Gender Composition and University Climate *

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Abstract

The university climate is an essential factor for students' outcomes and future trajectories. Traditional masculinity traits can create barriers to success especially for women in male-dominated fields. This paper leverages the random allocation of students into classes within the same course at an élite university to examine how the gender composition of peers affects students' gender attitudes, beliefs, anxiety, academic performance, and confidence. Our findings reveal that greater exposure to female peers reduces classroom conformity to masculinity norms and anxiety while improving confidence and exam performance.

Keywords: gender, university, peers, education, stem, mental health, well being, masculinity norms
JEL Codes: D91, I21, I24, J16

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1 Introduction

The university climate is an essential factor for students' outcomes and the university's success. Students spend considerable time with their peers during their university years. The environment they experience can significantly shape their personality, ambition, future achievements and overall well-being (Sacerdote, 2011; Brenøe and Zölitz, 2020; Shan and Zölitz, 2022). A supportive and inclusive university climate fosters personal growth, academic performance, and talent attraction (Martinez, Beaulieu, Gibbons, Pronovost, and Wang, 2015; Alan, Corekcioglu, and Sutter, 2023). Conversely, high-pressure environments may hinder some students' ability to flourish (Chen and Hu, 2024). Gender norms and traditional notions of masculinity can exacerbate these challenges, particularly for women in male-dominated fields (Dhar, Jain, and Jayachandran, 2022; De Haas, Baranov, Matavelli, and Grosjean, 2025). However, increased female representation in classrooms may challenge these norms, promoting a more inclusive climate that benefits all students.

This paper investigates the factors shaping the university climate, namely students' perceptions, behaviors, and academic performance. Specifically, we identify the causal impact of class gender composition on key climate characteristics, such as masculinity norms, anxiety, and confidence, and investigate how these factors influence students' academic outcomes. Exploiting the random allocation of students into classes within the same course at a single Italian university, we find that greater exposure to female peers reduces classroom adherence to masculinity norms, lowers anxiety, and improves confidence and exam performance. These findings underscore the role of gender diversity in fostering a more supportive and equitable learning environment, which, in turn, enhances academic performance.

While influential research has highlighted the importance of workplace climate for firm success (Alan, Corekcioglu, and Sutter, 2023), comparatively little is known about the university climate and its implications for student outcomes. A major trait that has been recently investigated is the masculinity normss — social expectations about appropriate male behavior, such as self-reliance, risk-taking, and dominance. These norms are increasingly recognized as influential factors shaping behavior, interactions, and outcomes (Baranov, De Haas, and Grosjean, 2023; De Haas, Baranov, Matavelli, and Grosjean, 2025). These dynamics are likely to emerge in universities, particularly in competitive fields like economics and finance, where traditional gender roles may influence interactions and outcomes. Given universities' pivotal role in shaping students' development and future trajectories, understanding the university climate is at least as critical as understanding workplace climate.

This paper combines administrative data with firsthand survey data[1] from students at an Italian university to measure the university climate and student norms, and to examine how the gender composition of university classes affects these dimensions, as well as students' academic performance.

[1]The questionnaire was approved by the university's ethical committee before being distributed.

Our analysis reveals that male students tend to align more closely with traditional masculinity norms, exhibiting higher levels of mainstream thinking, ambition, and risk propensity compared to their female classmates. Importantly, a more balanced gender composition within classes plays a pivotal role in shaping the university climate and student outcomes. Classes with a randomly higher proportion of female students show lower adherence to masculinity norms, reduced anxiety levels, enhanced confidence, and improved performance in quantitative subjects. These positive changes in the university climate benefit all students, regardless of gender, highlighting that greater gender diversity fosters a more supportive and effective learning environment.

The study relies on survey responses from approximately 2,500 first-, second-, and third-year students enrolled in bachelor programs at the same university in 2023. The questionnaire was designed to explore students' perceptions of the university environment. It covers a wide range of topics, including the factors influencing their choice of program, their initial expectations about their field of study versus their actual experiences, self-perceived abilities, adherence to masculinity norms, levels of anxiety, and overall university experiences. To measure adherence to masculinity norms, we use a set of questions selected from the Conformity to Masculine Norms Inventory (CMNI), a validated psychometric tool widely used in social and economic research (Mahalik, Burns, and Syzdek, 2007; De Haas, Baranov, Matavelli, and Grosjean, 2025). These questions focus on the dimensions of Winning, Primacy of Work, Risk-Taking, and Disdain for Diversity, which are particularly relevant in the context of the university's academic and social environment. By examining these dimensions, the survey aims to capture the ways in which adherence to traditional masculinity norms influences competitive behavior, career aspirations, and attitudes toward inclusivity. This approach allows for a deeper understanding of how these norms shape students' perceptions of the university environment and their broader academic and social experiences.

To causally identify the impact of gender composition on students' cognitive and non-cognitive outcomes, we exploit a unique feature of the University, namely the random allocation of students into classes. Within each academic program, lectures are delivered to students organized into smaller classes. Importantly, students in the same program are randomly reassigned to different classes each year of the three-year bachelor program.

This study makes several contributions to the literature on gender diversity and educational outcomes. First, this study is among the first to evaluate the causal relationship between gender imbalances and peer climate in a university setting. Previous research has underscored the importance of peer interactions during formative years (Sacerdote, 2011; Brenøe and Zölitz, 2020). For example, Lavy, Paserman, and Schlosser (2012) and Zimmerman (2003) demonstrate that peer composition significantly impacts student achievement, with gender diversity emerging as a critical factor in fostering collaborative learning environments (Nielsen, Bloch, and Schiebinger, 2018; Bostwick and Weinberg, 2022) and shaping long-term outcomes (Black, Devereux, and Salvanes, 2013). Beyond academic performance, studies such as Gong, Lu, and Song (2021) highlight the so-

cial and behavioral benefits of gender diversity, showing that balanced gender compositions enhance students' non-cognitive skills, including motivation and self-confidence. However, the influence of gender composition on classroom climate and students' adherence to social norms remains underexplored. By leveraging a randomized setting, this study provides robust causal evidence on the role of gender diversity in shaping university environments, particularly in influencing classroom climate and adherence to masculinity norms.

Secondly, this study contributes to the growing literature on the broader implications of gender diversity by examining its effects educational settings. While prior studies in workplace contexts suggest that greater gender diversity fosters collaboration, reduces conflict, and enhances group decision-making (Martinez, Beaulieu, Gibbons, Pronovost, and Wang, 2015; Alan, Corekcioglu, and Sutter, 2023), evidence on these dynamics within classrooms remains limited. This paper builds on emerging findings that female representation in classrooms promotes a more inclusive climate and extends this analysis by examining its impact on cognitive and non-cognitive outcomes, such as reduced anxiety and improved performance in quantitative subjects. The results underscore the role of female peers in breaking down traditional masculinity norms, benefiting all students regardless of gender.

2 The Institutional Context

We run our study in an Italian university located in the north of Italy, recognized as the top university in Italy for its disciplines. The university offers bachelor's and master's programs in a variety of fields, including economics, finance, law, business administration, management, political science, public administration, information science, data science, and computer science. For this study, we rely on a sample of bachelor's students enrolled in the first, second, or third year of programs in economics, management, and finance. Students from the data science program were excluded due to their low numerosity.[2] The university admits students based on the results of an entry test taken during their final year of high school. Applicants must indicate their preferred program, which they may enroll in if their test scores meet the eligibility criteria. The number of students admitted varies by program. On average, the primary programs—management, finance, and economics—collectively enroll approximately 7,000 students each year.

