Peer Gender Composition and University Climate

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Abstract

Students' university experience includes both academic and non-academic outcomes, which are shaped by the educational environment in which students interact. We refer to this environment as university climate and measure it along three dimensions: conformity to masculinity-related attitudes and perceptions, the perceived academic impact of mental health (worry and anxiety), and classroom interactions. Using administrative records combined with original survey data, and exploiting the random assignment of students to teaching classes within degree programs at an Italian university, we identify the causal effect of peer gender composition on university climate and academic performance. Greater exposure to female peers reduces conformity to masculinity-related attitudes, lowers the perceived academic impact of mental health, fosters more collaborative classroom interactions, and increases academic performance. These effects are observed for both male and female students. Our findings provide causal evidence that peer gender composition influences multiple dimensions of university climate beyond academic achievement alone.

Keywords: gender, education, mental health, masculinity attitudes, classroom interactions, academic performance, university climate
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1 Introduction

Students' university experiences include both academic and non-academic outcomes that are central to their development and future success. Grades are important, but they do not capture all relevant outcomes of the university experience. University years also shape socio-emotional dimensions, such as students' perceptions of how worry and anxiety affect their academic performance, as well as classroom interactions. These dimensions may influence engagement, confidence, and persistence (Heckman et al., 2006; Lau et al., 2022; Cannonier and Burke, 2023) with consequences for students' longer-run trajectories (Eisenberg et al., 2009). Because students spend a substantial share of their university years interacting with peers, classroom interactions and the dominant attitudes to which students are exposed constitute a central component of the educational environment. While a large literature studies how peer composition affects academic achievement and specialization, the university climate itself is typically not directly observed.

This paper provides causal evidence on how peer gender composition shapes the university climate and academic outcomes. We define university climate as attitudes, perceptions, and interaction dynamics that characterize students' learning environment. To proxy university climate we use measures of masculinity-related attitudes and perceptions, perceived academic impact of mental health, and classroom interactions. Combining administrative records with original survey data, and exploiting the random assignment of students to teaching classes within degree programs at an Italian university, we identify the causal effect of exposure to female peers. Greater exposure to female peers is associated with systematic changes across all dimensions: it reduces conformity to masculinity-related attitudes, lowers the perceived academic impact of mental health, fosters more collaborative classroom interactions, and increases academic performance. These effects are observed for both male and female students. These effects are observed for both male and female students and remain robust for female shares up to approximately 40 percent, suggesting that gender balance plays an important role in shaping university climate.

Our analysis estimates reduced-form peer effects. We document parallel changes across indicators of university climate and academic performance outcomes. We do not attempt to isolate a single mechanism linking these dimensions. Rather, the evidence suggests that peer gender composition operates as a structural feature of the class, influencing the overall environment in which students interact and learn.

A growing literature shows that peer environments are associated with a wide range of student outcomes, including personality traits, aspirations, future achievements, and overall well-being (Sacerdote, 2011; Brenøe and Zölitz, 2020; Shan and Zölitz, 2022). Supportive and inclusive university environments are associated with talent attraction (Martinez, Beaulieu, Gibbons, Pronovost, and Wang, 2015; Alan, Corekcioglu, and Sutter, 2023) whereas environments characterized by intense competition and rigid expectations may undermine students' sense of belonging and well-being, lim-

iting some students' ability to thrive (Chen and Hu, 2024). Prior research documents gender gaps in academic achievements (Anelli and Peri, 2019), socio-emotional outcomes such as anxiety and psychological distress (Galasso and Profeta, 2024), patterns of classroom interaction (Bostwick and Weinberg, 2022), and attitudes formed during university (Francis et al., 2017), suggesting that gender is a relevant dimension across multiple aspects of students' university experience.

These findings suggest that gender composition may shape not only academic outcomes but also the university climate. In classrooms with relatively few female peers, masculinity-coded attitudes—emphasizing dominance, emotional restraint, status orientation, and risk-taking—may become more salient, particularly in male-dominated fields (Dhar et al., 2022; De Haas et al., 2025). Differences in peer gender composition may therefore be reflected in prevailing norms, perceptions of academic pressure, and classroom dynamics. These dimensions may vary systematically with the share of female students in a classroom.

While prior studies examine how gender composition affects educational choices and performance, our analysis directly measures university climate alongside academic outcomes. To measure the role of female peers in shaping both university climate and academic outcomes, we combine rich administrative records with original survey data from approximately 3100 undergraduate students in a large Italian university. [1] The administrative data provide detailed information on academic performance, including grades and exam completion, while the survey captures students' conformity to masculinity-related attitudes, their perceived academic impact of mental health, and classroom dynamics. First, to measure adherence to masculinity, we adapt a subset of items from the Conformity to Masculine Norms Inventory (CMNI), a widely used and validated psychometric tool in psychological and economic research (Mahalik, Burns, and Syzdek, 2007; De Haas, Baranov, Matavelli, and Grosjean, 2025; Matavelli, Grosjean, de Haas, and Baranov, 2026). We selected four items that reflect core dimensions of traditional masculinity particularly salient in university settings: (1) the importance attributed to excelling in early exams ("Winning"); (2) comfort with or appreciation of risky situations ("Risk-Taking"); (3) rejection of the idea that certain minority groups continue to face disadvantages ("Disdain for Diversity,"); and (4) the desire to be seen as an important person ("Primacy of Work/Status").[2] Second, we measure students' perceived academic impact of mental health by asking how much worry and anxiety affect their academic performance. This measure captures students' beliefs about how psychological strain interferes with academic functioning, rather than underlying mental health levels per se. By focusing on perceived functional impact, we capture a dimension of university climate that may respond to features of the peer environment and shape students' academic engagement. Finally, to measure classroom interactions, we include questions on

[1] Data are collected using a questionnaire which was approved by the university's ethical committee before being distributed.

[2] Rather than capturing the full spectrum of masculine attitudes, we focus on a parsimonious set of items most salient to students' academic and social experiences. This approach enables us to investigate how specific dimensions of masculinity influence competitive behavior, career aspirations, and attitudes toward inclusion, while ensuring broad participation in the survey.

students' experiences within the classroom, specifically whether they experienced: (i) peers sharing notes, (ii) greater attention among peers toward the most successful students, (iii) diminishing comments from peers, and (iv) hearing others state that receiving high grades is important for success.

We first document that male students tend to align more closely with traditional masculine attitudes, exhibiting higher levels of mainstream thinking, ambition, and risk propensity compared to their female classmates. Girls are more likely to believe that their performance is influenced by their perceived academic impact of mental health. We also show that conformity to masculinity attitudes is positively correlated with grades, suggesting that adherence with masculinity attitudes could be a signal of higher performance. Beliefs that negative mental states impact performance are instead negatively correlated with adherence to masculinity and performance.

Then, to estimate the causal impact of peer gender composition on students' outcomes, we exploit a unique feature of the university's course structure: the random allocation of students into teaching classes. Within each academic program, students are divided into smaller classes for instruction, which count on average 120 students. Crucially, these class assignments are reshuffled each academic year, with students randomly reallocated to different peer groups. This institutional feature generates plausibly exogenous variation in classroom gender composition across students within the same field of study and year of enrollment.

Our identification strategy relies on the assumption that, conditional on program and year fixed effects, student demographics, and prior academic achievement, the proportion of female peers in a class is as good as randomly assigned. We provide supporting evidence for this assumption by showing that pre-determined student characteristics and baseline outcomes are balanced across classes with different gender compositions. In addition, to address concerns about selective survey response, we estimate models predicting survey participation and find that the proportion of female peers does not significantly predict the likelihood of responding to the survey, suggesting that non-random response is unlikely to bias our main results.

We find that greater exposure to female peers significantly decreases masculinity attitudes and the perceived academic impact of mental health, while positively increasing academic outcomes and improving classroom interactions. More specifically, a 10 percentage point increase in the share of female classmates reduces conformity to masculine attitudes by 9.5% of a standard deviation. The perceived academic impact of mental health, such as anxiety or worry, decreases by 6.4% of a standard deviation. A higher share of female classmates has a positive impact on exam performance, the number of exams completed, and reduces the likelihood of switching to a different field of study at the master's level. Notably, these effects are not limited to female students, as both men and women benefit from greater gender diversity in their peer group.

Taken together, our findings indicate that peer gender composition is associated with systematic changes in university climate and academic performance. Our results contribute to the broader literature on the effects of gender-balanced peer environments. They also have policy implications:

promoting more gender-balanced classrooms may improve both academic outcomes and university climate.

This paper makes several contributions. First, we advance the literature on peer effects in higher education by providing new causal evidence on how gender composition shapes academic and non-academic outcomes. Peer environments are known to influence academic performance (Zimmerman, 2003; Sacerdote, 2011). Gender composition, in particular, has been linked to field-of-study choice, academic performance and persistence in STEM (Lavy, Paserman, and Schlosser, 2012; Anelli and Peri, 2019; Brenøe and Zölitz, 2020; Zölitz and Feld, 2021; Hoxby, 2000; Lavy and Schlosser, 2011). Some studies also suggest that environments with a higher share of females can affect labour market outcomes (Black, Devereux, and Salvanes, 2013). Existing evidence does not point to unambiguously positive effects of greater female representation: greater exposure to female peers has been shown to affect specialization patterns and, in some contexts, to increase gender segregation in educational and career choices (Brenøe and Zölitz, 2020; Zölitz and Feld, 2021). Other studies show that peer gender composition can improve women's persistence in male-dominated environments and interpret these patterns as consistent with a climate mechanism (Bostwick and Weinberg, 2022). Using original survey data, we enable a causal analysis of how peer gender composition shapes the social and academic environment in higher education.

Related studies suggest that more gender-balanced classrooms can foster collaborative learning environments (Nielsen, Bloch, and Schiebinger, 2018; Bostwick and Weinberg, 2022) and enhance non-cognitive skills such as confidence and motivation (Gong, Lu, and Song, 2021). These outcomes matter not only for students' success but also for long-term human capital formation (Heckman, Stixrud, and Urzua, 2006; Deming, 2017; Booth and Yamamura, 2018; Francis, Archer, Moote, DeWitt, MacLeod, and Yeomans, 2017). Recent evidence from MBA programs shows that exposure to female peers increases women's entry into senior management, consistent with shifts in cohort dynamics and information sharing (Hampole et al., 2024). Building on this literature, our study provides causal evidence on how female peers affect both university climate and academic performance.

Second, we contribute to the emerging literature on masculinity and social norms by shifting the focus from adult men in workplaces or family contexts to students in university environments. Research in psychology and economics has increasingly examined how masculinity traits, such as dominance, competitiveness, and emotional restraint, shape male outcomes and interactions (Baranov, De Haas, and Grosjean, 2023; De Haas, Baranov, Matavelli, and Grosjean, 2025). However, empirical evidence on the role of these attitudes in educational settings, especially during the university years, remains limited (Matavelli, 2024). This gap is important: university represents a formative period for identity development, career preparation, and peer influence, particularly in competitive and male-dominated fields like economics and finance. Our study documents how exposure to female peers can moderate adherence to traditional masculinity attitudes in this context.

