.936	0.004
	(0.487)	(0.465)	(0.487)				
Mother's education: university	0.196	0.162	0.141	0.170	-0.062	0.035	-0.104
	(0.397)	(0.369)	(0.348)				
Father's education: high school	0.389	0.329	0.335	0.035	-0.089	0.085	-0.079
	(0.488)	(0.470)	(0.473)				
Father's education: university	0.164	0.111	0.117	0.028	-0.108	0.040	-0.095
	(0.371)	(0.315)	(0.322)				
Mother works	0.658	0.713	0.653	0.063	0.084	0.894	-0.006
	(0.475)	(0.453)	(0.476)				
Father works	0.790	0.783	0.820	0.798	-0.012	0.221	0.053
	(0.408)	(0.413)	(0.385)				
Occupation of mum: medium or high wage	0.218	0.220	0.234	0.936	0.004	0.582	0.028
	(0.413)	(0.415)	(0.424)				
Occupation of dad: medium or high wage	0.276	0.215	0.269	0.039	-0.101	0.815	-0.011
	(0.448)	(0.411)	(0.444)				
Lives with both parents	0.814	0.807	0.831	0.783	-0.013	0.478	0.032
	(0.389)	(0.395)	(0.375)				
Panel B: Administrative data							
Std grade (INVALSI): math	47.797	44.190	44.614	0.082	-0.088	0.122	-0.080
	(28.707)	(29.174)	(27.375)				
Std grade (INVALSI): literature	50.867	46.693	48.873	0.048	-0.097	0.347	-0.049
	(29.172)	(31.392)	(28.717)				
Teacher assigned grade: math	3.958	3.884	4.108	0.768	-0.014	0.578	0.029
	(3.751)	(3.715)	(3.605)				
Teacher assigned grade: literature	3.990	3.923	4.194	0.781	-0.013	0.425	0.039
	(3.687)	(3.697)	(3.623)				
Observations	409	414	427				

Notes: The first three columns present the mean of the variable for the control group and the two treatment arms respectively. Standard deviations are shown in parentheses. Treatment 1 is Disclosure to Peers and Treatment 2 is Disclosure to Peers and Interaction. Columns 4 and 6 display *p*-values for the two-sided test of equivalence in means in means between Treatment 1 and the Control group and between Treatment 2 and the Control group respectively. In addition, Columns 5 and 7 report the corresponding normalized difference, following Imbens and Wooldridge (2009). Standard errors are clustered at the class level. We create a category for missing variables. For brevity, the balance on the missing variable is omitted.Significance levels: *** p< 0.01, ** p< 0.05, * p< 0.1.

Table A.II. Correlation between Students' Choice of math and Other Relevant Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dep. Var. = Student chose math						
Variable X	**Overconfidence Math**	**Overconfidence Literature**	**Logic Task**	**South**	**Work Mother**	**Share Math Friends**	**Share Math Classmates**
Girl	-0.168*	-0.168*	-0.123*	-0.129*	-0.220*	-0.150*	-0.197*
	(0.038)	(0.043)	(0.039)	(0.041)	(0.057)	(0.057)	(0.096)
X	0.121**	-0.082**	0.422***	0.032	0.038	0.286***	0.369**
	(0.039)	(0.040)	(0.036)	(0.043)	(0.046)	(0.065)	(0.117)
X*Girl	-0.020	-0.047	0.005	-0.124**	0.041	-0.036	0.019
	(0.054)	(0.056)	(0.057)	(0.057)	(0.069)	(0.097)	(0.166)
Constant	0.569***	0.679***	0.401***	0.613***	0.603***	0.470***	0.435***
	(0.029)	(0.032)	(0.029)	(0.030)	(0.039)	(0.042)	(0.067)
Observations	1250	1250	1250	1250	1250	1250	1250
Mean X var: Boys	0.493	0.607	0.540	0.496	0.677	0.536	0.525
Mean X var: Girls	0.386	0.550	0.379	0.478	0.672	0.462	0.521

Notes: The dependent variable indicates whether the student chose math versus literature in our lab-in-the-field experiment; i.e., if they believe they are better in math than literature. For each of the control variables, an indicator controlling for whether the answer is missing is included and interacted with the female variable. Robust standard errors, clustered at the class level, are in parentheses. Significance levels: *** p< 0.01, ** p< 0.05, * p< 0.1.

