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

Michela Carlana†, Lucia Corno‡

April 2026

Abstract

Adolescents' educational choices are strongly shaped by their peers, particularly those of the same gender. This paper provides causal evidence on the channels underlying peer influence through a lab-in-the-field experiment. We focus on two key mechanisms: (i) *social image concerns*, whereby students may conform to gender stereotypes (e.g., girls choosing literature and boys choosing math) when their choices are observable by peers, and (ii) a *preference for same-gender interactions*, whereby the expected gender composition of peers affects high school track choices. Our results reject the social image channel: students' choices do not respond to observability by peers. Instead, we uncover a strong role for expected peer composition: girls are significantly less likely to choose counter-stereotypical tracks, particularly math, when they anticipate environments with a higher share of male (and potentially high-performing) peers. Boys, in contrast, do not respond to either mechanism. We validate these findings using population-wide administrative data on Italian students, showing consistent patterns at scale. Taken together, our results identify peer composition — rather than social image — as a key constraint on young girls' entry into STEM tracks, offering a new explanation for the persistence of gender gaps in education.

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

*We thank seminar participants at Harvard Kennedy School, University of Zurich, Geneva, Stockholm, Maryland, Bristol, Bologna, Berlin, USI, World Congress IEA, the BRIQ Institute, Cattolica University and Desmond Ang, Will Dobbie, Alexia Delfino, Nicola Gennaioli, Pamela Giustinelli, Eliana La Ferrara, Valerio Nispi Landi, Michela Tincani for helpful comments. We are grateful to the schools that took part in the survey and the intervention for their collaboration, to Action Aid and CIAI, and to our team of enumerators (Francesca Bramucci, Silvia Farina, Beatrice Ferrario, Agnese Gatti, Matteo Giugovaz, Maddalena Grignani, Pietro Guglielmi, Maurizio Malpede, Sara Pratico, Gian Matteo Ricci, and Gianluca Strada) for invaluable help with data collection. Lucrezia Di Scanno and Elisa Muscarella provided excellent research assistance. We are also grateful to Gianna Barbieri and Annarita Marzullo from the Italian Ministry of Education for providing the data used in this paper. Financial support from "Con i Bambini Impresa Sociale" and from Cattolica University grant D32-2022 "Unpacking Inequalities: Mechanisms and Policies" is greatly acknowledged. AER RCT Registry ID: AEARCTR-0004900. The project has been approved by the Ethics Committee of Bocconi University (Prot n. 7098-2 07/03/2019) and Harvard University (IRB19-1630).

†Harvard Kennedy School, Bocconi University, INSPIRE-LEAP, NBER and CEPR (email: michela_carlana@hks.harvard.edu).

‡Cattolica University, INSPIRE-LEAP and CEPR (email: lucia.corno@unicatt.it).

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 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, 2024).[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. 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 the choice of 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, 2021). 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, 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 questions in both math and literature. Their choice was incentivized through differential scoring: 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 also told that 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 concerns about

[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.

social image influence the students' choices. For example, 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, in contrast, explores whether the desire to avoid interactions with opposite-sex 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 peers with whom they will interact during high school. For example, by choosing a scientific area, a student will study more math but will also 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 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. 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 who are more likely to choose literature.

Second, 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 these data, we first 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). Then, we merge the administrative data at the individual level with our survey and experimental data to validate the reliability of survey-based measures. Our results show that students' choices between math and humanistic fields in the experiment are strongly and positively correlated with their ability in these subjects before the experiment, as captured by standardized test scores, and with their actual high school track choice at the end of middle school. Students who choose the math task in the experiment are more likely to enroll in STEM high schools. Finally, administrative data are used to assess the external validity of the same-gender interaction mechanism identified in our lab-in-the-field experiment. We test how girls' exposure to high-achieving male peers in math during middle school - which serves as a proxy for their expectations about the future gender composition of scientific tracks and, more broadly, about the peers with whom they will interact over the next five years of education - influence their STEM high school track choices. We find that greater exposure to high-performing male peers in math significantly widens the gender

gap in enrollment in STEM-oriented high school tracks. Taken together, these results provide evidence that same-gender interactions are a crucial driver of gender segregation in STEM and help explain the persistence of gender disparities in educational choices.

This paper contributes to two main strands of the literature. First, it advances our understanding of the determinants of gender-stereotypical educational choices. A long-standing debate asks whether gender gaps in field of study reflect innate differences in abilities and preferences (Baron-Cohen, 2005) or are shaped by cultural and social forces (Guiso et al., 2008; Nollenberger et al., 2016). The former emphasizes factors such as competitiveness (Buser et al., 2014; Almås et al., 2016), comparative advantage in reading versus math (Breda and Napp, 2019), confidence and aspirations (Kamas and Preston, 2012; Azmat et al., 2025), and interests (Bian et al., 2017). The latter highlights the role of norms, stereotypes, and early exposure to role models in shaping preferences and beliefs (Tungodden and Willen, 2023; Carlana, 2019; Lavy, 2008; Breda et al., 2020; Porter and Serra, 2020; Canaan and Mouganie, 2023). We contribute to this debate by focusing on peers -central actors in adolescents' lives- and by showing how expectations about the gender composition of future environments shape educational choices. We also introduce a novel measure of perceived comparative advantage across fields and document its strong predictive power for high school track choices.

Second, we contribute to the literature on peer effects and horizontal socialization in education (De Giorgi et al., 2010; Black et al., 2013; Hill, 2015; Born et al., 2022; Dobbie and Fryer, 2014; Carrell et al., 2018; Cohodes et al., 2022). Existing evidence shows that peer gender composition can have persistent effects on educational and labor market outcomes. For example, Brenøe and Zölitz (2020) find that greater exposure to female peers reduces womenâs likelihood of pursuing STEM and affects long-run earnings and fertility. Zolitz and Feld (2021) show that female students assigned to cohorts with more women are less likely to choose male-dominated majors, while Anelli and Peri (2019) find that male students exposed to predominantly male peers are more likely to select male-dominated fields, with limited effects for females. Overall, this literature suggests that peer composition shapes gendered choices, though the underlying mechanisms remain unclear.

We make two key contributions. First, while prior work focuses on individuals who have already sorted into educational tracks, we study decisions at the onset of puberty -during middle school- when peer influence is particularly salient and before trajectories are largely determined. Second, we move beyond reduced-form evidence and provide causal evidence on the mechanisms through which peers affect choices. We distinguish between (i) conformity to social norms, whereby students align their choices with peer expectations (Bernheim, 1994; Bursztyn and Jensen, 2015; Bursztyn et al., 2019), and (ii) preferences over peer interactions, including aversion to minority status in gender-imbalanced environments (Robnett and Leaper, 2013; Robnett, 2016; Shan, 2021; Booth et al., 2018). Our experimental design isolates these channels by varying the observability of choices and the expected gender composition of peers, allowing us to identify the mechanisms driving gendered educational trajectories.

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 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.[3] 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.