Third, we build a bridge between education and organizational studies by highlighting the broader

implications of gender diversity in early-career environments. While workplace studies have shown that gender-diverse teams exhibit better decision-making, lower conflict, and improved performance (Martinez, Beaulieu, Gibbons, Pronovost, and Wang, 2015; Alan, Corekcioglu, and Sutter, 2023), the exploitation of a similar empirical design in classroom settings (variation in female peers exposure) mainly focus on educational and labour market outcomes revised above (i.e. persistence into stem fields, improved performance, success in becoming a manager). On top of extending this literature by showing that gender diversity in university classrooms can improve cognitive outcomes, such as exam performance, we present novel evidence on non-cognitive outcomes related to university climate. Our findings suggest that the benefits of gender diversity begin well before labor market entry and may play a foundational role in shaping the attitudes and interpersonal skills that students carry into professional environments.

Finally, although our analysis focuses on a single, highly selective university, this setting offers important insights into the future of leadership in business and economics. Graduates from this institution are disproportionately represented in elite firms, consulting companies, and financial institutions, both in Italy and abroad. As such, the university environment and social dynamics experienced during these formative years are likely to influence professional behavior and organizational culture in high-stakes, competitive sectors. Understanding how gender composition affects student outcomes thus has broader implications for shaping more inclusive, productive workplaces in the long run.

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, management, law, political 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 the following three-year programs: Economics and Finance, Management, and Management of Art and Culture. These programs are offered separately in Italian and English.[3] The university admits students based on the GPA of the third-last and second-last year of high school (which counts 45%) and the score of an entry test (55%) taken during the second-last or last year of high school. The test can be taken at maximum 3 times. 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 main courses — Economics and Finance and Management — collectively enroll approximately 7,000 students each year.

Within each program, lectures are delivered in smaller class groups. Students are randomly as-

[3]We exclude from our analysis the programs in Law, Political Science and Computer Science, as these have only one class per year, which prevents analysis of the role of class composition within the program.

signed to different classes within the same program each year, and they are not allowed to switch class groups. Each class has about 120 students. While the course content remains consistent across classes, the professors differ. Importantly, students are required to attend lectures and sit the final exam with the professor assigned to their class, which ensures that exposure to peers and teaching styles remains consistent within each class group. This setting implies that exposure to peers is bundled with classroom interaction rather than reflecting a purely administrative grouping. 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 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 31.

3 Data

We integrate survey responses with administrative data.

3.1 Survey data

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. 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 climate 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 and their gender is also included.

4 Outcomes of interest

4.1 University climate

We define university climate as the prevailing norms and interaction patterns that govern students' university experience. We proxy it using three dimensions: masculinity-related attitudes, the perceived academic impact of mental health, and classroom interactions, measured using our survey data.

4.1.1 Masculinity Attitudes

We are interested in students' conformity to masculinity attitudes and their perceptions of peers' conformity to these attitudes.

We measure adherence to masculine attitudes among both male and female students, as these attitudes can prescribe the dominant or expected behaviors in traditionally male-dominated fields,

such as economics and finance. In such contexts, attitudes aligned with masculinity —such as competitiveness, dominance, and risk-taking—can become standards for success, shaping interactions, performance expectations and socio-emotional outcomes (Baranov et al., 2023; Matavelli et al., 2026). Consequently, understanding how these attitudes operate among all students, regardless of gender, provides valuable insights into how inclusive or exclusive the educational environment is, and how it impacts student outcomes.

To assess conformity to masculine attitudes, 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.[4]

These dimensions are theoretically grounded in the understanding that cultural masculine attitudes 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 masculine attitudes influence students' social experiences and academic outcomes.

We surveyed students to assess their conformity to masculine attitudes and their perceptions of peers' conformity to them. 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 more traditional masculine attitudes, capturing dimensions of winning, primacy at work, risk-taking, and dislike for diversity. By averaging these fourth responses for each individual, we constructed two indices: *Conformity to Masculinity* and *Perceptions of Peers' Conformity to Masculinity*. Each index represents the average of students' responses to the relevant

[4]The CMNI 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, 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.

questions. Figure 1 presents the correlations between the overall CMNI-4 index and its four separate dimensions.

4.1.2 Perceived academic impact of mental health

We also investigate students' perceptions of how adverse psychological states influence their academic performance. We ask: "How much do you think your mental health, such as your level of worry and anxiety, affects your academic performance?", with responses ranging from 1 ("*Not at all*") to 5 ("*A great deal*").

This question captures the perceived functional impact of anxiety and stress on academic performance, rather than students' underlying level of mental health, and reflects an individual outcome that may respond to features of the peer environment.

We deliberately avoid asking direct questions about students' mental health levels, which are often prone to underreporting due to stigma and impression-management concerns (Tourangeau et al., 2000). The cognitive model of survey response (Paulhus, 2002) highlights how question framing shapes the information respondents retrieve from memory. By focusing on functional impact rather than potentially stigmatizing labels, our question encourages respondents to draw on concrete academic experiences and may reduce social desirability bias.[5]

4.1.3 Classroom interactions

To capture interactions within the classroom, we ask students to what extent (on a 1–5 scale) they have experienced one of the following circumstances during their time at the university. The circumstances are (1) "Peers sharing notes or helping each other with course content"; (2) "Students trying to talk more and be more friendly with the most successful peers"; (3) "Direct diminishing comments or questions aimed at underestimating someone's intellectual value in front of others or in a one-on-one interaction"; and (4) "Heard saying that you have to take a high grade on specific exams to signal your ability in order to achieve certain goals (e.g., being hired by a firm or accepted into a Ph.D. program).).

4.2 Academic Performance

We measure academic performance in the administrative data by averaging students' grades in the academic year in which the survey was conducted. Each course is evaluated on a scale from 1 to 30, where a minimum of 18 points required to pass a subject. Students can also receive a 30 *Cum Laude*,

[5]Replacing the categorical question "Is your mental health poor?" with a functional assessment such as "How much does your mental health impact your daily performance?" represents a strategic methodological choice. This approach aligns with cognitive models indicating that respondents provide more accurate and honest information when asked to recall specific impacts on their daily activities, rather than to make abstract evaluations of their overall mental state or personal attributes (Tourangeau et al., 2000).

which corresponds to a score of 31. Grades are aggregated across all exams and analyzed separately for quantitative (e.g. mathematics, microeconomics, macroeconomics, statistics) and qualitative (e.g., economic history, law) subjects, providing a comprehensive view of academic performance across disciplines. We also investigate the proportion of exams taken by students out of all exams they were expected to take in a given year.[6] Finally, we examine students' intentions to pursue a master's degree in the same field after completing their bachelor's degree.

5 Descriptive evidence

Before presenting our causal analysis, this section provides descriptive evidence and correlations that highlight the connections across outcomes and motivate analyzing them in parallel. Our final sample comprises 1,575 students who completed the survey. We construct an unbalanced panel by retrospectively imputing reported outcomes of the survey. The following criteria were used. Students surveyed in grade one should appear once, linked to the female share of peers in year one, and to reported survey outcomes. Students surveyed in grade two should appear twice, with different exposure to female peers in grades one and two, while survey outcomes are fixed at the levels reported in grade two. Students surveyed in grade three should appear three times, with exposure to female peers imputed for grades one, two, and three, and survey outcomes reported at the same levels as those in grade three. In total, our dataset counts 3131 observations. Table 1 reports the summary statistics.

In Panel A, we report information on students' demographics. In our sample, 37% of students are female. The majority of students are born in Italy. 47% are born in northern Italy, while the remaining are from the south, the center, or the islands (Sicily and Sardinia), and only 13% are born abroad. Over one-third of the students come from large cities with populations exceeding 200,000 residents. Additionally, approximately one in four students reports having at least one sibling.

Panel B provides details on students' high school backgrounds and 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 57% coming from scientific lyceums, 17% from classical lyceums, and 2% from artistic lyceums. A small fraction, just 0.09%, attended either linguistic or technical high schools.[7]

In terms of university enrollment, 31% of students are pursuing undergraduate degrees in Economics and Finance, 64% are enrolled in Management degrees, and 5% are studying Management of

[6] In Italy, students are not required to take the exam immediately after attending the course.

[7] 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.

Art and Culture .

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 0.14. Figure 2 reveals substantial variation in the proportion of female peers in classrooms, even after controlling for course-grade-level influences. Figure 2A presents the raw distribution of the leave-out mean proportion of female classmates by courses, while Figure 2B plots the distribution after accounting for course-year-level influences.

Panel E of Table 1 presents statistics on masculine attitudes. As described in Section 4.1.1, we measure students' conformity to masculine attitudes and their beliefs about their peers' conformity to these attitudes 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 masculine attitudes. Conformity to masculinity index presents a mean value of 3.17, while students' perception of their peers' conformity to these attitudes scores 3.31 on average. Figure 3 plots the distribution of students' conformity to masculinity (upper figure) and the distribution of students' beliefs about peers' conformity to masculinity (lower figure). 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 3.34%, it remains statistically significant.

In Panel F, we document students' perception of academic impact of mental health. On a scale from 1 to 5, when asked if their mental health affects academic performance, students report an average level of 3.42. Figure 4 shows the distribution of answers by gender, indicating that female students report higher scores than male students, with a difference of approximately 7% (p-value $<$ 0.000).

In Panel G, we report statistics on measures of classroom interactions. On average, on a scale from 1 to 5, students declare average levels of 3.4 for peers sharing notes, 2.5 for experiencing greater attention for successful peers, 2.02 for receiving diminishing comments, and 3.11 for hearing from professors that high grades are needed for future success. Figure 5 reveals light gender differences in class interaction mode. Girls are more likely to notice that students' attention is more concentrated to successful peers, to experience diminishing comments, and to hear that high grades are needed to succeed.

Panel H documents summary statistics of students' performance. The average student GPA is approximately 26.5 out of 30, with the average GPA in quantitative subjects being 26 and in qualitative subjects being 27. Each year, students take on average 90% of courses' exams. Finally, only one out of four students reports the intention to continue studying in the same field at the master's level. With respect to gender, while there are no statistically significant differences in the overall GPA of male and female students across courses, gender differences emerges if we split courses in quantitative

versus qualitative subjects (Figure 6). Male students perform slightly better in quantitative subjects than females, while female students perform better in qualitative subjects. In addition, boys exhibit slightly more persistence than girls in the field of study.