Within each program, lectures are delivered in smaller classes. Students are randomly assigned to different classes within the same program each year. While the course content remains consistent across classes, the professors vary between them. Bachelor's students are required to complete a total of 30 courses, evenly distributed across three years: 10 in the first year, 10 in the second, and 10 in the third. Each course has its own assessment structure, which may consist of a single final exam

[2]The data science program has only one class per year, which prevents analysis of the role of class composition within the program.

or include intermediate exams. Group presentations or projects can also contribute to the overall evaluation. Grades are awarded on a scale ranging from 18 to 30, with "*cum laude*" being equivalent to a score of 32.

3 Data

To examine the impact of peers' gender on students' beliefs and academic outcomes, we integrate administrative data with survey responses.

3.1 Survey data

To measure university climate, student beliefs, and attitudes, we designed and administered a survey. A pilot survey was conducted in April 2023, targeting third-year students, and was later expanded in October/November 2023 to include all undergraduate students. The survey was administered through Qualtrics and made accessible via each student's online personal account for one month following its launch. To maximize the response rate, the research team visited classrooms during lecture time in the first two weeks, enabling students to complete the survey on-site.

The main sample consists of students who participated in either the pilot or the final survey. Each student could only respond once, as access to the final survey was restricted for those who had already participated in the pilot. Students who completed the pilot (third-year students in April 2023) had graduated by the time the main survey was launched, ensuring no overlap between the two groups.

The overall response rate was approximately 35%. During classroom visits, no additional information about the survey content was provided beyond what was included in the survey introduction. Students were instructed to complete the questionnaire individually and avoid discussing it with peers. Descriptive statistics for respondents and non-respondents are presented in Online Table A1. Respondents differ systematically from non-respondents; they are more likely to be male, Italian, from Northern Italy, and high-achieving. While these differences suggest that the results may not be fully generalizable to the broader student population, they do not compromise the validity of our identification strategy. This is because the gender composition of the classroom, which is central to the analysis, is derived from administrative data that includes all students.

In the first part of the survey, students were introduced to its purpose, which was to capture their perceptions of the university environment with a focus on inclusion and well-being. They were informed that completing the survey would take approximately seven minutes and were asked to acknowledge having read the provided information. Participation was emphasized as entirely voluntary, and students were assured that their responses would be anonymized before being made available to researchers.

The questionnaire covered several key areas, including demographic characteristics, reasons for university choice, self-perceived abilities, personal beliefs and perceptions of peers, evaluations of the university environment, and feedback on the survey itself. To ensure data quality, straightforward quantitative questions were incorporated to identify inattentive or unserious responses. Key statistics from these dimensions are summarized in the descriptive evidence section.

3.2 Administrative data

We link the survey data to administrative records for the entire student population at the university. Because the survey was accessed through students' online accounts, responses were securely matched to their administrative data while ensuring rigorous anonymity throughout the process. After the survey closed, the university's data office linked the survey responses to each student's administrative records and anonymized the data before providing the dataset to researchers for analysis.

The administrative data include comprehensive demographic information, such as gender, province of birth, and academic background. Academic records detail the type of high school diploma obtained (e.g., *maturità classica*, *scientifica*, or vocational education) and the final standardized national high school grade. Additionally, the data encompass each student's university program, the class to which they were randomly assigned each year, and their exam records. For each exam, we observe whether it was mandatory or elective, its pass/fail status, and the grade received. Information on the professors teaching these courses is also included.

4 Outcomes of interest

4.1 Conformity to Masculinity

The survey measures two behavioral norms: conformity to masculinity and perceptions of peers' conformity to masculinity. These norms capture key dimensions of the social and emotional environment that students experience, particularly in settings influenced by traditional masculinity norms.

To assess conformity to masculinity norms, we selected items from the Conformity to Masculine Norms Inventory (CMNI), a validated psychometric tool developed by Mahalik, Burns, and Syzdek (2007) to measure adherence to traditional masculine norms. The CMNI covers various dimensions, including Winning, Emotional Control, Risk-Taking, Violence, Power Over Women, Playboy, Self-Reliance, Primacy of Work, Perceptions of Disadvantage, and Pursuit of Status. Given the context of our respondents—university students from a highly affluent and elite institution—we focused on dimensions most relevant to this environment: Winning, Primacy of Work, Risk-Taking, and Disdain for Diversity.[3]

[3]The CMNI-22 is widely used in empirical research to examine the impact of gender norms on economic and social outcomes, such as labor market behaviors and mental health (Wong, Ho, Wang, and Miller, 2017; Milner,

These dimensions are theoretically grounded in the understanding that cultural masculinity norms encourage environments where risk-taking, competition, and dominance are celebrated. Such environments often lead to heightened stress and anxiety among individuals (Grosjean and Khattar, 2019; Baranov, De Haas, and Grosjean, 2023). By focusing on these dimensions, we aim to empirically evaluate how masculinity norms influence students' social experiences and academic outcomes.

We surveyed students to assess their conformity to masculinity norms and their perceptions of peers' conformity to these norms. Specifically, students were asked to respond to the following questions: "*Do you/your peers think performances in first exams are an important predictor of future success?*"; "*Do you/your peers appreciate risky situations?*"; ''*Do you/your peers think minorities are still disadvantaged in some opportunities?*"; "*Do you/your peers do things in order to be an important person?*".

Responses to these questions were recorded on a 5-point Likert scale ranging from 1 ("*Definitely not*") to 5 ("*Definitely yes*"), with intermediate options of 2 ("*Probably not*"), 3 ("*Might or might not*"), and 4 ("*Probably yes*"). Each response was rescaled such that higher values indicate stronger agreement with statements reflecting toxic attitudes, capturing dimensions of risk-taking, competition, and social dominance.

Using these responses, we constructed two indexes: *Conformity to Masculinity* and *Perceptions of Peers' Conformity to Masculinity*. Each index represents the average of students' responses to the relevant questions.

4.2 Student Anxiety

To capture student anxiety, we include the question: "How much do you think your mental health, such as your level of worry and anxiety, affects your academic performance?" Responses range from 1 ("*Not at all*") to 5 ("*A great deal*"), allowing us to capture students' self-reported perceptions of anxiety and its impact on academic performance.

4.3 Academic Performance

We measure academic performance in the administrative data by averaging students' grades in the academic year in which the survey was conducted. Grades are aggregated across all exams and analyzed separately for quantitative and qualitative subjects, providing a comprehensive view of academic performance across disciplines.

Kavanagh, King, and Currier, 2018; De Haas, Baranov, Matavelli, and Grosjean, 2025; Matavelli, 2024). Its brevity and psychometric reliability make it particularly suitable for large-scale surveys and interdisciplinary research, offering critical insights into the relationship between cultural norms and economic decisions.

4.4 Overconfidence

We construct a measure of students' overconfidence by integrating survey and administrative data. During the survey, we asked students the following questions: *"If we were to compare you to 100 randomly selected students in your program, how many students (out of 100) do you think would have: (i) a lower grade than you in quantitative subjects (e.g., mathematics, microeconomics, macroeconomics, and statistics); (ii) a lower grade than you in qualitative subjects (e.g., economic history, law)?"*

To evaluate the accuracy of these self-assessments, we compared the students' responses to the actual number of peers with lower performance in quantitative and qualitative subjects, as recorded in the administrative data. We define a student as overconfident in quantitative subjects if they overestimate the number of peers with lower grades than their own in these subjects. Similarly, a student is considered overconfident in qualitative subjects if they overestimate the number of peers with lower grades in those subjects.