2.1.1 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).[4]

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.[5] Before answering the multiple-choice

[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]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.

[4]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).

[5]We selected questions from past national standardized tests (INVALSI) administered to middle school children in Italy.

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.[6] 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 sized 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.[7]
- *"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.[8]

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 end of the questionnaire, the last screen on each student's tablet prominently displayed their initial decision of the task – either MATH or LITERATURE – in capital letters.

2.1.2 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.[9]

- *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

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.

[6] 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.

[7] 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."

[8] 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."

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

task may reveal how strongly an individual associates two concepts. In our case, we are interested in the 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.[10] 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.

2.2 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.[11] Finally, we obtained information on students' high school track choices for the 2021 - 2022 academic year, after the end 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 merge them 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. Second, we use them to provide external validity for the findings from our lab-in-the-field experiment by examining how track choices

[10] 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.

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

are influenced by exposure to high-ability peers in math (girls and boys) during middle school. Girls' exposure to high ability male peers serves as proxy for beliefs about the future gender composition of peers in scientific high schools and, by extension, the gender with whom girls will primarily interact during the next five years of their education.

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 into scientific and humanistic tracks.[12] 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.

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%). In Panel (C) we report descriptive statistics using administrative data. Girls have higher teacher-assigned grades than boys, and the gap is larger for humanistic subjects compared to scientific subjects. This is consistent with the evidence from (Breda and Napp, 2019), suggesting that girls have a comparative advantage in reading that may explain part of the gender gap in the chosen field of study. Despite the fact that girls have higher teacher assigned grades in both math, boys have a higher probability of choosing STEM oriented high school tracks (scientific or technological) (24.3% versus 22.3%). Standardized grade show again that girls significantly outperform boys in literature while boys perform better on standardized math tests.

[12] In our analysis, we define the scientific track as including scientific high schools with traditional, applied science, or sport science tracks. We define the humanistic track as including classic, human sciences, linguistic, and artistic tracks.

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.

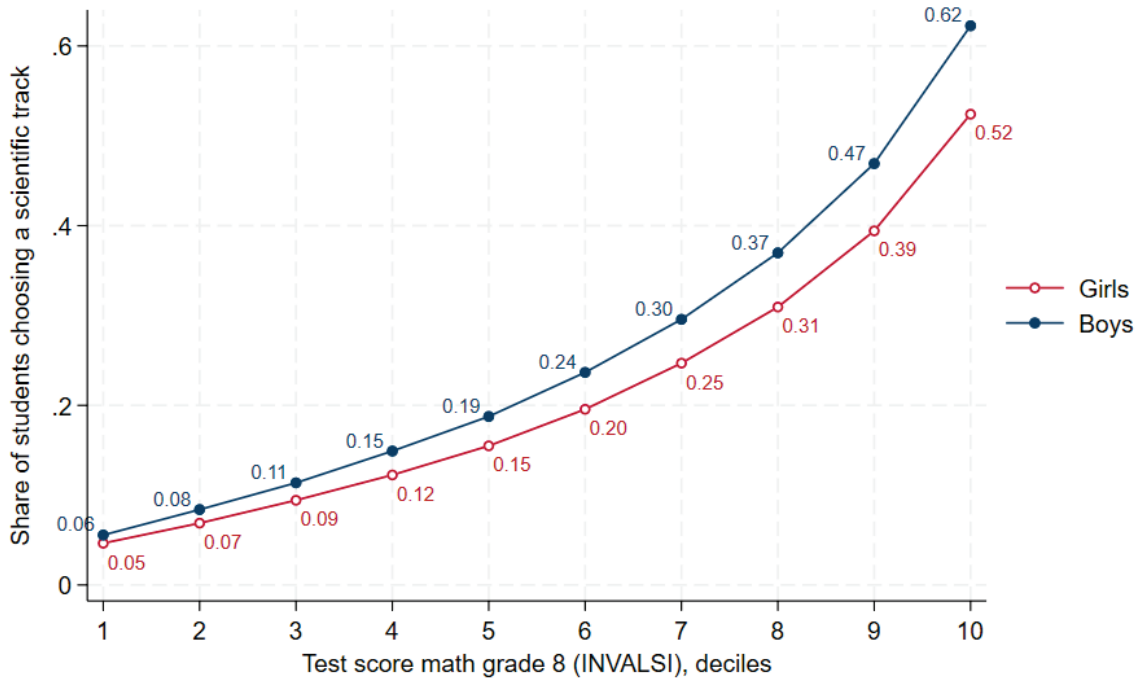
Table A.I in Appendix reports differences in summary statistics of the main variables of interest for the students in our sample, measured at baseline and separately by treatment arm (columns 1-3). Columns 4 and 6 show the p-values of the difference in means between Treatment 1 and the Control

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

3.1 Gender gap in 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).

In many countries around the world, women are systematically underrepresented in STEM fields, while men are underrepresented in humanistic fields (OECD, 2014; Delfino, 2024). Similarly, in Italian high schools, there are large gender gaps, with girls being more likely to enroll in humanistic tracks and boys more likely to enroll in STEM-oriented tracks. Appendix Figure A.III reports the gender composition

[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 different high school tracks in Italy, highlighting a higher concentration of males in more scientific tracks, particularly in the Scientific high school track and, even more so, in the Scientific track with an Applied Science focus.

Interestingly, this gender disparity persists even when accounting for students' academic ability, as measured by standardized test scores. Figure 1 shows the share of students enrolled in a scientific high school track by gender across deciles of grade 8 math test scores. Even among students in the top 10% of the math test score distribution, boys are about 10 percentage points more likely than girls to choose a scientific track, corresponding to nearly a 20% higher probability for boys relative to girls.