Figure A1 in the appendix shows the average levels of conformity to masculinity, beliefs about peers' conformity to masculinity, perception of academic impact of mental health, class interactions and performance, by gender and undergraduate courses. Female students report significantly lower conformity to masculinity across all undergraduate courses,while there are no statistically significant differences in students' perceptions of their peers' conformity to masculinity in any of the programs. Also, girls are more likely than boys to report that psychological distress affects performance in all undergraduate courses.

5.1 Correlations across outcomes

This subsection reports simple correlations across our outcomes. It shows how masculinity attitudes, the perceived academic impact of mental health, classroom interactions and academic outcomes are correlated. Consistent with our empirical approach, we treat all outcomes symmetrically and use correlations only to document how different dimensions of students' university experience are related, leaving the causal analysis to the next section.

Table 2 reports correlations between masculinity-related attitudes, the perceived academic impact of mental health, classroom interactions, and academic intentions, showing how the different outcomes are correlated. Panel A and Panel B focus, respectively, on correlations involving masculinity-related attitudes and the perceived academic impact of mental health, reported alongside the four measures of classroom interactions (Columns 1–4) and our measures of academic outcomes (columns 5-9). Each row reports coefficients from separate regressions that include course-by-year fixed effects, student-level controls (gender, sibling composition, place of birth, and municipality size), and classroom-level controls (leave-one-out average peer performance in compulsory subjects).

Panel A of Table 2 shows that higher conformity to masculinity attitudes, as measured by our indicator based on the CMNI-4 scale, is positively correlated with the perception that greater attention is paid to high-achieving peers in the classroom (coefficient = 0.140, p-value < 0.01), indicating a potential link between masculine norm endorsement and competitive classroom dynamics. However, there is no statistically significant association between CMNI-4 and the remaining three classroom experience outcomes. Higher conformity to masculinity is also associated with higher GPA in qualitative subjects and the intention to continue into the consecutive master program.

Panel B reveals a markedly different pattern. Students' perception of the academic impact of mental health is positively and significantly associated with the intention to switch master's programs (coefficient = 0.020, p-value < 0.01), and is also positively correlated with perceptions that success requires high grades (coefficient = 0.079, p-value < 0.01), and that comments in class are diminishing (coefficient = 0.117, p-value < 0.01). The perceived academic impact of mental health is

negatively associated with experiencing peer sharing of notes (coefficient = –0.095, p-value < 0.01), and positively associated with the perception that successful peers receive more attention (coefficient = 0.058, p-value < 0.01). Taken together, these results suggest that student perceived academic impact of mental health is more broadly correlated with adverse perceptions of classroom dynamics. In addition to their associations with academic intentions and classroom experiences, we examine how conformity to masculinity attitudes and perceived academic impact of mental health relate to academic performance (Figure 1). We find that conformity to masculine attitudes is negatively correlated with the perceived academic impact of mental health (pair-wise individual correlation = -0.05, p-value < 0.05), indicating that students who adhere more strongly to traditional masculine attitudes—such as emotional restraint, dominance, and the pursuit of status—report lower levels of psychological distress. Conformity to masculine attitudes is positively correlated with academic performance, particularly in quantitative subjects (pair-wise individual correlation = 0.119, p-value < 0.01), consistent with evidence that fields emphasising innate brilliance—traits closely aligned with traditional masculine ideals—tend to show higher male representation and achievement (Leslie et al., 2015). In contrast, the perceived academic impact of mental health is negatively associated with performance in both quantitative and qualitative subjects (pairwise individual correlation = -0.216 for quantitative and -0.186 for qualitative performance; p-value < 0.01), consistent with a large body of evidence showing that elevated anxiety impairs concentration, reduces working memory capacity, and hinders academic achievement (Lau et al., 2022; Cannonier and Burke, 2023)

6 Empirical strategy

6.1 Estimated Equation

To investigate how the gender composition of peers influences our four set of 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-one-out mean share of female classmates in mandatory courses. Because a small number of courses are elective, we compute the share of female peers using only compulsory courses attended by the student, thereby eliminating endogenous sorting through elective choices. Since compulsory courses account for the vast majority of the bachelor's curriculum, this restriction preserves most of the relevant variation while avoiding selection concerns. $\mathbf{X}'_{icsg}$ 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 6.2, 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 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' outcomes.

6.2 Randomized Classroom Assignment

One threat to our identification strategy is the possibility that students self-select into classrooms within a course based on the proportion of female students, or that certain student characteristics influence the probability of being assigned to a particular classroom. In the context of this study, students are randomly allocated to classrooms at the beginning of each academic year, within the courses they choose to enroll in.[8] 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 the proportion of females in the classroom (measured as leave-out mean, namely excluding the student in question) correlates with predetermined observable student characteristics. This analysis provides evidence 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 3 presents results. We find no statistically significant associations between these classroom characteristics and individual

[8] We exclude programs that have only one classroom per year.

student attributes. These findings support the assumption that the distribution of female peers across classrooms is exogenous.

Next, we use simulation methods to provide evidence of the randomness of student assignments to classrooms within a course. Following Carrell et al. (2010), Lehmann and Romano (2005), and Good (2006), we randomly sample students for each year-course-classroom observation to generate 10,000 synthetic classrooms, each with the same size as the observed classroom. We then calculate the number of female students in each synthetic classroom and compute an empirical p-value based on the proportion of synthetic classrooms that contain fewer female students than the actual classroom. This process is repeated for every classroom-course-year observation in our data. If students are randomly assigned to classrooms within each course and year, then the empirical p-values should be uniformly distributed. We test this hypothesis using the Kolmogorov–Smirnov test, as in Ammermueller and Pischke (2009). Table A2 presents the results. Given the 43 year-course cohorts in our data, we cannot reject the null hypothesis of a uniform distribution. These tests provide evidence that students are randomly assigned to classrooms within each year-course.

6.3 External validity and Selective Survey Response

Regarding external validity, a first caveat in interpreting our results concerns the specific context of analysis. The university under study is among the most selective in Italy, a setting in which gender differences among students are likely to be smaller than in less selective institutions, and unlikely to be larger. Effects may differ across institutional contexts. [9] A second potential concern in our analysis is that some of the outcome variables - such as conformity to masculinity, perceived academic impact of mental health, classroom interactions - are measured through a student survey. As such, it is only observed for the subset of students who chose to respond. If the survey response is not random, and instead systematically related to the gender composition of students' classroom peers, our estimates may be biased due to sample selection. For example, classrooms with a higher share of female peers may foster greater willingness to participate in voluntary activities such as surveys, thereby introducing endogenous selection. Table A1 uses information available in the administrative data and shows that students who respond to the survey have different observable characteristics than those who did not answer.

To assess the extent of this concern, we estimate whether the peer gender composition predicts survey response, using a rich set of pre-survey student and classroom characteristics. Table 4 report the estimate for the OLS model (in Column 1), and the Probit model (in Column 2). We find that the proportion of female peers in the classroom does not significantly predict the likelihood of survey response. This finding alleviates concerns that selection into the sample is directly driven by our main regressor of interest. While selection into the survey is clearly not random, the fact that female peer

[9] Our setting is closer to prior studies of peer effects among MBA students (Bertrand and Schoar (2003); Hampole et al. (2024)), who are likely to become managers and to develop strong peer interactions.

share is uncorrelated with selection suggests that our estimates of its effect on perceived impact of mental health are unlikely to be mechanically driven by differential response rates across classrooms. Nonetheless, we acknowledge that our estimates identify the effect of peer gender composition only for the subpopulation of survey respondents and may not generalise to non-respondents. This limits external validity but does not necessarily bias our within-sample estimates.

7 Results

7.1 Main findings

Tables 5,6,7 present our main results. Table 5 focuses on the first two set of outcomes - masculinity attitudes and perception of mental health and performance -, while Table 6 focuses on our measures of classroom interactions and Table 7 on academic outcomes.

Table 5 presents our baseline estimated effects of peer gender composition on students' conformity to masculinity (column 1), their beliefs about their peers' conformity to masculinity (column 2), and their beliefs of the academic impact of mental health (column 3). We find that a 10 percentage point increase in the proportion of female classmates reduces students' masculinity conformity by 9.5 percent of a standard deviation (SD) ((0.628 $\times$ 0.10) / 0.66). Similarly, a 10 percentage point increase in the proportion of female classmates reduces students' reported association between bad mental health and grades by 6.5 percent of an SD ((0.706 $\times$ 0.10) / 1.08).[10]

Next, we verify whether a higher share of female peers influence classroom interactions. Table 6 reports that a 10 percentage points increase in the share of female students increases the likelihood that students share notes among each other by 11 percent (Column 1), reduce their attention to successful peers by 10 percent (Column 2), and are less likely to hear that high grades are needed for success (Column 4). Finally, we investigate how gender composition affects students' academic performance. Table 7 presents the results. Column 1) shows that a 10 percentage point increase in the proportion of female classmates increases students' exam performance by 11.3 percent of a 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 7.7 percent of a SD. [11]

These effects are comparable to those reported in Gong, Lu, and Song (2021) and are economically meaningful.[12]. Moreover, when compared with alternative interventions, a 10-percentage-point

[10]Results are consistent when we examine each question underlying the conformity to masculinity separately, although the estimates are less precise.

[11]Our findings are robust to omitting elective course grades from the calculation of the official GPA.

[12]Gong, Lu, and Song (2021) estimates that a 10 pp increase in the share of female peers in Chinese middle schools rise students text-score by 10.19 % of a SD. Other studies, instead, documents lower effects (Lavy and Schlosser

increase in the share of female classmates improves students' performance by an amount similar to the effect of being assigned to a teacher whose quality is about 0.8 standard deviations above the average (Lavy and Megalokonomou, 2024; Chetty, Friedman, and Rockoff, 2014; Bau and Das, 2020) or reducing class size by about 10 percent.

A higher share of female classmates leads to an increase in students' likelihood of sitting and passing exams. In particular, the estimate in Column 4 of Table 7 shows that a 10 percentage point increase in the proportion of female classmates increases the proportion of exams sat and passed by 1.6 percentage points. The proportion of exams passed out of those enrolled is an important outcome, as it captures both students' academic engagement and success,making it a comprehensive measure of academic progression.

7.2 Heterogeneity

7.2.1 By Gender

Table A3 presents the heterogeneous effects of peers' gender composition on students' conformity to masculinity norms, perceptions of conformity, and the perceived academic impact of mental health, disaggregated by gender. An increase in the proportion of female peers reduces both masculinity conformity and the perceived impact of mental health for male and female students alike. The magnitude of the effects is comparable across genders, as indicated by the insignificant coefficient on the interaction term.

Table A4 reports heterogeneous effects on classroom interactions by gender. Consistent with the previous findings, an increase in the share of female peers has significant and similar effects for both female and male students across all types of experiences, with the exception of exposure to diminishing comments, for which no significant effects are detected for either group.