4.5 Descriptive evidence

Our final sample consists of 2,553 students who completed the survey. Table 1 reports the summary statistics. In our sample, 38% of students are female. The majority of students are born in Italy, with only 13% born abroad. Among the Italian-born students, 46% come from northern Italy, while the remaining are from the south, the center, or the islands (Sicily and Sardinia). Over one-third of the students come from large cities with populations exceeding 200,000 residents. Additionally, approximately one in four students reported having at least one sibling.

Panel B of Table 1 provides details on students' high school backgrounds and their standardized grades upon graduation. The average end-of-high-school grade is 94 on a scale ranging from 60 to 100, reflecting the high academic standard of students. Most students in the sample graduated from a lyceum, with 58% coming from scientific lyceums, 16% from classical lyceums, and 2% from artistic lyceums. A small fraction, just 0.04%, attended either linguistic or technical high schools.[4] In terms of university enrollment, 66% of students are pursuing undergraduate degrees in management or marketing, 31% are enrolled in finance programs, and 4% are studying economics and economic policy (Panel C of Table 1).

Panel D presents summary statistics for the main explanatory variable used in the analysis. The average leave-out mean proportion of female classmates is 0.36, with a standard deviation of 0.13. Figure 1 reveals substantial variation in the proportion of female peers in classrooms,

[4]In Italy, high school education is divided into different tracks, each with a distinct focus. Lyceums (*Licei*) are academically oriented schools that prepare students for university. They include several specializations: the Scientific Lyceum emphasizes mathematics and science, the Classical Lyceum focuses on humanities and classical studies, the Artistic Lyceum specializes in visual and performing arts, and the Linguistic Lyceum prioritizes foreign languages. Technical and Professional Schools (*Istituti Tecnici* or *Istituti Professionali*), on the other hand, combine academic studies with vocational training, preparing students for specific careers or further education in technical fields.

even after controlling for course-grade-level influences. We also document in the appendix the raw distribution of the leave-out mean proportion of female classmates (Figure 1A) and the distribution after accounting for course-year-level influences (Figure 1B).

As described in Section 4.1, we measure students' conformity to masculinity norms and their beliefs about their peers' conformity to these norms by averaging responses to four survey items. Each component, originally scored on a 1-5 scale, was re-scaled so that higher values indicate stronger adherence to masculinity norms. Panel E of Table 1 presents statistics on students' conformity to masculinity norms, with an average score of 3.14, and their perceptions of their peers' conformity to these norms, which have an average score of 3.28. Figure 2 plots the distribution of students' conformity to masculinity (2A) and the distribution of students' beliefs about peers' conformity to masculinity (2B). Female students exhibit lower conformity to masculinity than male students, with a difference of approximately 12 percent. This difference is statistically significant (p-value $<$ 0.000). Similarly, female students believe that their peers exhibit lower conformity to masculinity compared to male students. Although the difference is smaller, around 2.70%, it remains statistically significant.

On a scale from 1 to 5, the average level of student anxiety is 3.43 (Panel E of Table 1). However, female students report higher levels of anxiety compared to males. Figure 3 shows the distribution of student responses to the question: *"How much do you think your mental health, such as your level of worry and anxiety, affects your academic performance?"* The figure indicates that female students experience higher levels of anxiety than male students, with a difference of approximately 7%. Online Figure A1 shows the average levels of conformity to masculinity norms, beliefs about peers' conformity to masculinity, and levels of anxiety by gender and undergraduate courses. Female students have significantly lower conformity to masculinity norms across all undergraduate courses (Figure A1A). On the contrary, female students report higher levels of anxiety in all undergraduate courses (Figure A1C).

Panel F of Table 1 reports the summary statistics for students' performance. Student GPA is measured on a scale from 1 to 30, where a GPA of at least 18 is required to pass a subject. Students can also receive a 30 *Cum Laude*, which corresponds to a score of 31. CREDO SIA 31 The average student GPA is approximately 26 out of 30, with the average GPA in quantitative subjects being 26 and in qualitative subjects being 27. Regarding students' overconfidence, approximately 41% of students mistakenly believe they perform better than their peers in quantitative subjects, while 45% hold the same misconception regarding qualitative subjects (Panel F of Table 1). Online Figure A2 shows the distributions of students' misperceptions about their relative performance in quantitative and qualitative subjects, disaggregated by gender. There is no statistically significant gender difference in students' misperceptions about their relative performance in quantitative subjects. However, male students are significantly more likely than female students to overestimate their relative ranking in the distribution of performance in qualitative subjects.

5 Empirical strategy

5.1 Estimated Equation

To investigate how the gender composition of peers influences students' beliefs about masculine environments, their level of anxiety and their educational outcomes, we estimate the following regression:

$$Y_{icsg} = \alpha + \beta_1 \text{PeerFem}_{ics} + \beta_2 \text{Female}_{icsg} + \mathbf{X}'_{icsg}\gamma + \mathbf{W}'_{icsg}\delta + \lambda_{sg} + \epsilon_{ics} \tag{1}$$

where Y_{icsg} represents the outcome measures for student i in class c, in course s, and grade g. PeerFem_{ics} denotes the leave-out mean share of female classmates, and $\mathbf{X}'_{icsg}$ includes predetermined student characteristics, such as whether the student was born outside Italy, whether the student was born in a northern Italian region, and the number of younger and older siblings (brothers and sisters). Female_{icsg} is a dummy variable indicating whether the student is female, while $\mathbf{W}'_{icsg}$ includes peers' baseline ability, measured as their performance in high-stakes final exams at the end of high school. The regression includes course-grade fixed effects, to isolate the impact of peer gender composition on student outcomes while controlling for grade-level and course-specific factors.

The estimate of β_1 in equation (1) represents the causal effect of being assigned to a class with a larger proportion of girls within the course and grade in which the student enrols. This estimation assumes that the share of female classmates is uncorrelated with student i's characteristics, conditional on classmates' performance and the inclusion of student controls. The random assignment of students to classrooms, as discussed in Section 5.2, ensures that the share of girls is uncorrelated with both observable and unobservable characteristics of students, conditional on classmates' performance and the inclusion of student controls.

Our identification strategy exploits the variation in peer gender composition across classrooms within the same course and academic year. The main idea is to compare the beliefs and academic outcomes of students from different classrooms within the same grade and course. These students share similar characteristics (including baseline performance) and are enrolled in the same course during the same year. The key difference is that some students are randomly assigned to classrooms with a larger proportion of female peers. Because there is no significant variation in students' observed characteristics and abilities across classrooms within the same course and grade, this approach enables us to isolate the causal impact of peer gender composition on students' beliefs and academic outcomes.

5.2 Randomized Classroom Assignment

To investigate the impact of female peers on students' perceptions of masculinity norms and classroom performance, we leverage the random assignment of students to classrooms within university courses. University students in the context of this study are randomly allocated to classrooms at the beginning

of each academic year, within the courses they choose to enroll in.[5] We demonstrate that students' baseline characteristics are uncorrelated with their peers' characteristics at the time of classroom assignment, which is crucial for addressing reflection and selection biases as discussed by Manski (1993). We empirically test the validity of this random assignment by examining whether variables like the proportion of females in the classroom and the average end-of-high-school performance (both measured excluding the student in question) correlate with observable student characteristics. This analysis ensures that students are not systematically sorted into classrooms based on attributes such as end-of-high-school exam performance, gender, sibling order, or place of birth. Table 2 presents results for the proportion of females in the classroom in columns (1)-(9) and for average end-of-high-school performance in columns (10)-(18). We find no statistically significant associations between these classroom characteristics and individual student attributes. These findings support the assumption that the distribution of female peers across classrooms is exogenous.