3.2 Gender gaps in experimental data and correlation with administrative outcomes

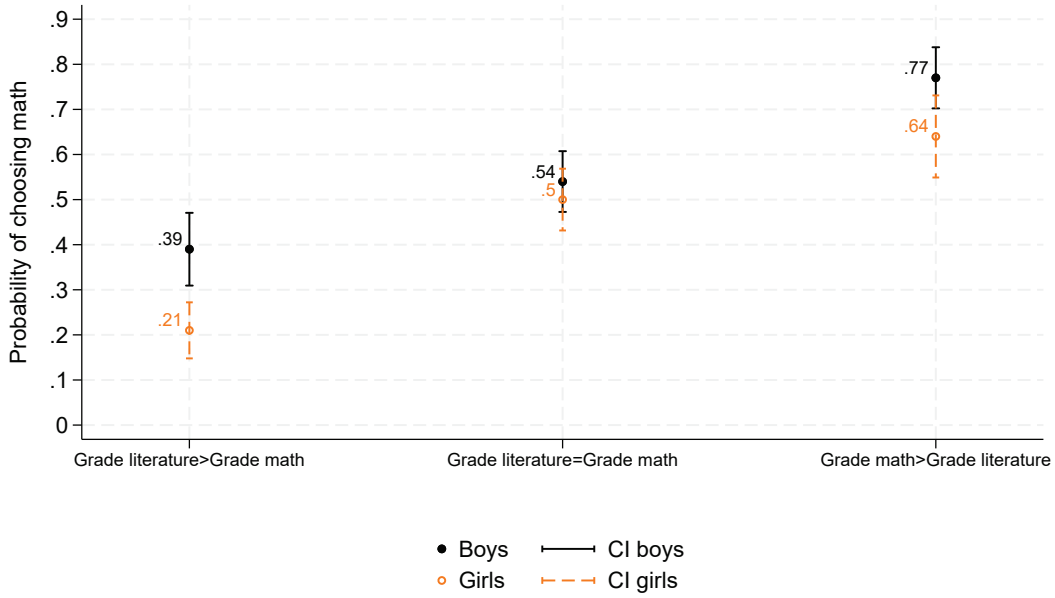
The gender gap in track choice documented in the previous section is mirrored in our experimental setting. First, as reported in Table I, we observe a substantial gender difference in the choice between the traditionally male-typed task (math) and the female-typed task (literature): on average, 63% of boys in our sample select math, compared to only 44% of girls. Second, we further show that the this gap remains also conditionally on students' ability. In Figure 2, we report the correlation between the probability of selecting the math task and students' relative ability in math and literature. Students with higher 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 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. However, Figure 2 also reveals a persistent gender gap: girls are systematically less likely to choose math, regardless of their relative grades in the two 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 probability 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, impose a cost for students of both genders who are talented in counter-stereotypical fields.

These results are confirmed by the regression analysis reported in Table II where we examine the relationship between task choice in the experiment and subsequent enrollment in a scientific high school track reported in the administrative data.[14] In column 1 of Table II we confirm that girls are less likely to choose math in our experiment. Furthmore, we find that boys who select a scientific track at high school are, ceteris paribus, 13.1 percentage points more likely to choose math in our experiment. Girls who *do not* choose a scientific high school are on average 19.4 percentage points *less* likely to select math in the experiment, but the gender gap is completely closed among girls choosing the scientific track (column 2). Overall, these results indicate that the main experimental outcome is a strong predictor of students' subsequent track choice.

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 records collected after students completed middle school.

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.

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.

In columns 5 and 6 of Table II, 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.

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, 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

[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.

Table II. Actual Outcomes in the Administrative and Survey Data

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var. = Student chose math					
Female	-0.189***	-0.194***	-0.166***	-0.176***	-0.183***	-0.193***
	(0.029)	(0.045)	(0.028)	(0.029)	(0.030)	(0.030)
Scientific High School		0.131**				
		(0.064)				
Scientific High School * Girl		0.275***				
		(0.083)				
Grade math - Grade lit			0.595***			
			(0.088)			
Grade math - Grade lit * Girl			-0.078			
			(0.138)			
INV. math - INV. ita				0.072***		
				(0.027)		
INV. math - INV. ita * Girl				-0.009		
				(0.037)		
Std IAT					0.038**	
					(0.018)	
Std IAT * Girl					-0.061**	
					(0.027)	
Std Explicit Gender Index						-0.022
						(0.018)
Std Explicit Gender Index * Girl						-0.010
						(0.028)
Constant	0.629***	0.553***	0.616***	0.621***	0.627***	0.631***
	(0.022)	(0.032)	(0.022)	(0.021)	(0.022)	(0.022)
Observations	1250	1250	1250	1250	1250	1250
R-squared	0.036	0.071	0.089	0.045	0.041	0.040
Mean X var – Boys		0.24	00.02	00.01	-0.14	0.14
Mean X var – Girls		0.22	-0.05	-0.19	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.

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 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

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

choosing math themselves.

Taken together, the descriptive evidence from administrative data and the experimental results point to a consistent pattern: gender gaps in scientific track choice emerge early and persist conditional on students' ability. Gender-stereotypical perceptions of comparative advantage generate a "cost" for girls by inducing them to choose literature even when their optimal choice is likely to be math, and for boys by inducing them to select math even when their optimal choice would be literature.

The experimental findings further show that these gaps are not fully explained by differences in ability, but instead reflect gender-stereotypical perceptions of comparative advantage and implicit biases that distort students' decisions. Overall, these results highlight the importance of social interactions and beliefs in the formation of educational trajectories and motivate our experimental design, which is specifically aimed at isolating the causal mechanisms through which peers and gender norms influence track choice.

4 Experimental Results

4.1 Empirical Strategy

To evaluate the mechanisms behind peer influence in task choices, we estimate the following OLS regression:

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

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 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 III 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 II we show that this choice is strongly correlated with actual high school track choice and performance using real-world data.

Table III. Treatment Effects

Outcome: Student chose math			
	(1)	(2)	(3)
Disclosure to Peers	0.047	0.051	0.058
	(0.046)	(0.047)	(0.047)
Disclosure + Interaction	0.056	0.061	0.062
	(0.047)	(0.047)	(0.045)
Girl	-0.126***	-0.130***	-0.117**
	(0.048)	(0.048)	(0.046)
Disclosure to Peers * Girl	-0.049	-0.050	-0.052
	(0.073)	(0.072)	(0.071)
Disclosure + Interaction * Girl	-0.135**	-0.135**	-0.134**
	(0.066)	(0.064)	(0.064)
Constant	0.594***	0.560***	0.401***
	(0.035)	(0.080)	(0.130)
Observations	1250	1250	1250
R-squared	0.040	0.049	0.078
Mean dep. var. control group	0.54	0.54	0.54
School FE	No	Yes	Yes
Controls	No	No	Yes
P-value(T1 + T1 x Girl)	0.978	0.979	0.909
P-value(T2 + T2 x Girl)	0.064	0.081	0.086

Notes: The dependent variable indicates whether the student chose math versus literature in our lab-in-the-field experiment. Columns 2–3 control for school fixed effects. Column 3 adds controls for the student: 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 mother's level of education, and parents' employment status 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.

We look at treatment effects on the probability to choose math in the task and at the interactions between treatments and a binary variable indicating students' gender. First, 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 and the coefficient is statistically significant at 5% level. This result shows that girls shy away from male-dominated fields when they have to interact with peers who choose the same field. In contrast, the coefficient on the interaction between "Girl" and "Disclosure to Peers" remains statistically insignificant, showing that 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.

Finally, in columns 2 and 3 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 as well as baseline grades in math and literature. The inclusion of these controls confirms that the findings remain both statistically and economically significant.

4.3 Mechanisms: Peer Interaction Discourages Girls from Math

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 partly driven by a desire to avoid such interactions, the effect of the âDisclosure to Peers and Interactionâ treatment should be stronger among girls who expect a higher proportion of boys in their class to choose math. This hypothesis can be directly tested using the detailed data we collected on students' expectations regarding the subject choices of their male and female classmates.