Table A5 presents the heterogeneous effects of peers' gender composition on academic performance. A higher share of female classmates improves academic performance for both male and female students, as shown in Column 1. The interaction term is only marginally significant, suggesting somewhat larger gains for girls. Improvements in grades in quantitative exams are driven primarily by female students (Column 2). Finally, a greater proportion of female peers increases both the share of exams passed within a year and persistence in the field of study to a similar extent for male and female students.

7.2.2 By High-School Performance

The effect of peer gender composition on student outcomes may plausibly vary by prior performance. Students with lower prior performance may be more susceptible to environmental factors, as they

(2011), Briole (2021), Dewan, Ray, Chaudhuri, and Tater (2024), Zhang (2025), Huang, Huang, Shi, and Zhang (2025), Goulas, Megalokonomou, and Zhang (2023), Lao (2023))

often lack established learning strategies or confidence in academic settings. A higher proportion of female peers may foster a more cooperative, disciplined, and academically oriented classroom climate, which could disproportionately benefit these students (Carrell et al., 2013).

To explore whether the impact of female peers varies depending on students' prior academic performance, we estimate heterogeneous treatment effects by terciles of end-of-high-school exam scores. We define three performance groups—bottom, middle, and top terciles—based on students' relative standing in the national final high-school exam taken before university admission. This stratification allows us to examine whether students with different academic backgrounds respond differently to peer gender composition.

Figure 7 presents the results. A higher proportion of female peers is associated with a reduction in conformity to masculinity attitudes, particularly among low-performing students—those in the bottom 25% of the end-of-high-school exam distribution. We find no evidence of differential effects on perceived academic impact of mental health across performance groups. In contrast, the positive impact of female peers on academic performance appears to be largely driven by students with lower prior achievement. Finally, we find that top-performing students are less likely to report that peers attempt to engage more or be more friendly with the most successful students.

7.2.3 By Classroom Gender Composition

In addition, we explore whether the effect of peer gender composition varies non-linearly with the overall classroom-level proportion of female peers. Specifically, we examine whether the impact of an increase in female peers differs between classrooms with relatively low versus high female shares.

We split the sample according to whether the proportion of female peers in a given classroom falls into the first, second, or third tercile of the distribution. Figure 8 reports the estimated effects from model (1) for these sub-samples.

For cognitive outcomes (GPA), the coefficient on the share of female peers is consistently positive across terciles, although not always significant. Turning to climate outcomes, however, the positive influence of female peers is particularly pronounced in classrooms where the share of female students lies in the first and second terciles—namely, between 0.13 and 0.30 (first tercile) and between 0.30 and 0.40 (second tercile). In contrast, in the third tercile (between 0.40 and 0.88), the estimated coefficient for hearing that high grades are needed for success switches sign and becomes positive and statistically significant. A similar sign reversal is observed for the perceived impact on mental health, although the estimate is not statistically significant.

Taken together, these findings point to non-linearities in peer gender effects: the benefits of a higher share of female peers on classroom climate appear strongest at lower and intermediate levels, while at higher levels the relationship becomes less consistent across outcomes, potentially reflecting different peer dynamics or norms once a critical mass is reached.

7.2.4 By Gender Composition of teachers' pool

Finally, to explore whether the impact of female peers varies with students' exposure to female teachers in mandatory classes, we define three exposure groups—bottom, middle, and top terciles—based on students' relative exposure to female teachers in these courses. We then estimate heterogeneous treatment effects across these terciles of female teacher exposure. This approach allows us to examine whether students who experienced different levels of exposure to female teachers within the same course respond differently to peer gender composition (see Figure 9). Overall, the results are not statistically significant: the share of female teachers does not appear to drive the effect of peer gender composition on our outcomes of interest.

7.3 Placebo Exercises

One potential concern is that the observed effects of peer gender composition on students' masculinity related attitudes, perceived academic impact of poor mental health, classroom interactions and academic performance may be driven by unobserved factors or spurious correlations. To address this, we conduct two placebo tests. Specifically, we replace our main variable of interest—the leave-out proportion of female peers in a student's own classroom—with the proportion of female peers in: (1) the same course, class, and year level, but from the previous cohort year; and (2) the following cohort year. Since students do not share classes with peers from earlier or later cohorts, we do not expect peer composition in those years to affect their outcomes.

Out of 12 outcomes, the share of female peers in the previous year only correlates with greater attention to successful peers, while the share in the following year predicts only a lower likelihood of sharing notes (see table A6). These results provide reassurance that our main findings are not driven by unobserved confounding factors or mechanical correlations, reinforcing the internal validity of our identification strategy.

8 Discussion and Conclusion

This paper provides new evidence on how peer gender composition shapes students' university experience. Exploiting the random allocation of students to classes within degree programs at an Italian university, we show that a higher proportion of female peers systematically shifts multiple dimensions of the classroom environment. Greater exposure to female classmates is associated with lower conformity to masculinity-related attitudes, lower perceived academic impact of mental health, more collaborative classroom interactions, and higher academic performance. These effects are observed for both male and female students, although their magnitude varies across outcomes.

Our analysis estimates reduced-form peer effects. We document parallel changes in normative attitudes, perceived academic constraints, interaction patterns, and performance. We do not attempt

to isolate a single mechanism linking these dimensions. Instead, the evidence suggests that peer gender composition operates as a structural feature of the classroom environment, influencing the salience of masculinity-related attitudes, perceived mental health impact and broader interaction dynamics. The fact that multiple outcomes shift simultaneously is consistent with peer composition affecting the overall classroom equilibrium rather than a single behavioral channel.

These findings contribute to the literature on gender diversity by highlighting peer composition as a determinant of local normative environments in educational settings. While much of the existing evidence focuses on workplace contexts, our results indicate that gender composition during formative university years is associated with systematic changes across both socio-emotional and academic domains. The effects extend beyond grades to encompass perceived academic burden and classroom interaction patterns, dimensions that are central to students' engagement and human capital accumulation.

From a policy perspective, the results indicate that increasing female representation in traditionally male-dominated fields can alter the broader classroom environment in ways that affect attitudes, perceived academic constraints, interactions and performance outcomes. By documenting these multidimensional effects, this study shows that peer gender composition is relevant not only for specialization and field choice, but also for the social and productive environment in which learning takes place.

Future research may explore how such equilibrium shifts unfold in different institutional contexts and over longer time horizons, and whether similar patterns emerge in other competitive environments beyond higher education.

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Tables and Figures

Table 1: Descriptive Statistics

	Mean	SD	Min	Max	N
Panel A: Demographics					
Female Student	0.37	0.48	0	1	3,131
Student Born Outside Italy	0.13	0.34	0	1	3,131
Students Born in North Italy	0.47	0.50	0	1	3,131
Living in a City with More than 200k Residents	0.35	0.48	0	1	3,131
Student has Older Brother	0.26	0.44	0	1	3,131
Student has Younger Brother	0.24	0.43	0	1	3,131
Student has Older Sister	0.23	0.42	0	1	3,131
Student has Younger Sister	0.27	0.44	0	1	3,131
Panel B: High-School Information					
Student' s End of High-School Grade	94.13	7.57	60	100	3,131
Scientific Lyceum	0.57	0.49	0	1	3,131
Classical Lyceum	0.17	0.38	0	1	3,131
Artistic Lyceum	0.02	0.13	0	1	3,131
Linguistic Lyceum	0.04	0.20	0	1	3,131
Technical School	0.05	0.21	0	1	3,131
Professional or Vocational School	0.00	0.03	0	1	3,131
Panel C: Course Information					
Economics and Finance	0.31	0.46	0	1	3,131
Management	0.64	0.48	0	1	3,131
Management of Art and Culture	0.05	0.21	0	1	3,131
Panel D: Explanatory Variables					
Prop. of Female Classmates	0.36	0.14	0	1	3,131
Panel E: Masculinity Attitudes					

Conformity to Masculinity	3.17	0.66	1	5	3,131
Perception of Peers' Conformity to Masculinity	3.31	0.54	1	5	3,131
Panel F: Perceived Academic Impact of Mental Health					
Student's Mental Health affects Academic Performance	3.42	1.08	1	5	3,131
Panel G: Classroom Interactions					
Experience Peers Sharing Notes	3.47	1.16	0	5	3,131
Experience Greater Attention to Successful Peers	2.52	1.25	0	5	3,131
Experience Diminishing Comments	2.02	1.16	0	5	3,131
Heard High Grade needed for Success	3.11	1.38	0	5	3,131
Panel H: Academic Performance					
GPA	26.56	2.50	18	31	3,131
GPA (Quantitative)	26.19	2.84	18	31	3,131
GPA (Qualitative)	26.92	2.83	18	31	3,131
Share of Exams (Out of Total)	0.91	0.17	0.12	1	3,131
Plan to Stay Same Course for Master	0.25	0.43	0	1	3,131

Notes: The table reports descriptive statistics for student characteristics for students who answered the survey.

Table 2: Correlations across students' outcomes

	Experience peers sharing notes	Experience greater attention to successful peers	Experience diminishing comments	Heard high grade needed for success	GPA (Std.)	GPA (Std.) Quantitative	GPA (Std.) Qualitative	Share of Exams (Out of Total)	Plan to stay Same course for master
	(1)	(2)	(3)	(4)	(5)	(6)	87)	(8)	(9)
	Panel A: Correlation between Conformity to Masculinity, Class Experiences and Academic Performance								
Conformity to Masculinity	-0.008	0.039***	-0.030	0.006	0.097***	0.105***	0.040	-0.003	0.028**
	(0.034)	(0.012)	(0.032)	(0.039)	(0.027)	(0.026)	(0.027)	(0.004)	(0.011)
	Panel B: Correlation between Perceived Academic Impact of Mental Health, Class Experiences and Academic Performance								
Perceived Academic Impact of Mental Health	-0.089***	0.028***	0.117***	0.079***	-0.183***	-0.181***	-0.136***	-0.005**	-0.020***
	(0.020)	(0.007)	(0.019)	(0.023)	(0.016)	(0.016)	(0.016)	(0.002)	(0.007)

Notes: This table reports estimates from a series of regressions examining the relationship between conformity to masculinity (Panel A) and perceived academic impact of mental health (Panel B) as explanatory variables for several outcomes. Columns 1–4 report associations with various classroom experiences, while columns 5-9 report associations with academic performance outcomes. 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-value < 0.1; ** p-value< 0.05; *** p-value< 0.01.

Table 3: 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		-0.002							-0.002
		(0.002)							(0.002)
Student has Older Brother			-0.002						-0.002
			(0.002)						(0.002)
Student has Younger Brother				-0.001					-0.001
				(0.002)					(0.002)
Student has Older Sister					0.003*				0.003
					(0.002)				(0.002)
Student has Younger Sister						0.000			0.001
						(0.002)			(0.002)
Student Born Outside Italy							0.002		0.003
							(0.003)		(0.003)
Students Born in North Italy								0.001	0.001
								(0.002)	(0.002)
Obs	3,131	3,131	3,131	3,131	3,131	3,131	3,131	3,131	3,131
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-value < 0.1; ** p-value< 0.05; *** p-value< 0.01.