6 Results

6.1 Main findings

Table 3 presents our baseline estimated effects of peer gender composition on students' masculinity (column 1), their beliefs about their peer's masculinity (column 2), and whether their level of anxiety affects their performance (column 3). We find that a 10 percentage point increase in the proportion of female classmates reduces students' masculinity conformity by 8.8 percent of a SD ((0.589 $\times$ 0.10) / 0.67). Similarly, a 10 percentage point increase in the proportion of female classmates reduces students' anxiety by 8.8 percent of an SD ((0.959 $\times$ 0.10) / 1.09).

Then, we investigate how gender composition affects students' performance and overconfidence. Table 4 presents the results. Column (1) shows that a 10 percentage point increase in the proportion of female classmates increases students' exam performance by 12.2 percent of a standard deviation (SD). In Columns (2) and (3), we separate the exams into quantitative and qualitative subjects. We find that the gender composition of peers has a significant and positive effect on students' performance in quantitative subjects but no significant effect on performance in qualitative subjects. Specifically, a 10 percentage point increase in the proportion of female classmates increases students' performance in quantitative subjects by 8.7 percent of an SD. These effects are comparable to those reported in Gong, Lu, and Song (2021) and are economically meaningful. For instance, the 10 percentage point increase in the proportion of female classmates has a positive effect on students' performance that is comparable to the impact of hiring a teacher whose quality is approximately 0.8 SD above average (Lavy and Megalokonomou, 2024; Chetty, Friedman, and Rockoff, 2014; Bau and Das, 2020) or reducing class size by about 10 percent.

[5] We exclude data science courses from our sample, as they have only one classroom per year.

An higher share of female classmates leads to a higher over-confidence in quantitative subjects. In particular, the estimate in Column (4) on Table 4 shows that a 10 percentage point increase in the proportion of female classmates increases students' overconfidence in their quantitative performance by 0.4 percentage of a SD ($(0.432 \times 0.10)/9.25$).

6.2 Heterogeneity by Gender

Table A2 presents the heterogeneous effects of peers' gender on students' male conformity, perceptions of male conformity, and anxiety, disaggregated by gender.

An increased proportion of female peers reduces masculinity conformity for both male and female students, though the effect is statistically significant only for males. Specifically, a 10-percentage-point increase in the proportion of female classmates reduces male students' index by 9.3% of a standard deviation[6]. Similarly, a higher proportion of female peers significantly decreases the level of anxiety among male students, whereas the effect for female students is smaller and not statistically significant. For male students, a 10-percentage-point increase in the proportion of female classmates reduces anxiety levels by 10.9% of a standard deviation[7].

Table A3 presents the heterogeneous effects of peers' gender on students' performance and overconfidence. An increased share of female classmates improves the performance of both male and female students, as shown in columns (1)-(2). Specifically, a 10-percentage-point increase in the proportion of female classmates increases performance by 11.5% and 15.3% of a standard deviation for male and female students, respectively. However, a larger share of female classmates increases overconfidence only among male students, as indicated in column (7).

7 Conclusion and Discussion

This paper provides new evidence on the importance of gender diversity in shaping the university climate and its subsequent impact on students' beliefs, behaviors, and academic outcomes. By exploiting the random allocation of students to classes within the same program at an Italian university, we demonstrate that an increased proportion of female peers positively influences classroom dynamics, reducing adherence to traditional masculinity norms, lowering anxiety levels, and enhancing confidence and academic performance. These effects benefit both male and female students, though the impacts on specific outcomes vary by gender.

Our findings contribute to the growing literature on gender diversity by highlighting the significant role it plays in educational settings. Previous research has focused primarily on workplace environments, yet our study reveals that gender composition during the formative university years

[6]The exact computation is given by $((0.603 \times 0.10)/0.65)$

[7]The exact computation is given by $((1.223 \times 0.10)/1.12)$

has profound implications for students' social and cognitive development. Notably, the positive effects of gender diversity extend beyond academic performance to encompass non-cognitive outcomes, such as reduced anxiety and greater confidence, which are essential for long-term success.

From a policy perspective, our results underscore the value of promoting gender diversity in educational institutions as a means to foster more inclusive and equitable learning environments. Initiatives aimed at increasing female representation, particularly in male-dominated fields, can have far-reaching benefits, including challenging traditional gender norms, reducing stress, and improving performance in both quantitative and qualitative disciplines. These changes not only enhance the overall university climate but also prepare students to thrive in increasingly diverse workplaces.

By emphasizing the importance of gender diversity in educational settings, this study offers a pathway for universities to enhance student outcomes and contribute to a more equitable society. As institutions increasingly prioritize inclusion and diversity, the lessons from this research can inform strategies that maximize the potential of all students, regardless of their gender.

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Figures and Tables

Table 1: Descriptive Statistics

	Mean	SD	Min	Max	N
Panel A: Students Demographics					
Female Student	0.38	0.48	0	1	2,553
Student Born Outside Italy	0.13	0.34	0	1	2,553
Students Born in North Italy	0.46	0.50	0	1	2,553
Living in a City with More than 200k Residents	0.35	0.48	0	1	2,553
Student has Older Brother	0.25	0.43	0	1	2,553
Student has Younger Brother	0.24	0.43	0	1	2,553
Student has Older Sister	0.23	0.42	0	1	2,553
Student has Younger Sister	0.27	0.44	0	1	2,553
Panel B: High-School Information					
Student' s End of High-School Grade	94.18	7.60	60	100	2,553
Scientific Lyceum	0.58	0.49	0	1	2,553
Classical Lyceum	0.16	0.37	0	1	2,553
Artistic Lyceum	0.02	0.13	0	1	2,553
Linguistic Lyceum	0.04	0.19	0	1	2,553
Technical School	0.04	0.20	0	1	2,553
Professional or Vocational School	0.00	0.03	0	1	2,553
Panel C: University Information					
Undergraduate in Economics/Policy	0.04	0.19	0	1	2,553
Undergraduate in Management/Marketing	0.66	0.47	0	1	2,553
Undergraduate in Finance	0.31	0.46	0	1	2,553

Panel D: Explanatory Variables					
Prop. of Female Classmates	0.36	0.13	0	1	2,553
Panel E: Survey Outcomes					
Conformity to Masculinity	3.14	0.67	1	5	2,553
Perception of Peers' Conformity to Masculinity	3.28	0.55	1	5	2,553
Anxiety	3.43	1.09	1	5	2,553
Panel F: Academic Outcomes					
GPA (Overall)	25.93	3.01	14	32	2,553
GPA (Quantitative)	26.11	2.91	16	32	2,553
GPA (Qualitative)	27.00	3.00	17	32	2,553
Student is Over-Confident in Quantitative Subject	0.41	0.49	0	1	2,553
Student is Over-Confident in Qualitative Subject	0.45	0.50	0	1	2,553

Notes: The table reports descriptive statistics for student characteristics in the main analysis sample, namely students who answered the survey.