Figure 3 visually illustrates this key finding. The effects of the treatment are shown separately for boys (Panel A) and girls (Panel B), based on whether they believe that more male peers than female peers in their class will choose the math task (right panel) or not (left panel). Focusing on Panel B, we show that 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 26.8% - when they are required to interact with classmates making the same choice (Figure 3, bottom right). By contrast, for girls who perceive at least equal representation of boys and girls in math, choices remain unaffected relative to the corresponding control group (Figure 3, bottom left).

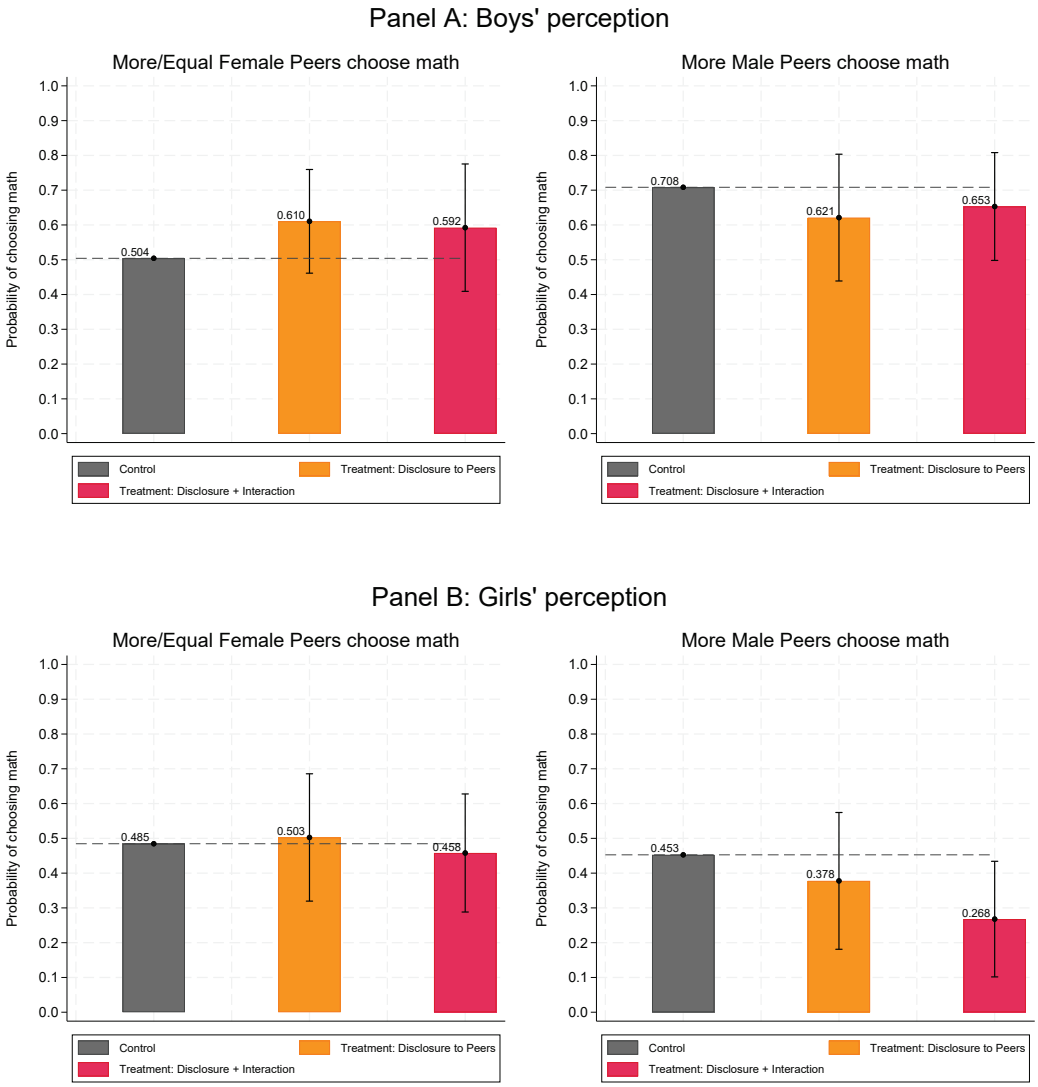
This result may reflect different aspects. Girls might anticipate a more competitive environment in male-dominated fields, as suggested by previous research (Niederle and Vesterlund, 2010). They may also be deterred by the prospect of being a minority among peers selecting the same subject (Shan (2021)). 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, neither Treatment 1 ("Disclosure to Peers") nor Treatment 2 ("Disclosure to Peers and Interaction") has a statistically significant effect, regardless of whether they believe that most classmates selecting math are male or female (Figure 3, top panel). Appendix Table A.III reports the corresponding regression coefficients, including adjustments for multiple hypothesis testing using Westfall-Young step-down adjusted p-values.

An important question is whether studentsâ beliefs about their classmatesâ choices -central to the "Disclosure to Peers and Interaction" treatment- align with actual choices. In our survey, we elicited

[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; we therefore 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.

studentsâ expectations about their classmatesâ task selection. 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; and the remaining 37% of girls and 36% of boys believed that boys would be in the minority among those choosing math. Appendix 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 students' beliefs are predictive of actual peer choices. This association does not differ by 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 task versus the literature task.