Table A.III. Heterogeneous Treatment Effects by Perception of Peers' Choice

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var.: = 1 if Student chose math					
	Girls			Boys		
Disclosure to Peers	-0.075	-0.082	-0.078	-0.087	-0.087	-0.056
	(0.100)	(0.098)	(0.099)	(0.093)	(0.088)	(0.085)
	{ 0.726}	{ 0.695}	{ 0.858}	{ 0.676}	{ 0.695}	{ 0.894}
Disclosure + Interaction	-0.185**	-0.164*	-0.133	-0.055	-0.055	-0.050
	(0.085)	(0.088)	(0.093)	(0.079)	(0.078)	(0.078)
	{ 0.093}	{ 0.194}	{ 0.472}	{ 0.726}	{ 0.695}	{ 0.894}
Disclosure to Peers × More/equal girls choose math	0.093	0.109	0.092	0.194	0.210*	0.156
	(0.140)	(0.140)	(0.144)	(0.124)	(0.123)	(0.125))
	{ 0.726}	{ 0.695}	{ 0.894}	{ 0.341}	{ 0.264}	{ 0.584}
Disclosure + Interaction × More/equal girls choose math	0.158	0.136	0.079	0.143	0.150	0.125
	(0.130)	(0.135)	(0.140)	(0.127)	(0.127)	(0.124))
	{ 0.580}	{ 0.695}	{ 0.894}	{ 0.584}	{ 0.608}	{ 0.763}
More/equal girls choose math	-0.008	-0.019	0.009	-0.297***	-0.282**	-0.256**
	(0.118)	(0.117)	(0.119)	(0.083)	(0.085)	(0.084)
Class FE	Yes	Yes	Yes	Yes	Yes	Yes
Student controls	No	Yes	Yes	No	Yes	Yes
Parent controls	No	No	Yes	No	No	Yes

Notes: The dependent variable indicates whether the student chose math; i.e., if they believe they are better in math than literature. "Student controls" include baseline grades in math and literature, an indicator for the students being an immigrant, the IAT score and an indicator of explicit stereotypes. "Parent controls" include whether the student lives with both parents, dummy variables indicating the parents' level of education, and employment and job skill category as described in the footnote of Table I. For each variable, we include an indicator controlling for when the answer is missing. Standard errors in parentheses are clustered at the class level. FWER *p*-values are displayed in braces underneath standard errors. Significance levels: *** p< 0.01, ** p< 0.05, * p< 0.1.

Table A.IV. Heterogeneous Treatment Effects by Choice of Student's Friends

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var.: = 1 if Student chose math					
	Girls			Boys		
Disclosure to Peers	0.003	-0.004	0.009	0.020	0.029	0.013
	(0.100)	(0.095)	(0.094)	(0.105)	(0.095)	(0.094)
	{ 1.000}	{ 0.998}	{ 1.000}	{ 1.000}	{ 0.998}	{ 1.000}
Disclosure + Interaction	-0.170**	-0.142*	-0.123	0.030	0.024	0.013
	(0.082)	(0.084)	(0.087)	(0.125)	(0.119)	(0.119)
	{ 0.116}	{ 0.310}	{ 0.493}	{ 1.000}	{ 0.998}	{ 1.000}
Disclosure to Peers × More/equal friends in math	-0.032	-0.042	-0.075	-0.028	-0.024	-0.009
	(0.138)	(0.135)	(0.137)	(0.136)	(0.121)	(0.122))
	{ 1.000}	{ 0.998}	{ 0.973}	{ 1.000}	{ 0.998}	{ 1.000}
Disclosure + Interaction × More/equal friends in math	0.132	0.091	0.068	-0.041	-0.030	-0.021
	(0.114)	(0.115)	(0.116)	(0.144)	(0.139)	(0.141))
	{ 0.637}	{ 0.916}	{ 0.973}	{ 0.999}	{ 0.998}	{ 1.000}
More/equal friends in math	-0.225**	-0.218*	-0.213*	-0.090	-0.079	-0.086
	(0.111)	(0.112)	(0.113)	(0.102)	(0.089)	(0.094)
Class FE	Yes	Yes	Yes	Yes	Yes	Yes
N. friends	Yes	Yes	Yes	Yes	Yes	Yes
Student controls	No	Yes	Yes	No	Yes	Yes
Parent controls	No	No	Yes	No	No	Yes