Table 4: Effect of Proportion of Female Peers on Students' Survey Response

	Student Answered Survey = 1	
	(1) OLS	(2) Probit
Prop. of Female Classmates	-0.208	-0.900
	(0.131)	(0.562)
Female Student	-0.001	0.000
	(0.007)	(0.027)
Av. Baseline Class Performance	0.001	0.002
	(0.000)	(0.002)
Obs	17,387	17,387
Mean Y	0.18	0.18
St Dev Y	0.38	0.38
Course-Year FE	Yes	Yes
Student Controls	Yes	Yes

Notes: The table reports the estimated effects of peer gender composition on the likelihood of survey response. Column 1 presents results from an OLS model, and Column 2 from a Probit model. All regressions include course-by-year fixed effects, student-level controls, and classroom-level controls. Student-level controls include gender, whether the student was born in Italy or abroad, and whether the student was born in Northern Italy. Classroom-level controls include the average baseline performance of peers in compulsory subjects, calculated using leave-one-out means. Standard errors are clustered at the class level. * p-value < 0.1; ** p-value< 0.05; *** p-value< 0.01.

Table 5: Effect of Proportion of Female Peers on Students' Masculinity Attitudes and on Perceived Academic impact of Mental Health

	Conformity to Masculinity	Perception of Peers' Conformity to Masculinity	Perceived Academic Impact of Mental Health
	(1)	(2)	(3)
Prop. of Female Classmates	-0.628**	0.054	-0.706*
	(0.258)	(0.152)	(0.382)
Female Student	-0.347***	-0.060***	0.315***
	(0.021)	(0.022)	(0.043)
Av. Baseline Class Performance	0.001	-0.003*	0.001
	(0.002)	(0.002)	(0.003)
Obs	3,131	3,131	3,131
Mean Y	3.17	3.31	3.42
St Dev Y	0.66	0.54	1.08
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 attitudes (Column 1), students' perceptions of peers' conformity to masculinity attitudes (Column 2), students' beliefs on how their levels of mental health affects academic performance (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. Standard errors are clustered at the class level. * p-value < 0.1; ** p-value< 0.05; *** p-value< 0.01.

Table 6: Effects of proportion of female peers on measures of classroom interactions

	(1) Experience Peers Sharing Notes	(2) Experience Greater Attention to Successful Peers	(3) Experience Diminishing Comments	(4) Heard High Grade needed for Success
Prop. of Female Classmates	1.229**	-1.235**	0.257	-1.503**
	(0.559)	(0.593)	(0.436)	(0.728)
Obs	3,131	3,131	3,131	3,131
Mean Y	3.47	2.52	2.02	3.11
St Dev Y	1.16	1.25	1.16	1.38
Course-Year FE	Yes	Yes	Yes	Yes
Student Controls	Yes	Yes	Yes	Yes

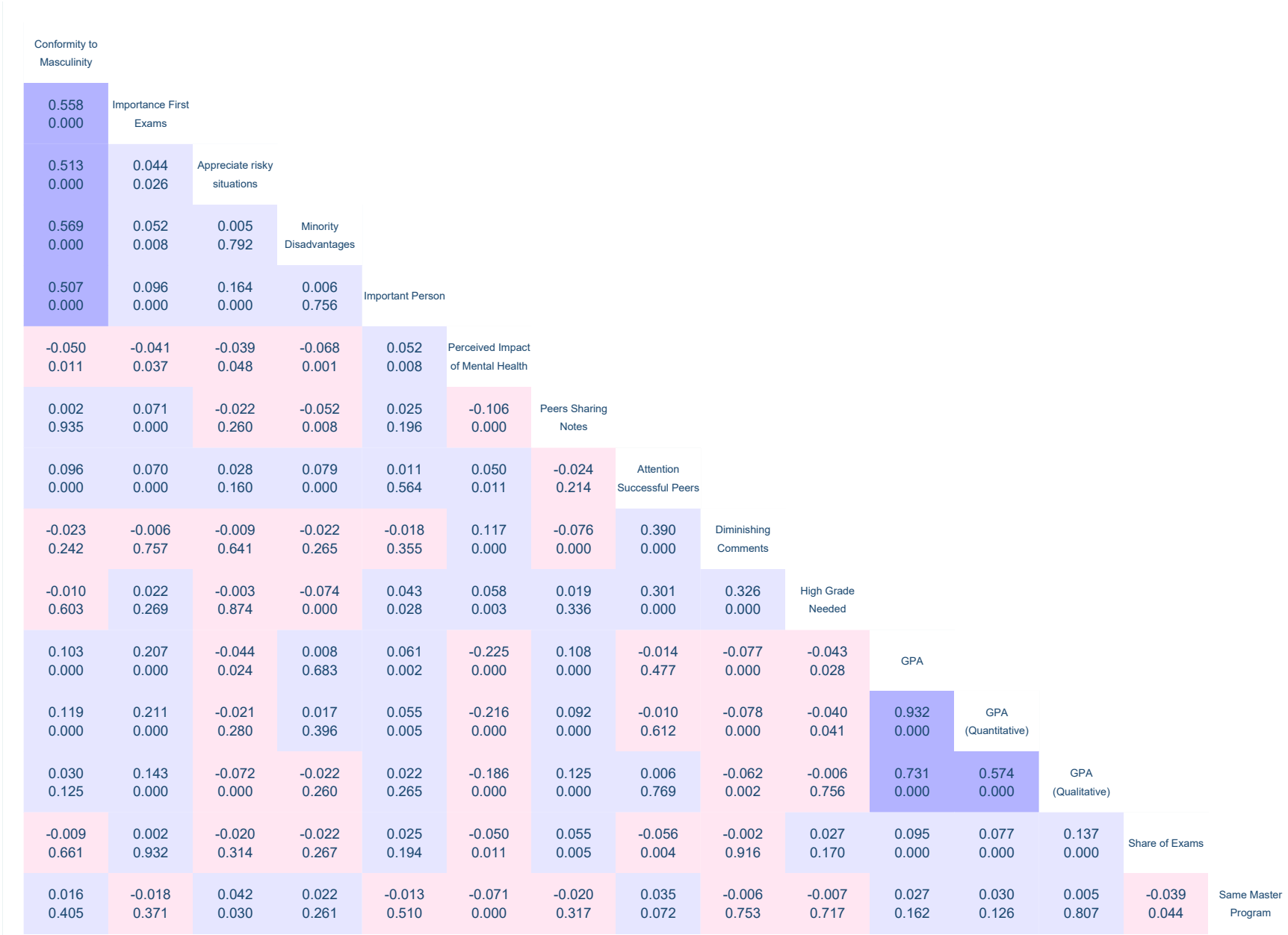
Notes: The table reports the estimated effects of peer gender composition on the likelihood that students experience four different situations in the classroom. Students were asked: "Have you ever experienced one of the following circumstances during your time at Bocconi?" The corresponding outcomes are: (1) "Peers sharing notes or helping each other with course content"; (2) "Students trying to talk more and be more friendly with the most successful peers"; (3) "Direct diminishing comments or questions aimed at underestimating someone's intellectual value in front of others or in a one-on-one interaction"; and (4) "Heard saying that you have to take a high grade on specific exams to signal your ability in order to achieve certain goals (e.g., being hired by a firm or accepted into a Ph.D. program)." Responses are coded on a scale from 1 (Never) to 5 (Always). All regressions include course-by-year fixed effects, student-level controls, and classroom-level controls. Student-level controls include gender, number and gender of siblings, whether the student was born in Italy or abroad, whether they were born in Northern Italy, and the size of the city of residence. Classroom-level controls include the average baseline performance of peers in compulsory subjects, calculated as leave-one-out means. Standard errors are clustered at the class level. * p-value < 0.1; ** p-value< 0.05; *** p-value< 0.01.

Table 7: Effect of Proportion of Female Peers on Academic Outcomes

	(1) GPA (Std.)	(2) GPA (Std.) Quantitative	(3) GPA (Std.) Qualitative	(4) Share of Exams (Out of Total)	(5) Plan to Stay Same Course for Master
Prop. of Female Classmates	1.132**	0.767*	0.660	0.162*	0.253*
	(0.438)	(0.434)	(0.628)	(0.089)	(0.146)
Female Student	-0.167***	-0.187***	-0.001	0.004	-0.017
	(0.040)	(0.040)	(0.034)	(0.006)	(0.017)
Av. Baseline Class Performance	-0.009***	-0.011***	-0.004**	-0.001***	-0.004***
	(0.002)	(0.003)	(0.002)	(0.000)	(0.001)
Obs	3,131	3,131	3,131	3,131	3,131
Mean Y	0.00	0.00	0.00	0.92	0.25
St Dev Y	1.00	1.00	1.00	0.17	0.43
Course-Year FE	Yes	Yes	Yes	Yes	Yes
Student Controls	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the estimated effects of peer gender on students' performance (Columns 1-3), on the proportion of exams given (Column 4), and on the reported likelihood of enrolling in the same course for Master Degree (Column 5). Students' GPAs are standardized within each year and grade level. 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. Standard errors are clustered at the class level. * p-value < 0.1; ** p-value< 0.05; *** p-value< 0.01.