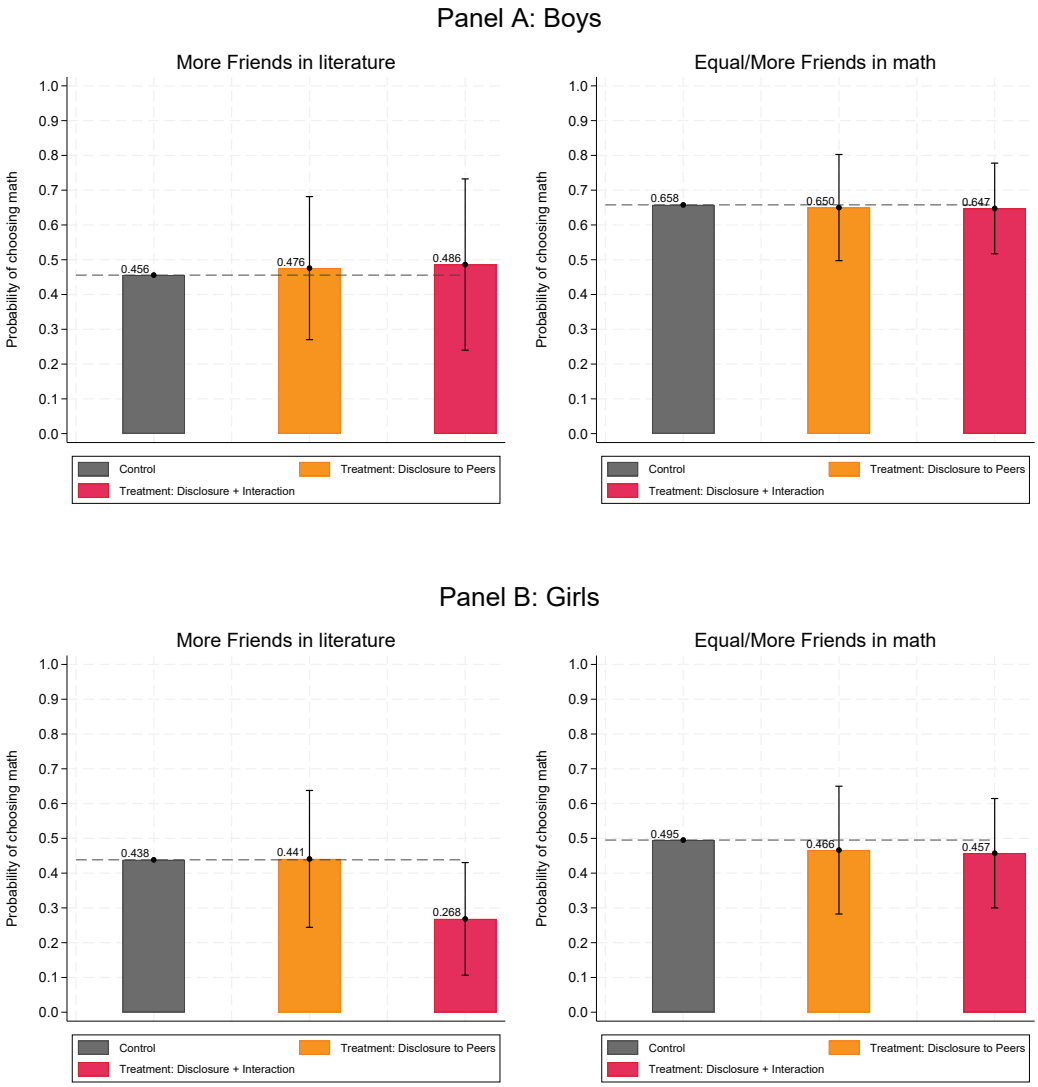
4.3.2 Desire to Interact with Friends

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 hypothesis, 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 who selected literature were significantly more influenced by Treatment 2, substantially decreasing their likelihood of choosing math (Panel B, bottom left). No statistically significant effects were observed for other groups. Appendix Table A.IV reports the corresponding 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 Further Evidence for the Same-Gender Interaction Mechanism using Administrative Data

Our experimental results show that girls are less likely to choose math when they *expect* a higher share of male peers to do so. We now test whether this mechanism extends beyond the experimental setting using administrative data covering the universe of Italian students completing middle school between 2016 and 2021.

Administrative data do not directly capture students' beliefs about the gender composition of STEM high school tracks. However, such beliefs are likely shaped by observed relative performance in math

and literature during earlier schooling. In particular, students may infer that if boys disproportionately outperform girls in math within their cohort, they will also be overrepresented in STEM tracks in high school. To capture this channel, we construct a measure of exposure to male peers defined as the share of boys among the top performing 50% of students in math, based on standardized INVALSI test scores from Grade 5 of primary school. Because these scores are measured prior to middle school class assignment, this measure alleviates concerns about endogenous peer sorting.

We first validate our proxy in the administrative data by linking it to students' stated beliefs in the experiment. Specifically, we correlate the share of top-achieving boys in math with a survey-based measure capturing whether students believe that boys are more likely to choose math. As shown in Table IV, higher exposure to high-achieving boys is strongly and significantly associated with the belief that more boys will select math in the experiment (Panel A, column 1). This relationship holds for both girls and boys (Panel A, columns 2-3) and remains robust after controlling for individual math ability. Panel B further shows that these beliefs are significantly correlated with a binary indicator identifying classes in which boys constitute the majority of top math performers. These results suggest that exposure to high-achieving male peers shapes students' expectations about the future gender composition of scientific tracks, which may, in turn, influence girls' educational choices and lead them to opt out of STEM pathways.

Table IV. 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.

We then examine whether this proxy predicts actual high school track choices. We test whether greater

exposure to boys among top math achievers affects the likelihood of enrolling in a scientific track. High achievers are defined as students in the top 50% of grade-5 math scores, measured prior to middle school class assignment. Our specification includes school and cohort fixed effects and exploits within-school, within-cohort variation across classes, following Hoxby (2000) and Ammermueller and Pischke (2009). Identification therefore relies on quasi-random variation in class composition within schools and cohorts.

Results in Table V show that greater exposure to high-achieving boys significantly reduces girls' probability of enrolling in a scientific track (columns 1-3), while slightly increasing boys' likelihood (columns 4-6). These effects are robust to alternative specifications and persist after controlling for school and cohort fixed effects. Consequently, exposure to male peers among top math performers substantially widens the gender gap in STEM enrollment.

Overall, these findings mirror our experimental results and support the interpretation that anticipated interactions with male peers -rather than ability differences - may play a central role in shaping gendered educational trajectories.

Table V. 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. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6 Conclusions and Policy Implications

Gender segregation in education -where men are underrepresented in humanities and women in STEM- remains a major challenge in many countries. A key but still underexplored driver of this imbalance is the role of peers in shaping students' educational choices. Since peers influence how students perceive their fit and belonging in different fields, they can contribute to decisions that do not fully reflect individual abilities, ultimately generating talent mismatches and reducing overall productivity. These dynamics are particularly salient in systems where students are tracked early, as choices made during adolescence have long-lasting effects on educational and career trajectories.

In this paper, we design a novel lab-in-the-field experiment among middle school students to examine the mechanisms through which peers influence their choices between scientific and humanistic fields, proxied by the selection of tasks in math or literature. We focus on understanding two main mechanisms: *social image concerns* and *aversion to interacting with peers of the opposite gender*. Our results show that making students' choices visible to peers does not significantly alter behavior. However, girls are less likely to choose math when they know they will collaborate with peers who also choose that 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 effect is stronger for girls with more friends who choose literature. These results highlight the role of peer interactions in shaping academic choices and how they can contribute to suboptimal alignment between students' talents and educational paths.

We also document that experimental choices are predictive of actual high school track enrollment and strongly correlate with academic ability, as measured in administrative records. Students who select a scientific track in high school and have higher standardized math grades are more likely to choose math in the experiment, confirming that our experimental task captures meaningful real-world behavior.

Finally, we exploit administrative data covering the universe of Italian middle school students to corroborate the role of expectations about the gender composition of STEM high schools in shaping girls' educational choices. We show that girls are less likely to enroll in STEM-oriented high school tracks when they expect a higher proportion of male peers to choose math. In the administrative data, these expectations are proxied by exposure to a higher share of high-achieving boys in mathematics during middle school.

These findings have clear policy implications. Interventions that focus solely on boosting girls' math ability or confidence may be insufficient to close gender gaps in STEM. Policies should also target the peer environment. Programs that promote gender balance within STEM tracks, or that create opportunities for girls to engage in STEM alongside female peers, could reduce the perceived cost of being in the minority. In systems with early tracking, separating students into different buildings or classes based on field choice may further discourage girls from entering male-dominated tracks. Rethinking track design -through shared classes, co-located tracks, or cross-track extracurricular activities- may mitigate these barriers. While further evidence is needed, policies in these directions have the potential to reduce gender gaps in field-of-study choices.