Notes: The dependent variable indicates whether the student chose math; i.e., if they believe they are better in math than literature. "Student controls" include baseline grades in math and literature, an indicator for the students being an immigrant, the IAT score and an indicator of explicit stereotypes. "Parent controls" include whether the student lives with both parents, dummy variables indicating the parents' level of education, and employment and job skill category as described in the footnote of Table I. For each variable, we include an indicator controlling for when the answer is missing. Standard errors in parentheses are clustered at the class level. FWER *p*-values are displayed in braces underneath standard errors. Significance levels: *** p< 0.01, ** p< 0.05, * p< 0.1.

Table A.V. Correlation between Classmates' Choice of Math and Perception of Students

Dep. Var.: Students' *Belief* on Peers' Choice (More boys chose math)	Girls			Boys		
	(1)	(2)	(3)	(4)	(5)	(6)
Actual peers' choice (More boys math)	0.411***	0.381***	0.372***	0.364***	0.355***	0.351***
	(0.051)	(0.053)	(0.053)	(0.046)	(0.048)	(0.048)
Constant	0.231***	0.552	0.153	0.244***	0.035	0.519
	(0.037)	(0.352)	(0.472)	(0.029)	(0.310)	(0.508)
Observations	609	609	609	641	641	641
R-squared	0.158	0.182	0.221	0.121	0.122	0.160
Mean dep. var.	0.49	0.49	0.49	0.48	0.48	0.48
Performance peers	No	Yes	Yes	No	Yes	Yes
Student controls	No	No	Yes	No	No	Yes

Notes: The dependent variable is a dummy equal to one if the student believes that more male classmates chose math. "Performance peers" includes the average grade in math, separately for male and female peers. "Student controls" include the grades, an indicator for the students being an immigrant, the IAT score, an indicator of explicit stereotypes, if the student lives with both parents, dummy variables indicating the parents' level of education, and employment and job skill category as described in the footnote of Table I. For each variable, we include an indicator controlling for when the answer is missing. Robust standard errors, clustered at the class level, are in parentheses. Significance levels: *** p< 0.01, ** p< 0.05, * p< 0.1.

Table A.VI. Correlation between Boys in the Top 50% and Perceptions of Boys choosing math

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.: Students' *Belief* on Peers' Choice (More boys chose math)						
Panel A						
Share Boys Top 50% in math	0.432***	0.432***	0.431***			
	(0.078)	(0.093)	(0.095)			
Girl		0.009	0.002			
		(0.069)	(0.070)			
Share Boys Top 50% in math * Girl		0.000	-0.002			
		(0.115)	(0.114)			
Panel B						
More Boys Top 50% in math				0.212***	0.181***	0.183***
				(0.047)	(0.056)	(0.057)
Girl					-0.024	-0.031
					(0.044)	(0.047)
More Boys Top 50% in math * Girl					0.062	0.060
					(0.064)	(0.065)
Constant	0.263***	0.259***	0.086	0.392***	0.403***	0.258
	(0.048)	(0.053)	(0.220)	(0.032)	(0.035)	(0.219)
Observations	1,239	1,239	1,239	1,239	1,239	1,239
R-squared	0.060	0.060	0.086	0.044	0.045	0.072
Mean dep. var.	0.49	0.49	0.49	0.49	0.49	0.49
Student controls	No	No	Yes	No	No	Yes

Notes: The dependent variable indicates whether the student believes that more male classmates chose math in the task in the experiment. "Student controls" include baseline grades in math and literature, an indicator for the students being an immigrant, the IAT score, an indicator of explicit stereotypes, if the student lives with both parents, dummy variables indicating the parents' level of education, and employment and job skill category as described in the footnote of Table I. The variable "More Boys Top 50% in math" is a dummy equal to one if the share of boys in the top 50% of INVALSI math score distribution in grade 5 is greater than 50%. Robust standard errors, clustered at the class level, are in parentheses. Significance levels: *** p< 0.01, ** p< 0.05, * p< 0.1.

B Appendix: Students' Survey

In this section, we report the most relevant questions asked in the experiment (B.1, Part I: The Experiment) and in the students' questionnaire (B.2, Part II: Student Questionnaire).