Table 2: Balancing Exercise

	Leave Out Mean Proportion of Female in the Classroom								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Student' s End of High-School Grade	0.000								0.000
	(0.000)								(0.000)
Female Student		-0.001							-0.001
		(0.002)							(0.002)
Student has Older Brother			-0.000						-0.001
			(0.002)						(0.002)
Student has Younger Brother				-0.002					-0.002
				(0.002)					(0.002)
Student has Older Sister					0.004*				0.004
					(0.002)				(0.002)
Student has Younger Sister						-0.001			-0.000
						(0.002)			(0.002)
Student Born Outside Italy							0.004		0.003
							(0.003)		(0.004)
Students Born in North Italy								-0.002	-0.002
								(0.002)	(0.002)
Obs	2,553	2,553	2,553	2,553	2,553	2,553	2,553	2,553	2,553
Mean Y	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41
St Dev Y	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Course-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Columns (1)–(8) report course-by-year fixed-effects estimates from separate regressions, each including a single student characteristic as an independent variable. Column (9) includes all control variables simultaneously in the regression and reports their joint significance. The outcome variable is the proportion of female peers in the classroom, excluding the student. $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 3: Effect of Proportion of Female Peers on Students' Perceptions

	Conformity to Masculinity	Perception of Peers' Conformity to Masculinity	Anxiety
	(1)	(2)	(3)
Prop. of Female Classmates	-0.578**	0.051	-0.964**
	(0.275)	(0.158)	(0.377)
Female Student	-0.385***	-0.064**	0.315***
	(0.022)	(0.025)	(0.047)
Average Classroom Performance	0.003	-0.002	-0.003
	(0.002)	(0.002)	(0.005)
Obs	2,553	2,553	2,553
Mean Y	3.14	3.28	3.43
St Dev Y	0.67	0.55	1.09
Course-Year FE	Yes	Yes	Yes
Student Controls	Yes	Yes	Yes

Notes: The table reports the estimated effects of peer gender on students' conformity to masculinity norms (Column 1), students' perceptions of peers' conformity to masculinity norms (Column 2), and their levels of anxiety (Column 3). All regressions include course-by-year fixed effects, student-level controls, and classroom-level controls. Student-level controls include gender, the number and gender of siblings, whether the student was born in Italy or abroad, whether the student was born in Northern Italy, and the size of the city the student resides in. Classroom-level controls include the average baseline performance of peers in compulsory subjects, calculated as leave-one-out means. $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 4: Effect of Proportion of Female Peers on Students' Performance

	GPA (Std.)			Self-Confidence	
	(1)	(2)	(3)	(4)	(5)
	All	Quantitative	Qualitative	Quantitative Subjects	Qualitative Subjects
Prop. of Female Classmates	1.101***	0.772**	0.390	0.410**	0.140
	(0.382)	(0.352)	(0.403)	(0.189)	(0.194)
Female Student	-0.139***	-0.152***	0.040	-0.007	-0.078***
	(0.038)	(0.036)	(0.041)	(0.020)	(0.020)
Average Classroom Performance	-0.018***	-0.001	0.000	-0.001	-0.002
	(0.005)	(0.004)	(0.003)	(0.002)	(0.001)
Obs	2,553	2,553	2,553	2,553	2,553
Mean Y	-0.23	-0.10	-0.12	0.41	0.45
St Dev Y	0.99	0.88	0.97	0.49	0.50
Course-Year FE	Yes	Yes	Yes	Yes	Yes
Student Controls	Yes	Yes	Yes	Yes	Yes

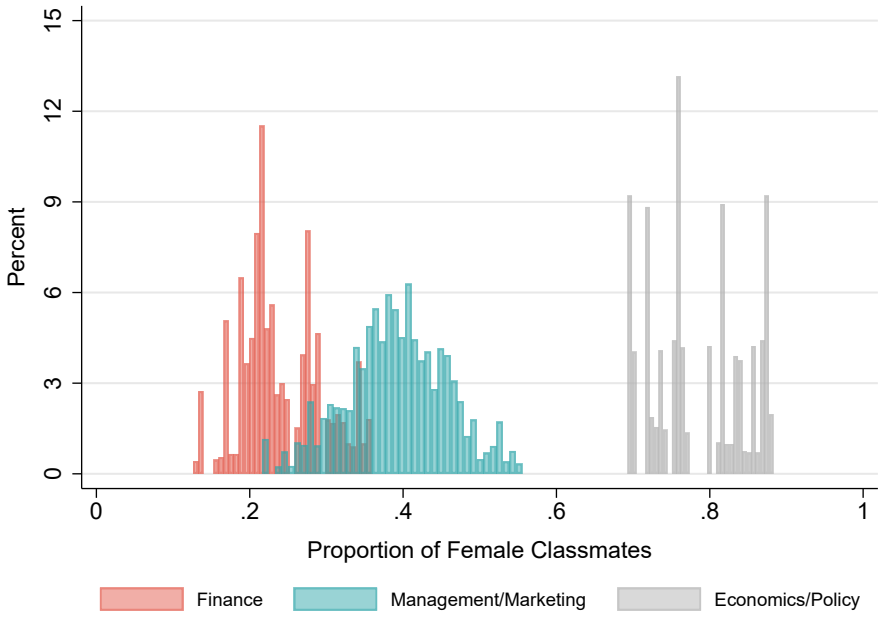
Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

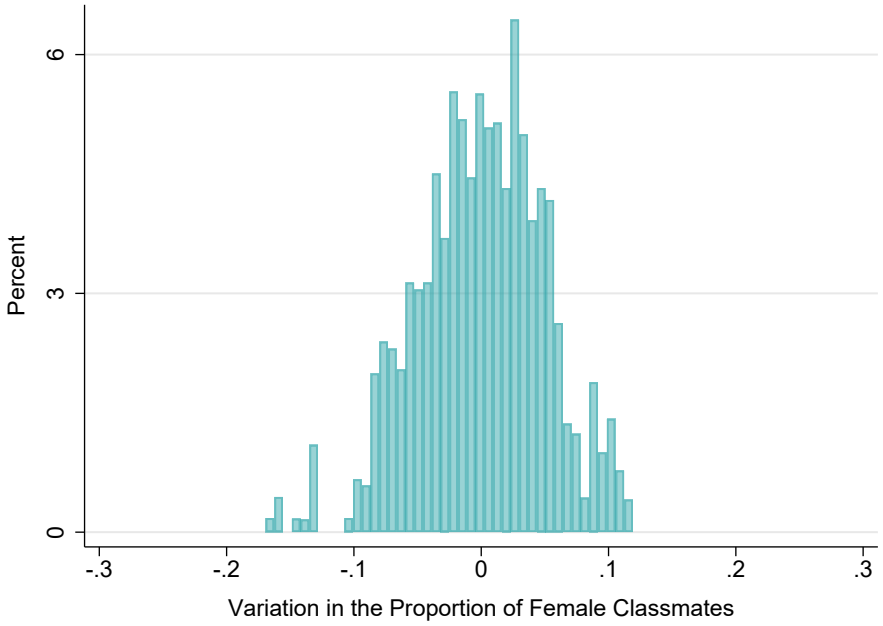
Notes: The table reports the estimated effects of peer gender on students' performance (Columns 1-3), and students' self-confidence (Columns 4-5). Students' GPAs are standardized within each year and grade level. A student is classified as overconfident in quantitative subjects if they report that a greater proportion of peers have lower performance than their actual grades indicate. Similarly, a student is classified as overconfident in qualitative subjects if they report that a greater proportion of peers have lower performance than their actual grades indicate. All regressions include course-by-year fixed effects, student-level controls, and classroom-level controls. Student-level controls include gender, the number and gender of siblings, whether the student was born in Italy or abroad, whether the student was born in Northern Italy, and the size of the city the student resides in. Classroom-level controls include the average baseline performance of peers in compulsory subjects, calculated as leave-one-out means. $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Figure 1: Proportion of Female Classmates