References

Almås, I., Cappelen, A. W., Salvanes, K. G., Sørensen, E. Ø., and Tungodden, B. (2016). Willingness to compete: Family matters. *Management Science*, 62(8):2149–2162.

Altonji, J. G., Blom, E., and Meghir, C. (2012). Heterogeneity in Human Capital Investments: High School Curriculum, College Major, and Careers. *Annual Review of Economics*, 4(1):185–223.

Ammermueller, A. and Pischke, J.-S. (2009). Peer effects in European primary schools: Evidence from the progress in international reading literacy study. *Journal of Labor Economics*, 27(3):315–348.

Anelli, M. and Peri, G. (2019). The effects of high school peers' gender on college major, college performance and income. *The Economic Journal*, 129(618):553–602.

Azmat, G., Cuñat, V., and Henry, E. (2025). Gender promotion gaps and career aspirations. *Management Science*, 71(3):2127–2141.

Baron-Cohen, S. (2005). The essential difference: The male and female brain. In *Phi Kappa Phi Forum*, volume 85, pages 23–26.

Bernheim, B. D. (1994). A theory of conformity. *Journal of Political Economy*, 102(5):841–877.

Bian, L., Leslie, S.-J., and Cimpian, A. (2017). Gender stereotypes about intellectual ability emerge early and influence children's interests. *Science*, 355(6323):389–391.

Black, S. E., Devereux, P. J., and Salvanes, K. G. (2013). Under pressure? The effect of peers on outcomes of young adults. *Journal of Labor Economics*, 31(1):119–153.

Blanton, H., Jaccard, J., Klick, J., Mellers, B., Mitchell, G., and Tetlock, P. E. (2009). Strong claims and weak evidence: Reassessing the predictive validity of the IAT. *Journal of applied Psychology*, 94(3):567.

Blau, F. D. and Kahn, L. M. (2017). The gender wage gap: Extent, trends, and explanations. *Journal of Economic Literature*, 55(3):789–865.

Booth, A. L., Cardona-Sosa, L., and Nolen, P. (2018). Do single-sex classes affect academic achievement? an experiment in a coeducational university. *Journal of Public Economics*, 168:109–126.

Born, A., Ranehill, E., and Sandberg, A. (2022). Gender and willingness to lead: Does the gender composition of teams matter? *Review of Economics and Statistics*, 104(2):259–275.

Breda, T., Jouini, E., Napp, C., and Thebault, G. (2020). Gender stereotypes can explain the gender-equality paradox. *Proceedings of the National Academy of Sciences*, 117(49):31063–31069.

Breda, T. and Napp, C. (2019). Girls' comparative advantage in reading can largely explain the gender gap in math-related fields. *Proceedings of the National Academy of Sciences*, 116(31):15435–15440.

Brenøe, A. A. and Zölitz, U. (2020). Exposure to more female peers widens the gender gap in stem participation. *Journal of Labor Economics*, 38(4):1009–1054.

Bursztyn, L., Egorov, G., and Jensen, R. (2019). Cool to be smart or smart to be cool? Understanding peer pressure in education. *The Review of Economic Studies*, 86(4):1487–1526.

Bursztyn, L., Fujiwara, T., and Pallais, A. (2017). 'Acting wife': Marriage Market Incentives and Labor Market Investments. *American Economic Review*, 107(11):3288–3319.

Bursztyn, L. and Jensen, R. (2015). How does peer pressure affect educational investments? *The quarterly journal of economics*, 130(3):1329–1367.

Buser, T., Niederle, M., and Oosterbeek, H. (2014). Gender, competitiveness, and career choices. *The Quarterly Journal of Economics*, 129(3):1409–1447.

Buser, T., Peter, N., and Wolter, S. C. (2017). Gender, competitiveness, and study choices in high school: Evidence from Switzerland. *American economic review*, 107(5):125–30.

Campa, P., Casarico, A., and Profeta, P. (2011). Gender culture and gender gap in employment. *CESifo Economic Studies*, 57(1):156–182.

Canaan, S. and Mouganie, P. (2023). The impact of advisor gender on female students' STEM enrollment and persistence. *Journal of Human Resources*, 58(2):593–632.

Carlana, M. (2019). Implicit stereotypes: Evidence from teachers' gender bias. *The Quarterly Journal of Economics*, 134(3):1163–1224.

Carlana, M. and Corno, L. (2024). Thinking about parents: Gender and field of study. *AEA Papers and Proceedings*, 114:254–58.

Carrell, S. E., Hoekstra, M., and Kuka, E. (2018). The long-run effects of disruptive peers. *American Economic Review*, 108(11):3377–3415.

Cohodes, S. R., Ho, H., and Robles, S. C. (2022). Stem summer programs for underrepresented youth increase stem degrees. *National Bureau of Economic Research*, (No. w30227).

Corno, L., La Ferrara, E., and Burns, J. (2022). Interaction, stereotypes and performance: Evidence from South Africa. *American Economic Review*, 112(12):3848–3875.

De Gioannis, E., Bianchi, F., and Squazzoni, F. (2023). Gender bias in the classroom: A network study on self and peer ability attribution. *Social Networks*, 72:44–51.

De Giorgi, G., Pellizzari, M., and Redaelli, S. (2010). Identification of social interactions through partially overlapping peer groups. *American economic journal. Applied economics*, 2(2):241–275.

Delfino, A. (2024). Breaking gender barriers: Experimental evidence on men in pink-collar jobs. *American Economic Review*, 114(6):1816–1853.

Dobbie, W. and Fryer, R. G. (2014). The impact of attending a school with high-achieving peers: Evidence from the New York City exam schools. *American Economic Journal: Applied Economics*, 6(3):58–75.

Dobbie, W. and Fryer, R. G. (2015). The medium-term impacts of high-achieving charter schools. *Journal of Political Economy*, 123(5):985–1037.

Greenwald, A. G. and Banaji, M. R. (1995). Implicit social cognition: attitudes, self-esteem, and stereotypes. *Psychological review*, 102(1):4.

Greenwald, A. G., McGhee, D. E., and Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: the implicit association test. *Journal of personality and social psychology*, 74(6):1464.

Greenwald, A. G., Nosek, B. A., and Banaji, M. R. (2003). Understanding and using the implicit association test: I. An improved scoring algorithm. *Journal of personality and social psychology*, 85(2):197.

Guiso, L., Monte, F., Sapienza, P., and Zingales, L. (2008). Culture, gender, and math. *Science*, 320(5880):1164–1165.

Hill, A. J. (2015). The girl next door: The effect of opposite gender friends on high school achievement. *American Economic Journal: Applied Economics*, 7(3):147–77.

Hoxby, C. (2000). Peer effects in the classroom: Learning from gender and race variation. Working Paper 7867, National Bureau of Economic Research.

Imbens, G. W. and Wooldridge, J. M. (2009). Recent developments in the econometrics of program evaluation. *Journal of economic literature*, 47(1):5–86.