B.1 Part I: The Experiment

After eliciting information on socio-demographic characteristics (i.e., place and date of birth, name of the school, grade in which they were enrolled, etc.), we told students the following:

- "You will now be asked to complete 6 multiple-choice questions, 3 in math and 3 in literature. You will gain two points for each correct question instead of one in the subject you choose, either math or literature. In the other subject, you will gain only one point for each correct question. In the past, students who completed these questions were on average equally likely to provide correct answers in math and in literature."

At this point, students were randomly assigned into two different treatment groups and a control group using a computer-based program. Each treatment group received a different type of information before reporting their choice of the task. To the first group (Treatment 1, "Disclosure to Peers") students were informed that their peers would observe their choice between the math and the literature task; to the second group (Treatment 2, "Disclosure to Peers and Interaction") students were told that their peers would observe their choice and that they would also need to collaborate on an additional task with classmates who selected the same subject. In the control group, students were simply asked to choose their preferred task without additional information.

Then, we elicited the following information:

- "In which subject do you think your MALE classmates (who are in the classroom at the moment) have chosen to gain 2 points for each correct answer? Options: (a) all of them chose math; (b) all of them chose math except for 1 or 2; (c) all of them chose math except for 3 or 4; (d) half chose math and half chose literature; (e) all of them chose literature except for 3 or 4; (f) all of them chose literature except for 1 or 2; (g) all of them chose literature."
- "In which subject do you think your FEMALE classmates (who are in the classroom at the moment) have chosen to gain 2 points for each correct answer? Options: (a) all of them chose math; (b) all of them chose math except for 1 or 2; (c) all of them chose math except for 3 or 4; (d) half chose math and half chose literature; (e) all of them chose literature except for 3 or 4; (f) all of them chose literature except for 1 or 2; (g) all of them chose literature."
- "Assume you are asked to complete one of the following two tasks. On which of these tasks do you expect to be better at? You can choose one task only, even if you think you will do equally well in both. Options: (a) a task that requires math and logic skills; (b) a task that requires communication and organizational skills (e.g., present a summary to the class)." Now solve the task in math and literature. The order of the questions was randomized at the individual level.

B.2 Part II: Questionnaire

B.2.1 Implicit Association Test

We invited students to complete a seven-block IAT following the schematic overview presented in Table B.I. Half of the students completed the IAT as presented in the table, while the other half completed the IAT with the blocks in the following order: 1, 5, 6, 7, 2, 3, and 4 ("order incompatible" IAT). The order of the two schemes was randomly selected at the individual level. The blocks used to calculate the IAT score are blocks 3, 4, 6, and 7. The number of words that must be categorized is 20 in blocks 3 and 6, and 40 in blocks 4 and 7, as in the standard IAT 7-blocks. The measure of implicit stereotypes is calculated as the difference in reaction time between the task in which scientific fields and male names are on the same side of the screen and the task in which scientific fields and female names are on the same side of the screen. The scoring procedure follows the guidelines of the improved scoring algorithm defined by Greenwald et al. (2003).

Table B.I. IAT: Blocks

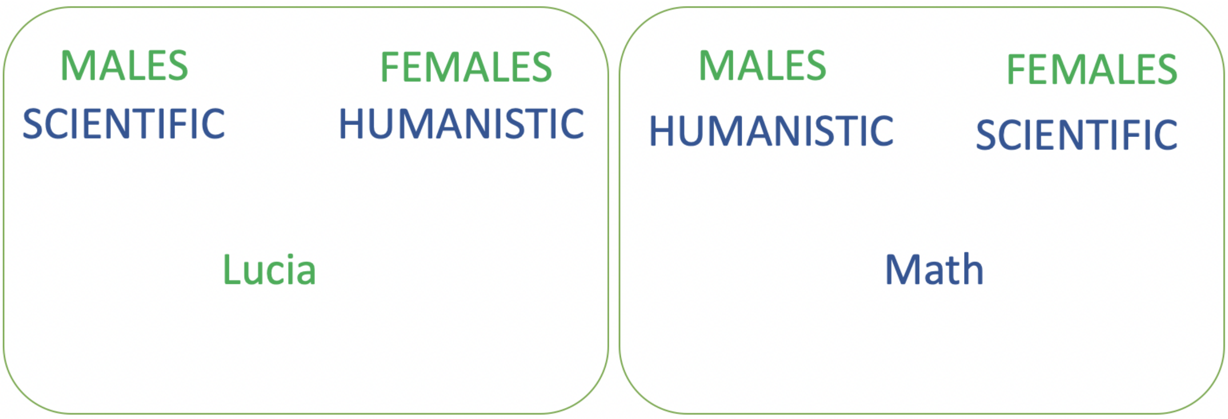
Blocks	Left Categories	Right Categories
1	Maschio (male)	Femmina (female)
2	Scientifico (scientific)	Umanistico (humanistic)
3	Maschio (male) and scientifico (scientific)	Femmina (female) and umanistico (humanistic)
4	Maschio (male) and scientifico (scientific)	Femmina (female) and umanistico (humanistic)
5	Umanistico (humanistic)	scientifico (scientific)
6	Maschio (male) and umanistico (humanistic)	Femmina (female) and scientifico (scientific)
7	Maschio (male) and Umanistico (humanistic)	Femmina (female) and scientifico (scientific)