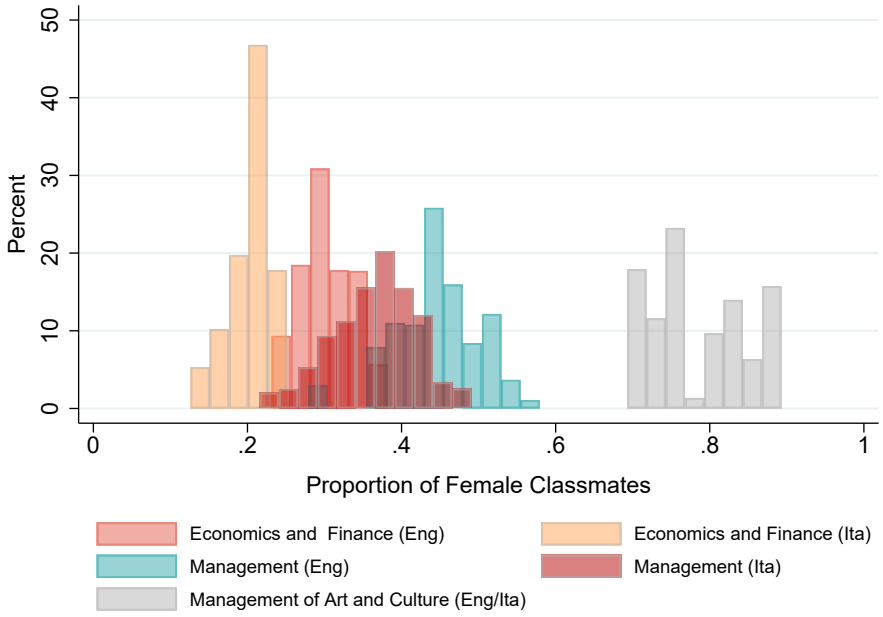
Figure 1: Correlation Matrix Between Outcomes



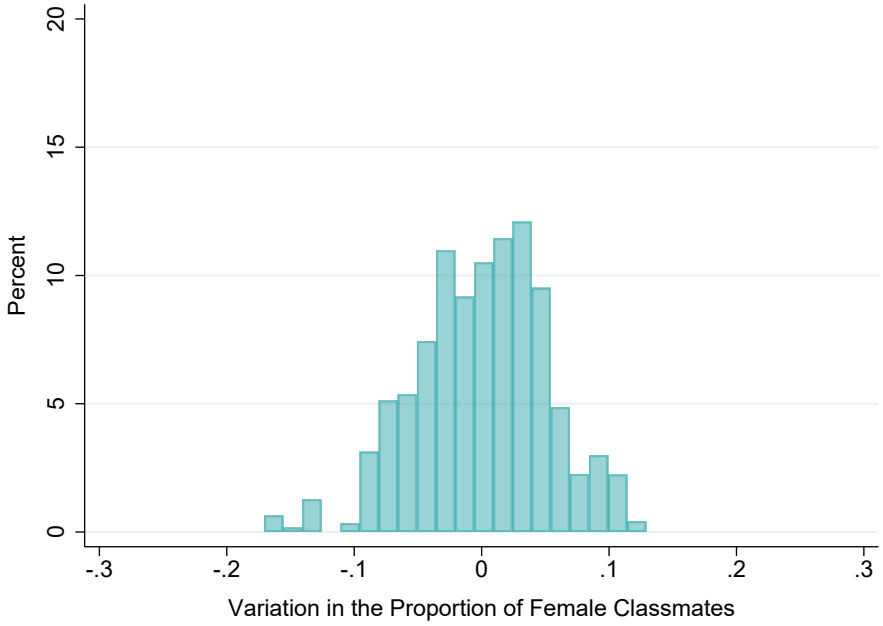
Notes: This figure displays the pair-wise individual correlation matrix between all the outcomes analyzed. Cooler colours indicate stronger positive correlations.

Figure 2: Proportion of Female Classmates

(A) By Undergraduate Course

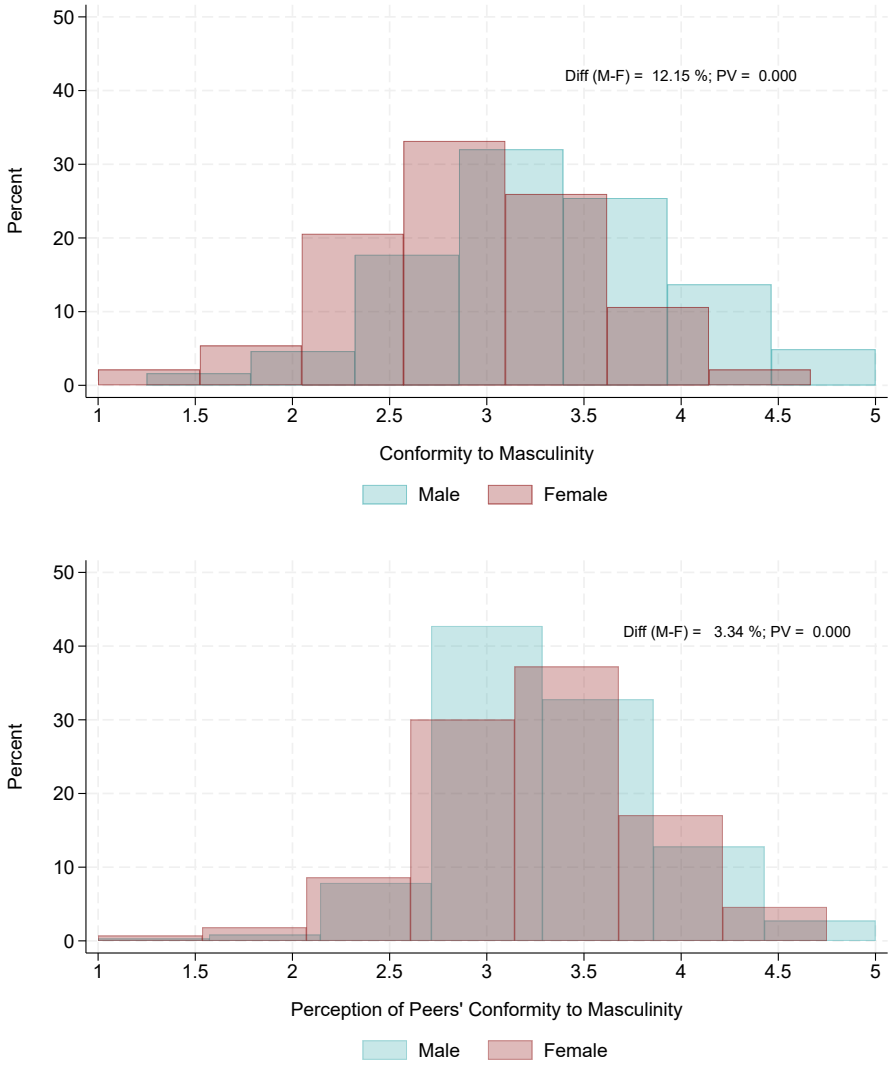


(B) Residual Variation After Accounting for Course-Year FE



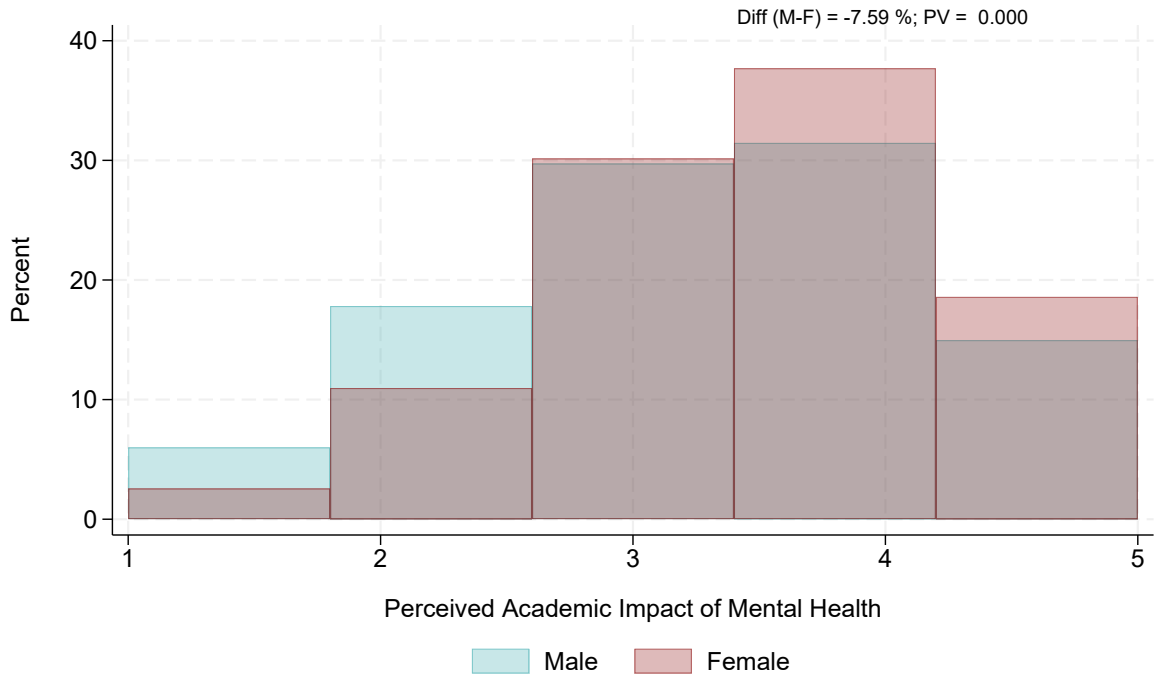
Notes: The figure displays the distribution of the proportion of female classmates. Panel (A) presents the distribution separately for the three undergraduate programs, while Panel (B) shows the distribution adjusted for course-by-year influences through regression. The variation in Panel (B) forms the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

Figure 3: Distributions of Students' and Peers' Conformity to Masculinity, by Gender



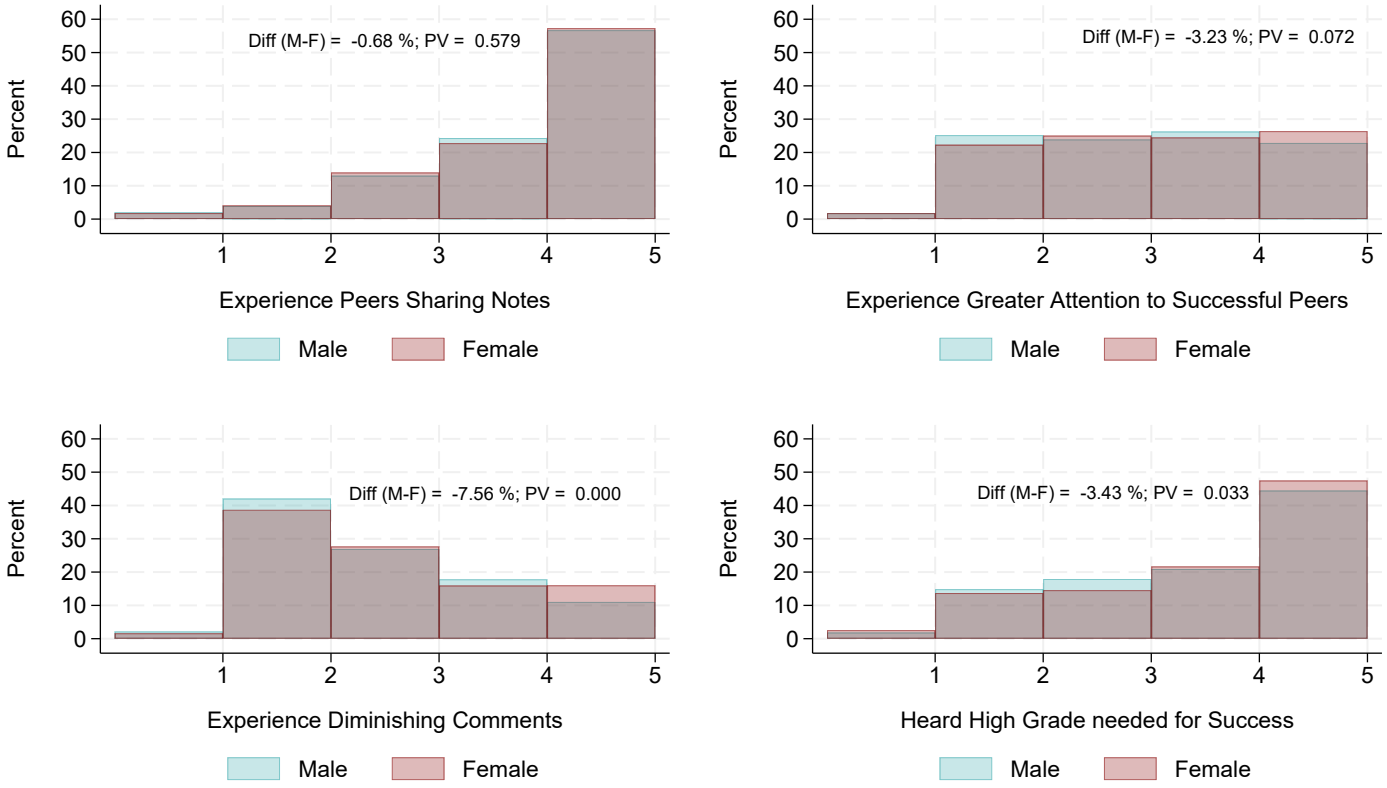
Notes: The upper figure shows the distribution of students' conformity to masculinity, as measured in the survey, separately for male and female students. The lower figure shows the distribution of students' beliefs about their peers' conformity to masculinity, as measured in the survey, separately for male and female students.