(A) By Undergraduate Course



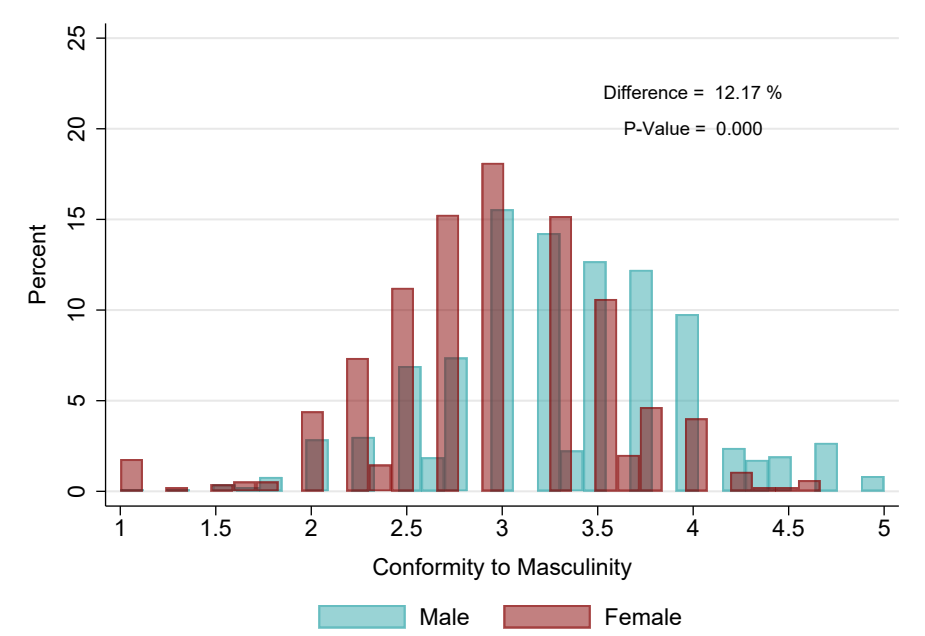
(B) Residual Variation After Accounting for Course-Year FE



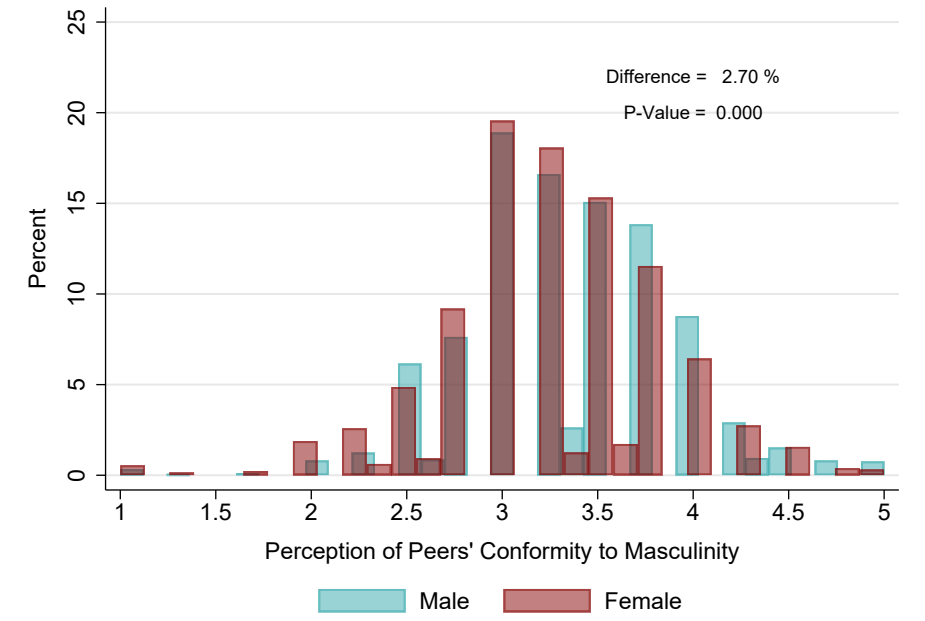
Notes: The figure displays the distribution of the proportion of female classmates. Panel (A) presents the distribution separately for the three undergraduate programs, while Panel (B) shows the distribution adjusted for course-by-year influences through regression. The variation in Panel (B) forms the basis of our identification strategy.

Figure 2: Distributions of Students' and Peers' Conformity to Masculinity, by Gender

(A) Students' Conformity to Masculinity

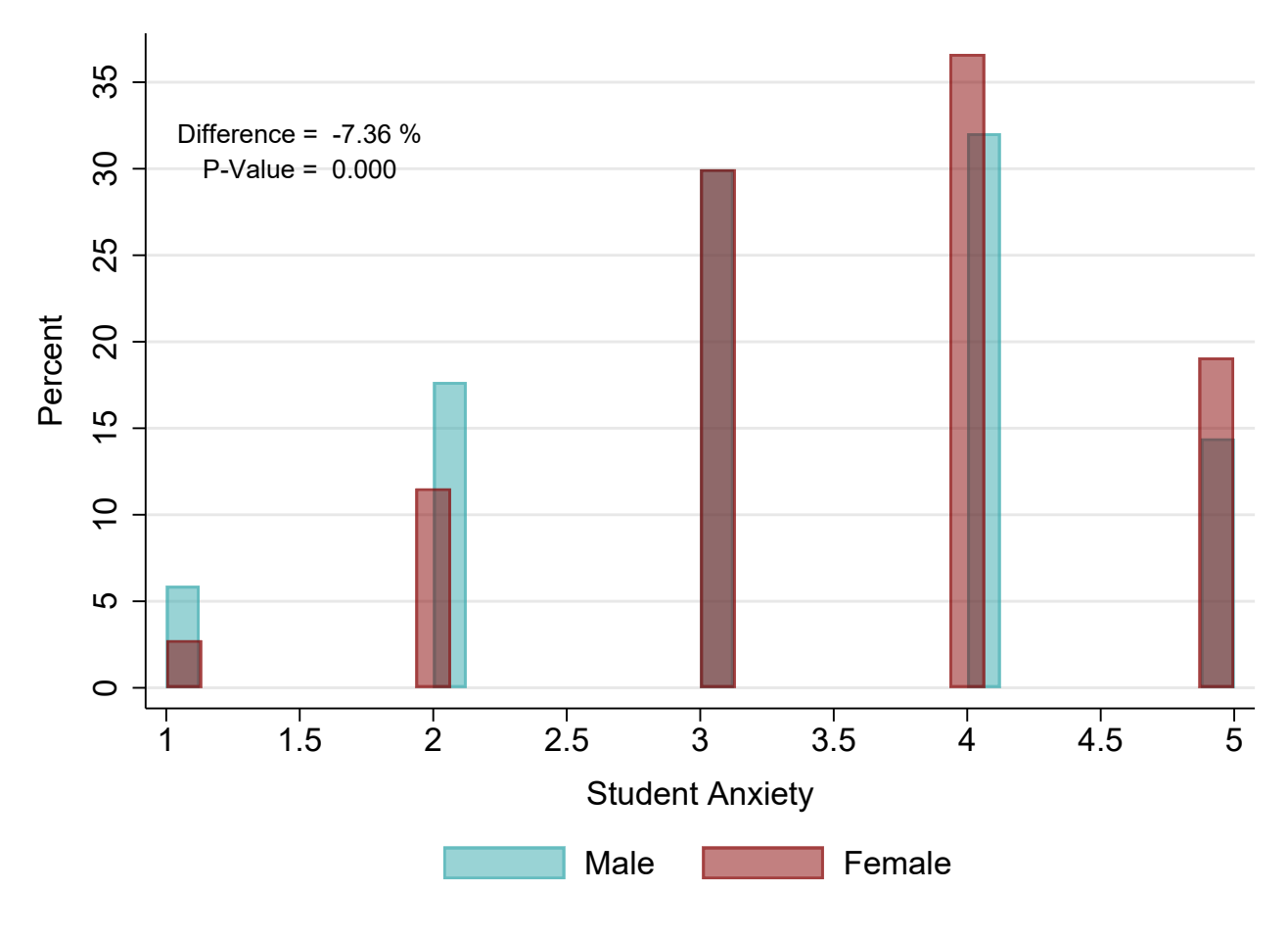


(B) Students' Beliefs of Peers' Conformity to Masculinity



Notes: Figure A shows the distribution of students' conformity to masculinity, as measured in the survey, separately for male and female students. Female students exhibit lower conformity to masculinity, approximately 12% lower than males, a statistically significant difference (the p-value for the t-test is less than 0.000). Figure B shows the distribution of students' beliefs about their peers' conformity to masculinity, as measured in the survey, separately for male and female students. Female students believe that their peers exhibit lower conformity to masculinity than male students. The difference is 2.70%, and it is statistically significant (the p-value for the t-test is less than 0.000).