Joensen, J. S. and Nielsen, H. S. (2021). Gender convergence in education choice: The role of institutions and peers. *Available at SSRN 3246074*.

Kamas, L. and Preston, A. (2012). The importance of being confident; gender, career choice, and willingness to compete. *Journal of Economic Behavior & Organization*, 83(1):82–97.

Kiefer, A. K. and Sekaquaptewa, D. (2007). Implicit stereotypes, gender identification, and math-related outcomes: A prospective study of female college students. *Psychological Science*, 18(1):13–18.

Kirkeboen, L. J., Leuven, E., and Mogstad, M. (2016). Field of Study, Earnings, and Self-Selection. *The Quarterly Journal of Economics*, 131(3):1057–1111.

Lavy, V. (2008). Do gender stereotypes reduce girls' or boys' human capital outcomes? Evidence from a natural experiment. *Journal of public Economics*, 92(10-11):2083–2105.

Makarova, E., Aeschlimann, B., and Herzog, W. (2019). The gender gap in STEM fields: The impact of the gender stereotype of math and science on secondary students' career aspirations. In *Frontiers in Education*, volume 4, page 60. Frontiers Media SA.

Manski, C. F. (1993). Identification of endogenous social effects: The reflection problem. *The review of economic studies*, 60(3):531–542.

Niederle, M. and Vesterlund, L. (2010). Explaining the gender gap in math test scores: The role of competition. *Journal of economic perspectives*, 24(2):129–144.

Nollenberger, N., Rodríguez-Planas, N., and Sevilla, A. (2016). The math gender gap: The role of culture. *American Economic Review*, 106(5):257–61.

OECD (2014). Are boys and girls equally prepared for life?

Olson, M. A. and Fazio, R. H. (2004). Reducing the influence of extrapersonal associations on the Implicit Association Test: personalizing the IAT. *Journal of personality and social psychology*, 86(5):653.

Oswald, F. L., Mitchell, G., Blanton, H., Jaccard, J., and Tetlock, P. E. (2013). Predicting ethnic and racial discrimination: a meta-analysis of IAT criterion studies. *Journal of personality and social psychology*, 105(2):171.

Porter, C. and Serra, D. (2020). Gender differences in the choice of major: The importance of female role models. *American Economic Journal: Applied Economics*, 12(3):226–254.

Robnett, R. D. (2016). Gender Bias in STEM Fields: Variation in Prevalence and Links to STEM Self-Concept. *Psychology of women quarterly*, 40(1):65–79.

Robnett, R. D. and Leaper, C. (2013). Friendship groups, personal motivation, and gender in relation to high school students' STEM career interest. *Journal of Research on Adolescence*, 23(4):652–664.

Shan, X. (2021). Does minority status drive women out of male-dominated fields? *Unpublished manuscript*.

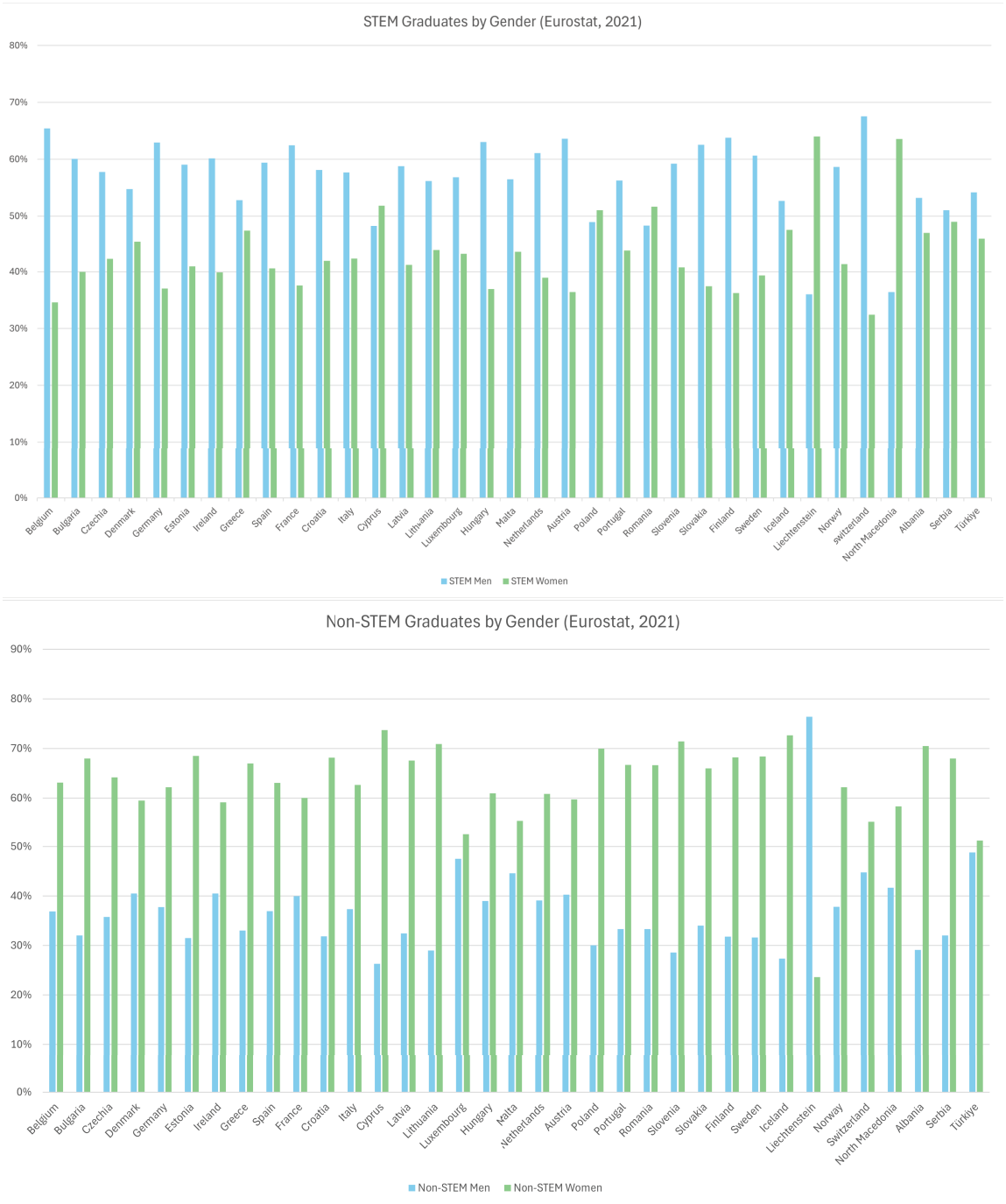
Stehlé, J., Charbonnier, F., Picard, T., Cattuto, C., and Barrat, A. (2013). Gender homophily from spatial behavior in a primary school: A sociometric study. *Social Networks*, 35(4):604–613.

Tungodden, J. and Willen, A. (2023). When parents decide: Gender differences in competitiveness. *Journal of Political Economy*, 131(3):751–801.