Figure 4: Distributions of perceived academic impact of mental health



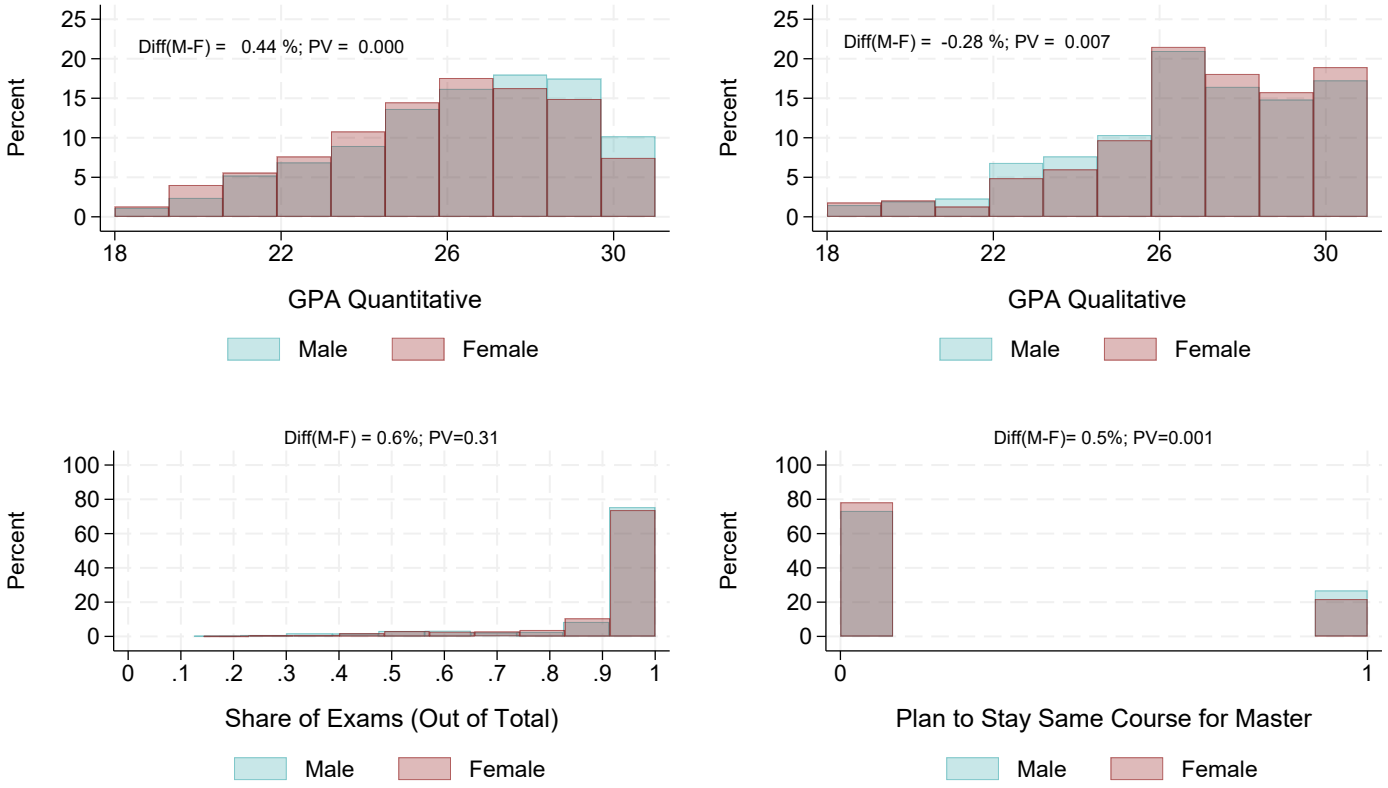
Notes: This Figure shows the distribution of perceived academic impact of mental health, as measured in the survey, separately for male and female students. Specifically, students were asked "How much do you think your mental health, for example your level of worry and anxiety, have affected your academic performance?" Responses range from 1 (None at all) to 5 (A great Deal).

Figure 5: Distributions of measures of classroom interactions, by gender



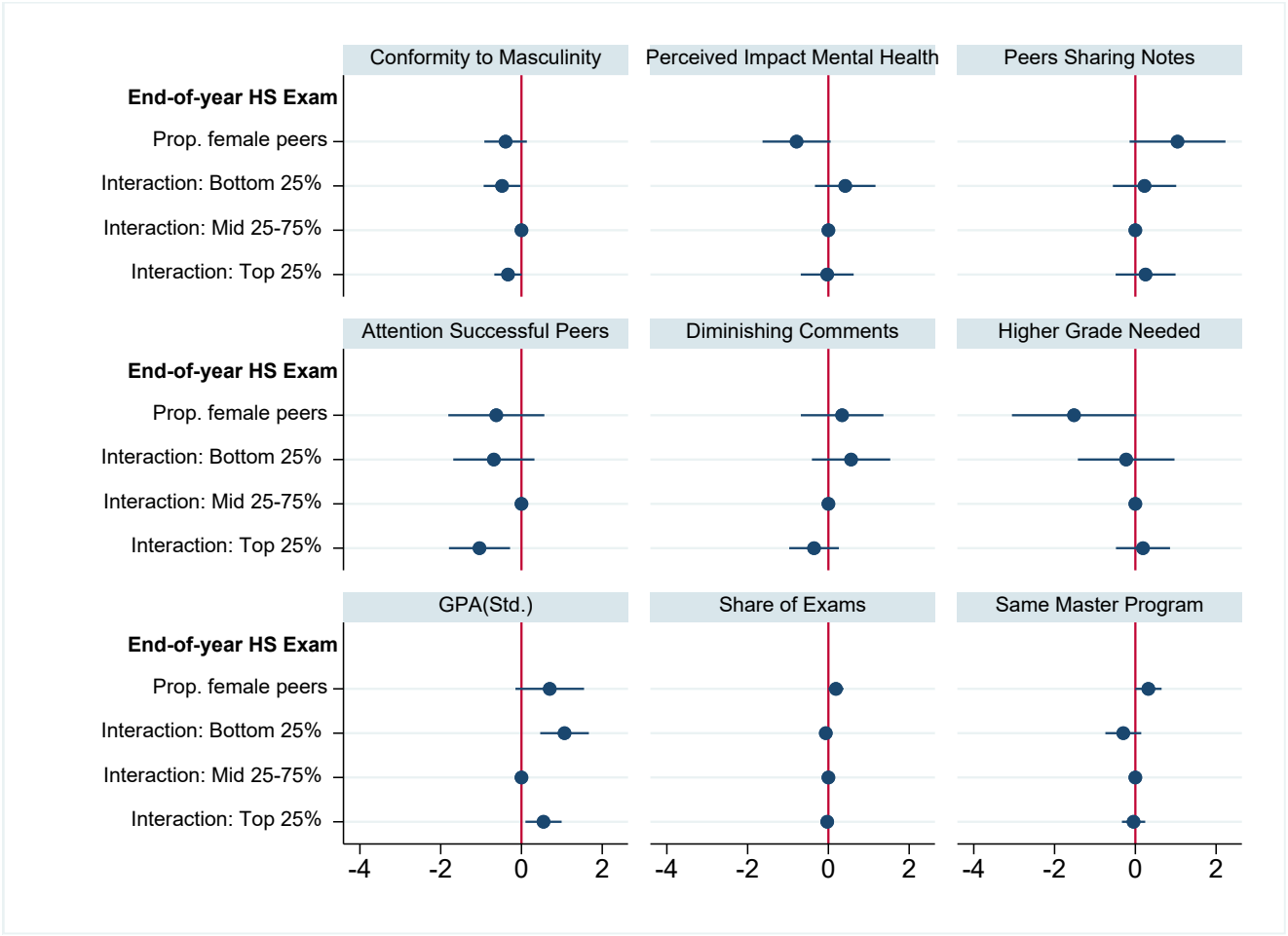
Notes: This Figure shows the distribution of measures of classroom interactions, as measured in the survey, separately for male and female students. Students were asked: "Have you ever experienced one of the following circumstances during your time at Bocconi?" The corresponding outcomes are: (1) "Peers sharing notes or helping each other with course content"; (2) "Students trying to talk more and be more friendly with the most successful peers"; (3) "Direct diminishing comments or questions aimed at underestimating someone's intellectual value in front of others or in a one-on-one interaction"; and (4) "Heard that you have to take a high grade on specific exams to signal your ability in order to achieve certain goals (e.g., being hired by a firm or accepted into a Ph.D. program)."