Figure 3: Distributions of Students' Level of Anxiety, by Gender

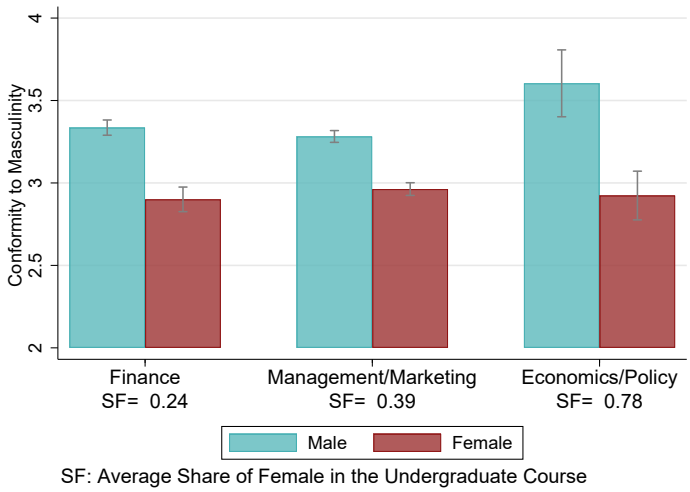


Notes: This Figure shows the distribution of students' levels of anxiety, as measured in the survey, separately for male and female students. Female students exhibit a higher level of anxiety than male students, approximately 7%, a statistically significant difference (the p-value for the t-test is less than 0.000).

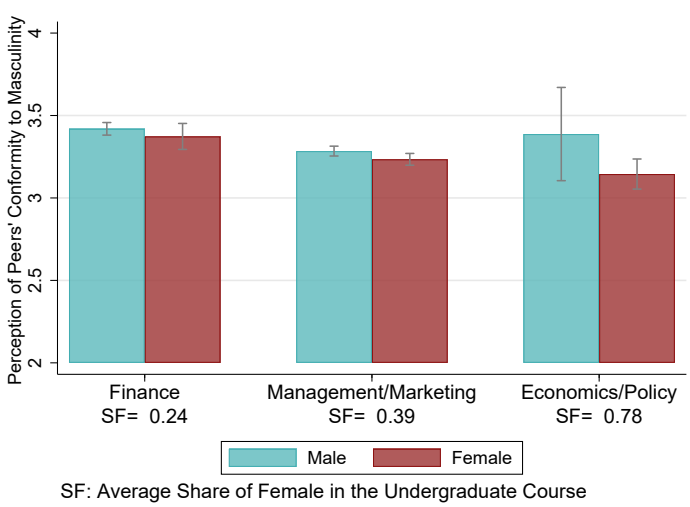
Appendix A: Additional Tables and Figures

Figure A1: Students' Survey Outcome, by Undergraduate Course

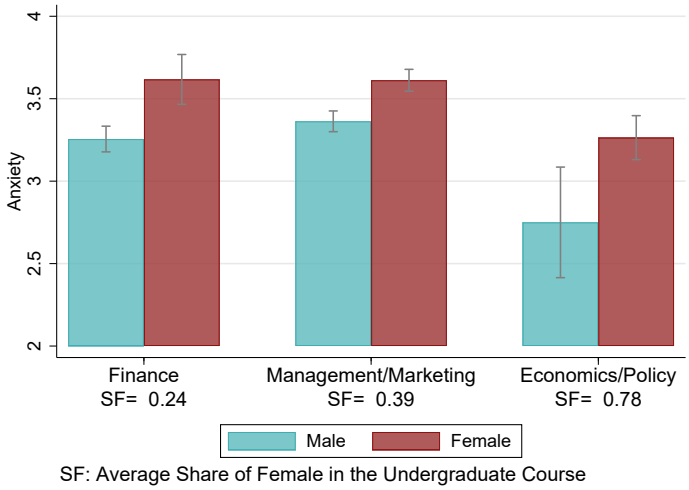
(A) Conformity to Masculinity



(B) Beliefs of Peers' Conformity to Masculinity



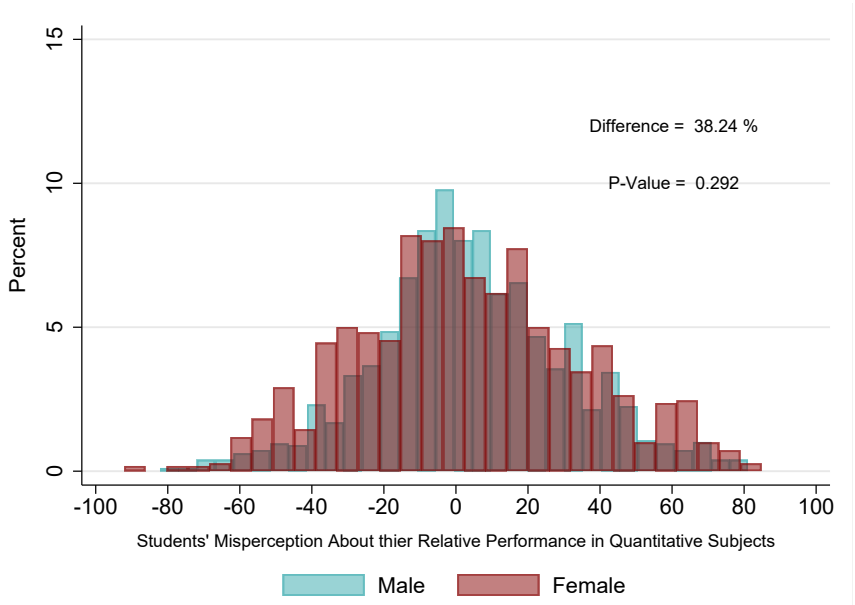
(C) Anxiety



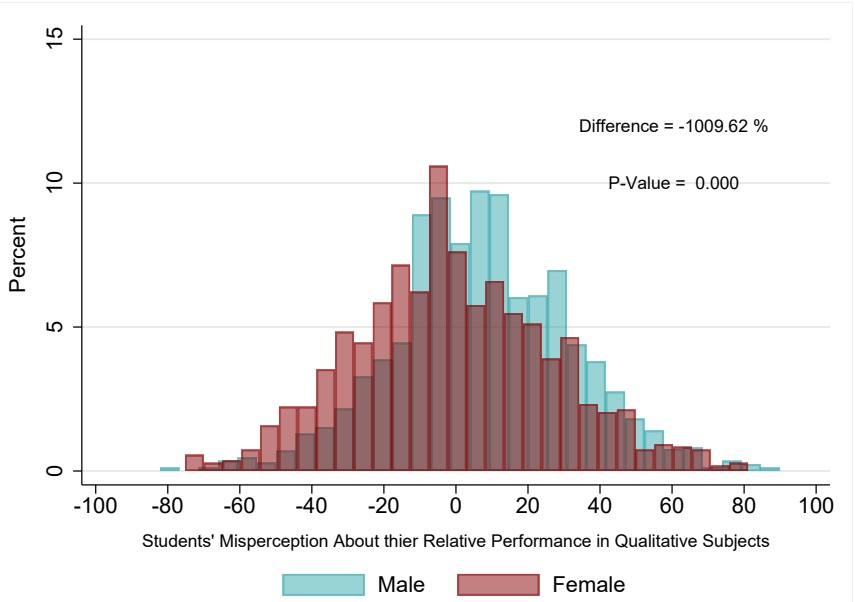
Notes: These figures show the average level of conformity to masculinity (Figure A), beliefs about peers' conformity to masculinity (Figure B), and level of anxiety (Figure C), by gender and undergraduate courses. The bars represent the means for male and female students, with error bars indicating 95% confidence intervals. The x-axis represents undergraduate courses grouped by their average share of female students (SF).