Table B.II summarizes the stimuli presented within each category, while Figure B.I shows a screenshot of the tablet.

Table B.II. IAT: Categories

Categories	Stimuli
Maschio (male)	Luca, Federico, Matteo, Alberto, Davide, Alessandro
Femmina (female)	Anna, Martina, Laura, Giulia, Chiara, Alessia
Scientifico (scientific)	Matematica (math), fisica (physics), scienze (science), chimica (chemistry), ingegneria (engineering), calcolo (calculus)
Humanistic (umanistico)	Lettere (literature), Italiano (Italian), filosofia (philosophy), letteratura (literature), storia (history), lingue (languages)

Figure B.I. Screenshot of the IAT



B.2.2 Self-Reported Answers and Background

1. Below you will find a list of some types of high schools. How interested would you be to continue your studies in each of these schools? *[Select from answer choices: "Not at all interested," "Not very interested," "Somewhat interested," "Very interested," "I don't know this school"]*

- Vocational high school
- Technical high school (economic sub-track)
- Technical high school (technological sub-track)
- Academic high school: Scientific with applied sciences
- Academic high school: Scientific
- Academic high school: Classic
- Academic high school: Languages
- Academic high school: Artistic
- Academic high school: Human sciences

2. You said you are "Somewhat interested" or "Very interested" in the scientific high school (with applied sciences). Why? You can select more than one option.

   - I like math and/or technology.
   - I think it creates good opportunities (university/jobs).
   - My parents think I should choose this school.
   - My teachers think I should choose this school.
   - I want the majority of my classmates to be male.
   - I want to be in class/school with my friends.
   - None of the reasons above.

3. You said you are "Not very interested" or "Not at all interested" in the scientific high school (with applied sciences). Why? You can select more than one option.

   - I don't like math and/or technology.
   - I think the opportunities (university/jobs) it creates are not interesting.
   - My parents think I shouldn't choose this school.
   - My teachers think I shouldn't choose this school.
   - I'm concerned I might fail my class.
   - I don't want the majority of my classmates to be male.
   - I want to be in class/school with my friends.
   - None of the reasons above.

B.2.3 Explicit gender stereotypes

State how much you agree with the following statements.
[Select from answer choices "Strongly disagree," "Disagree," "Agree," "Strongly agree"]

4. There are biological differences in men's and women's innate mathematical and scientific abilities.
5. Earning money to support the family is a father's responsibility.
6. Taking care of the house and children is a mother's responsibility.
7. A psychologist is not a job suitable for men.
8. A computer programmer is not a job suitable for women.
9. Even if they work hard, women cannot be good at football.
10. Even if they work hard, men cannot be good at cooking.

B.2.4 Friendship

11. Who are your 5 best friends in this class? Select the number that corresponds to their position in the class list. *[Multiple-choice question]*

12. You have to choose two good classmates to solve with you a complicated math problem.
    You can indicate up to two students and also you can include yourself. Select the number that corresponds to their position in the class list. *[Multiple-choice question]*

13. You have to choose two good classmates to solve with you a complicated Italian/grammar exercise.
    You can indicate up to two students and also you can include yourself. Select the number that corresponds to their position in the class list. *[Multiple-choice question]*

B.2.5 Background

Finally, we elicited information on students' siblings and parents, including information on their parents' level of education and occupation.

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