Zolitz, U. and Feld, J. (2021). The effect of peer gender on major choice in business school. *Management Science*, 67(11):6963–6979.

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

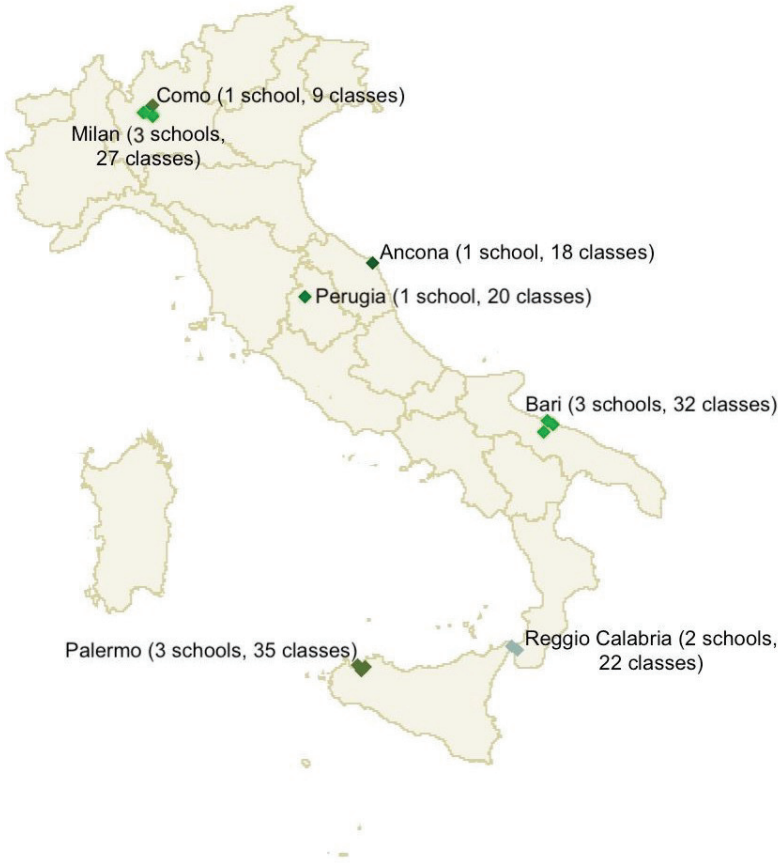
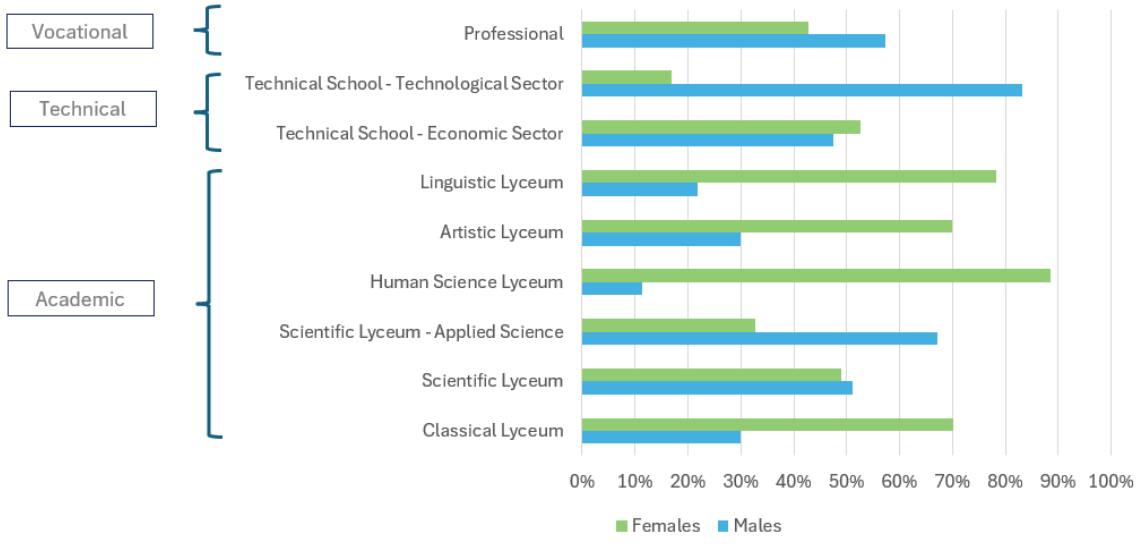


Figure A.III. Gender Composition of High School Tracks in Italy



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							
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)				
Std grade (INVALSI): italian	50.867	46.693	48.873	0.048	-0.097	0.347	-0.049
	(29.172)	(31.392)	(28.717)				
Std grade (INVALSI): math	47.797	44.190	44.614	0.082	-0.088	0.122	-0.080
	(28.707)	(29.174)	(27.375)				
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 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**		**Logic**	**South**	**Work**	**Share Math**	
	Math	**Literature**	**Task**		**Mother**	**Friends**	**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: *** $p< 0.01$, ** $p< 0.05$, * $p< 0.1$.

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

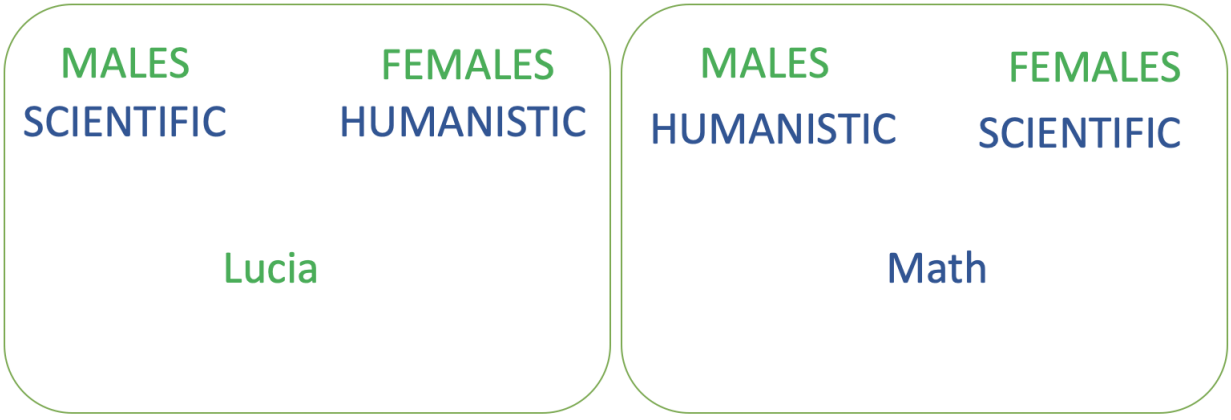
Blocks	Left Categories	Right Categories
1	Maschio (male)	Femmina (female)
2	Scientifico (scientific)	Umanistico (humanistic)
3	Maschio (male) and scientifico (scientific)	Femmina (female) and umanistico (humanistic)
4	Maschio (male) and scientifico (scientific)	Femmina (female) and umanistico (humanistic)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