Figure A2: Students' Misperception About their Relative Performance, by Gender

(A) Quantitative Subjects



(B) Qualitative Subjects



Notes: Figures A and B display the distribution of students' misperceptions about their relative performance in quantitative and qualitative subjects, respectively, disaggregated by gender. Students' misperceptions are calculated as the difference between their responses to the question: *"If we were to compare you to 100 randomly selected students in your program, how many students (out of 100) do you think would have a lower grade than you in quantitative/qualitative subjects?"* and the actual percentage of students with lower grades in quantitative/qualitative subjects, based on administrative data. A negative value indicates an underestimation of a student's rank in the grade distribution, while a positive value reflects greater self-confidence in a student's relative performance. The Figures also report the percentage difference between the average misperceptions among male and female students, and the p-value for the t-test for the difference in the mean for male and female students.

Table A1: Summary Statistics for Survey Respondents and Non-respondents

	Full Sample			Not Respondent			Respondent				
	Mean	SD	N	Mean	SD	N	Mean	SD	N	Diff. (4) − (7)	P-value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Female Student	0.40	0.49	7,474	0.41	0.49	4,921	0.38	0.48	2,553	0.04	0.00
Student Born Outside Italy	0.18	0.39	7,474	0.21	0.41	4,921	0.13	0.34	2,553	0.07	0.00
Students Born in North Italy	0.42	0.49	7,474	0.40	0.49	4,921	0.46	0.50	2,553	-0.07	0.00
Student' s End of High-School Grade	92.93	8.14	7,474	92.28	8.34	4,921	94.18	7.60	2,553	-1.90	0.00
Scientific Lyceum	0.55	0.50	7,472	0.53	0.50	4,919	0.58	0.49	2,553	-0.06	0.00
Classical Lyceum	0.15	0.36	7,472	0.15	0.36	4,919	0.16	0.37	2,553	-0.01	0.10
Artistic Lyceum	0.02	0.12	7,472	0.02	0.12	4,919	0.02	0.13	2,553	-0.00	0.47
Linguistic Lyceum	0.04	0.19	7,472	0.04	0.19	4,919	0.04	0.19	2,553	-0.00	0.76
Technical High-School	0.04	0.19	7,472	0.04	0.19	4,919	0.04	0.20	2,553	-0.01	0.17
Professional or Vocational High-School	0.00	0.03	7,472	0.00	0.03	4,919	0.00	0.03	2,553	0.00	0.96
Undergraduate in Economics/Policy	0.10	0.30	7,474	0.13	0.34	4,921	0.04	0.19	2,553	0.10	0.00
Undergraduate in Management/Marketing	0.66	0.47	7,474	0.67	0.47	4,921	0.66	0.47	2,553	0.01	0.40
Undergraduate in Finance	0.24	0.43	7,474	0.20	0.40	4,921	0.31	0.46	2,553	-0.11	0.00
Prop. of Female Classmates	0.40	0.16	7,474	0.42	0.17	4,921	0.36	0.13	2,553	0.06	0.00
GPA (Overall)	27.24	3.60	7,474	27.92	3.69	4,921	25.93	3.01	2,553	2.00	0.00
GPA (Quantitative)	27.31	3.64	7,474	27.93	3.82	4,921	26.11	2.91	2,553	1.81	0.00
GPA (Qualitative)	27.90	3.49	7,474	28.37	3.63	4,921	27.00	3.00	2,553	1.36	0.00

Notes: The table presents summary statistics for the characteristics of the full sample of undergraduate students (Columns 1–3), as well as statistics split by those who did not participate (Columns 4–6) and those who participated in the survey (Columns 7–9). Column 10 displays the differences in mean characteristics between students who did not respond and those who responded to the survey, while Column 11 reports the p-value from the t-test for these differences.

Table A2: Effect of Proportion of Female Peers on Students' Perceptions, By Gender

	Toxic Enviroment Index		Perception of Toxicity of Peers		Anxiety	
	(1)	(2)	(3)	(4)	(5)	(6)
	Male	Female	Male	Female	Male	Female
Prop. of Female Classmates	-0.580**	-0.617	-0.078	0.197	-1.222**	-0.570
	(0.272)	(0.646)	(0.215)	(0.378)	(0.534)	(0.842)
Average Classroom Performance	0.002	0.006*	-0.002	-0.003	-0.000	-0.008
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.009)
Obs	1,592	961	1,592	961	1,592	961
Mean Y	3.30	2.89	3.31	3.21	3.32	3.61
St Dev Y	0.65	0.61	0.55	0.56	1.12	1.02
Course-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Student Controls	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The table reports the estimated effects of peer gender on students' conformity to masculinity norms (Columns 1-2), students' perceptions of peers' conformity to masculinity norms (Columns 3-4), and their levels of anxiety (Columns 5-6), for male and female students separately. All regressions include course-by-year fixed effects, student-level controls, and classroom-level controls. Student-level controls include the number and gender of siblings, whether the student was born in Italy or abroad, whether the student was born in Northern Italy, and the size of the city the student resides in. Classroom-level controls include the average baseline performance of peers in compulsory subjects, calculated as leave-one-out means. $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table A3: Effect of Proportion of Female Peers on Students' Performance, By Gender

	GPA (Overall)		GPA (Quantitative)		GPA (Qualitative)		Overconfidence (Quantitative)		Overconfidence (Qualitative)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Prop. of Female Classmates	-0.062	0.546	0.014	0.695	0.128	0.835	-0.023	0.156	-0.335	-0.163
	(0.488)	(0.610)	(0.462)	(0.581)	(0.535)	(0.679)	(0.263)	(0.306)	(0.255)	(0.326)
Average Classroom Performance	0.169***	0.123***	0.096***	0.064**	-0.019	0.024	0.078***	0.038***	0.077***	0.055***
	(0.022)	(0.028)	(0.021)	(0.028)	(0.023)	(0.030)	(0.010)	(0.013)	(0.010)	(0.014)
Obs	1,592	961	1,592	961	1,592	961	1,592	961	1,592	961
Mean Y	-0.21	-0.26	-0.06	-0.16	-0.16	-0.04	0.44	0.36	0.49	0.38
St Dev Y	1.00	0.96	0.88	0.86	0.97	0.96	0.50	0.48	0.50	0.48
Course-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Student Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The table reports the estimated effects of peer gender on students' performance (Columns 1-6), and students' self-confidence (Columns 7-10), for male and female students separately. Students' GPAs are standardized within each year and grade level. A student is classified as overconfident in quantitative subjects if they report that a greater proportion of peers have lower performance than their actual grades indicate. Similarly, a student is classified as overconfident in qualitative subjects if they report that a greater proportion of peers have lower performance than their actual grades indicate. All regressions include course-by-year fixed effects, student-level controls, and classroom-level controls. Student-level controls include the number and gender of siblings, whether the student was born in Italy or abroad, whether the student was born in Northern Italy, and the size of the city the student resides in. Classroom-level controls include the average baseline performance of peers in compulsory subjects, calculated as leave-one-out means. $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.