Figure 6: Distributions of students' academic outcomes, by gender



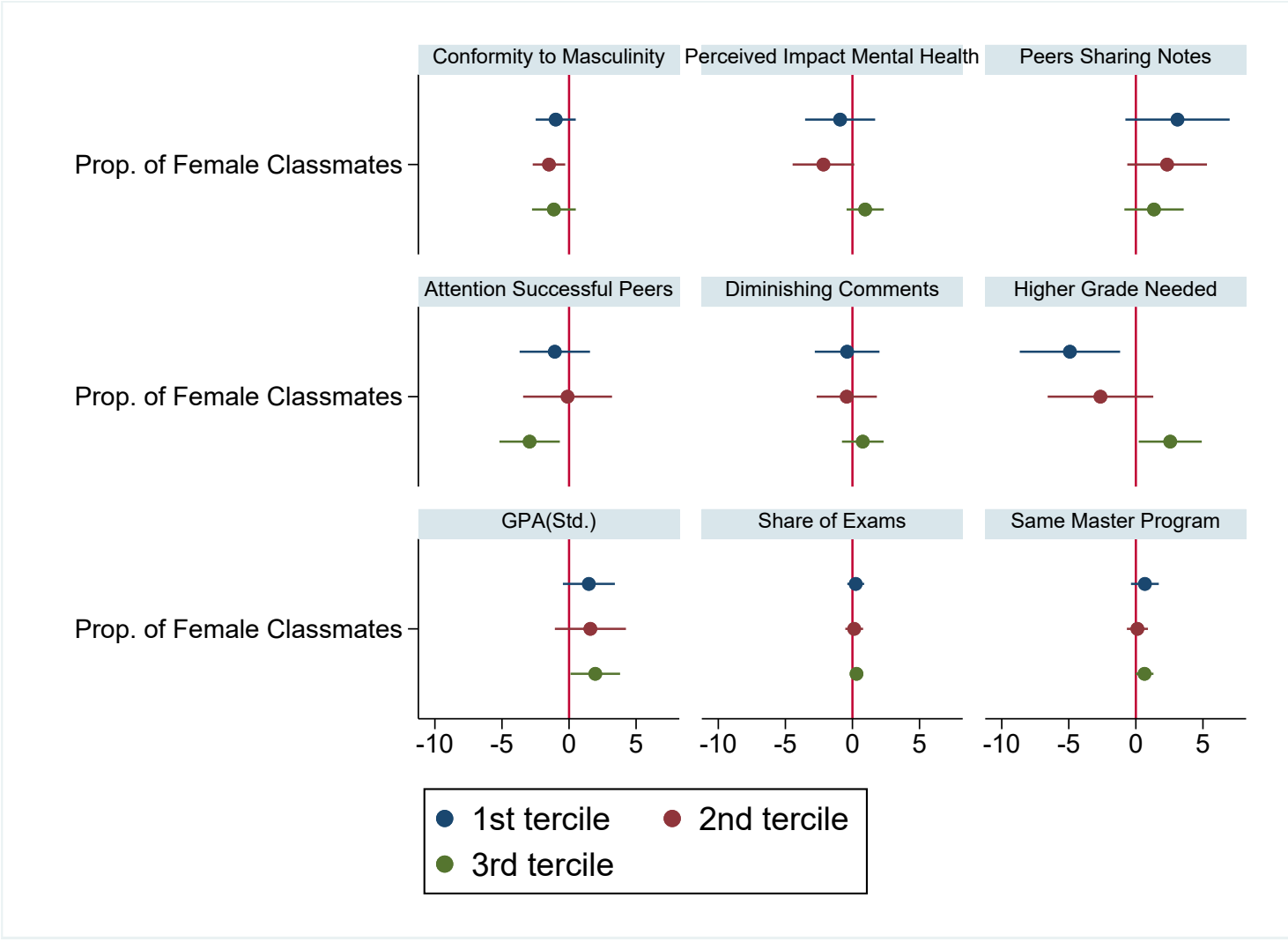
Notes: This Figure shows the distribution of students' academic outcomes, separately for male and female students. Specifically, dependent variables are average GPA of quantitative and qualitative exams, the share of exams taken out of the total courses offered in a given year, and a dummy equal to one if the student report his/her intention to stay in the same course for the Master Degree.

Figure 7: Heterogeneous Effect of Peer Composition, by Prior Performance



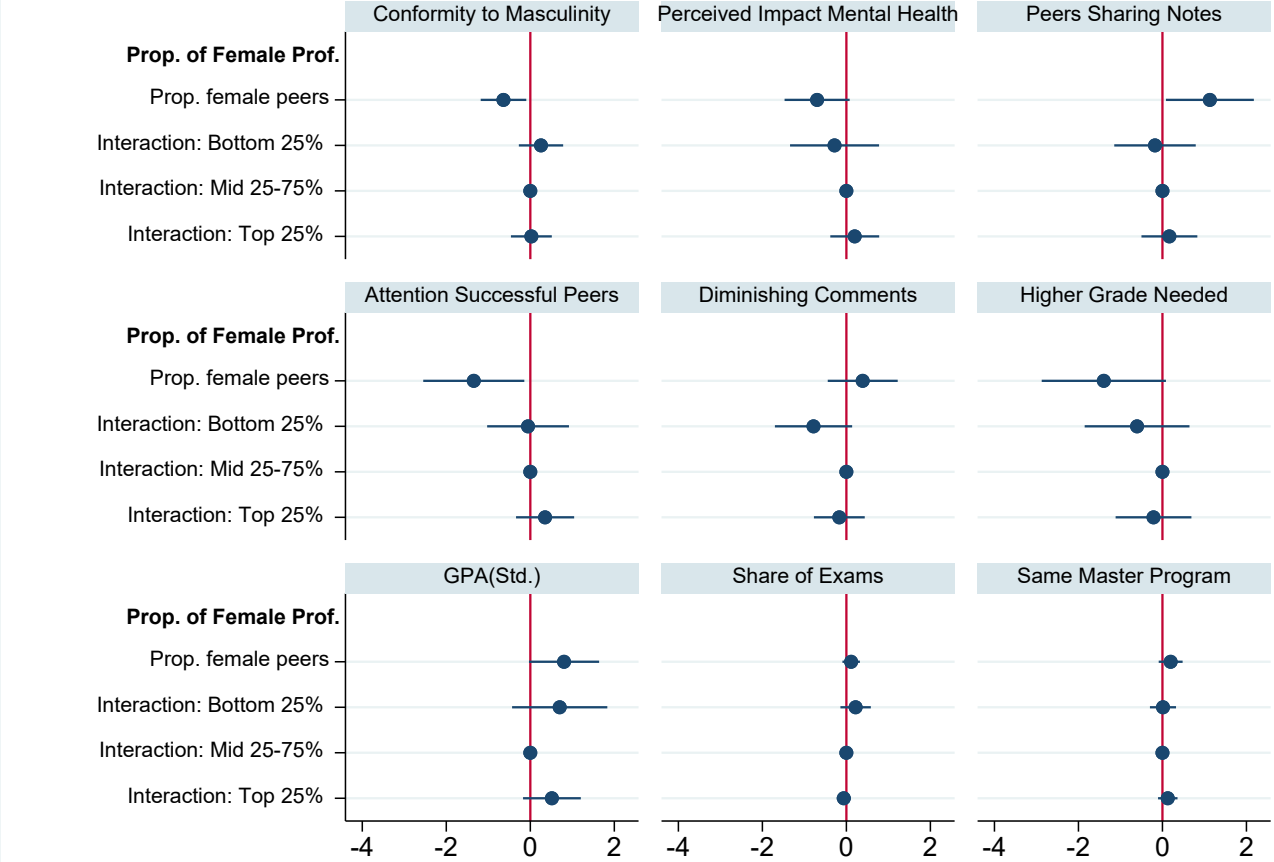
Notes: This figure plots the estimated coefficients and 95% confidence intervals for the estimate of the proportion of female peers, and the interaction between the proportion of female peers and terciles of students' prior academic performance, measured by the end-of-high-school exam score. The reference group is the middle tercile (25–75th percentile). Dependent variables are specified at the top of the pictures. 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. Standard errors are clustered at the class level.

Figure 8: Heterogeneous effect of Peer Composition: first, second and third tercile of the Share of Female Peers



Notes: This figure plots the estimated coefficients and 95% confidence intervals for the effect of the proportion of female peers, separately for students in classrooms where the proportion of female peers is in the first, second and third tercile of the share of female peers distribution. Dependent variables are specified at the top of the pictures. 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. Standard errors are clustered at the class level.

Figure 9: Heterogeneous effect of Peer Composition, by the Share of Female Teachers



Notes: This figure plots the estimated coefficients and 95% confidence intervals for the effect of the proportion of female peers, separately for students in classrooms where the proportion of female professors is in the top 25%, in the mid. 25%-75% and in the bottom 25%. Dependent variables are specified at the top of the pictures. 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. Standard errors are clustered at the class level.

Appendix A: Additional Tables and Figures

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	7,909	0.41	0.49	4,778	0.37	0.48	3,131	0.04	0.00
Student Born Outside Italy	0.18	0.38	7,909	0.21	0.40	4,778	0.13	0.34	3,131	0.07	0.00
Students Born in North Italy	0.43	0.49	7,909	0.40	0.49	4,778	0.47	0.50	3,131	-0.07	0.00
Student' s End of High-School Grade	93.04	8.08	7,909	92.33	8.32	4,778	94.13	7.57	3,131	-1.80	0.00
Scientific Lyceum	0.55	0.50	7,907	0.53	0.50	4,776	0.57	0.49	3,131	-0.05	0.00
Classical Lyceum	0.16	0.36	7,907	0.15	0.36	4,776	0.17	0.38	3,131	-0.02	0.02
Artistic Lyceum	0.02	0.13	7,907	0.01	0.12	4,776	0.02	0.13	3,131	-0.00	0.35
Linguistic Lyceum	0.04	0.19	7,907	0.04	0.19	4,776	0.04	0.20	3,131	-0.00	0.43
Technical School	0.04	0.20	7,907	0.04	0.19	4,776	0.05	0.21	3,131	-0.01	0.02
Professional or Vocational School	0.00	0.03	7,907	0.00	0.03	4,776	0.00	0.03	3,131	0.00	0.90
Undergraduate in Economics/Policy	0.10	0.30	7,909	0.13	0.34	4,778	0.05	0.21	3,131	0.09	0.00
Undergraduate in Management/Marketing	0.65	0.48	7,909	0.66	0.47	4,778	0.64	0.48	3,131	0.02	0.16
Undergraduate in Finance	0.25	0.43	7,909	0.21	0.40	4,778	0.31	0.46	3,131	-0.10	0.00
Prop. of Female Classmates	0.40	0.16	7,909	0.42	0.17	4,778	0.36	0.14	3,131	0.06	0.00
GPA (Overall)	26.17	2.61	7,909	25.91	2.65	4,778	26.56	2.50	3,131	-0.65	0.00
GPA (Quantitative)	25.82	2.94	7,909	25.57	2.98	4,778	26.19	2.84	3,131	-0.62	0.00
GPA (Qualitative)	26.54	2.95	7,909	26.30	2.99	4,778	26.92	2.83	3,131	-0.62	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: Empirical p-value Check for Random Assignment of Students to Classroom, within Course-year

	Students
Empirical p-values (mean and SD)	0.3781
	(0.319)
Kolmogorov–Smirnov test	
(No. failed/ total tests)	0/42

Notes: This table shows the mean and SD of the empirical p-value described in Section 6.2. The Kolmogorov–Smirnov test test ensure that the empirical p-value is distributed uniformly.

Table A3: Effect of Proportion of Female Peers on Students' Masculinity Attitudes and on students' Perceived Impact of mental health, By Gender

	Conformity to Masculinity	Perception of Peers' Conformity to Masculinity	Perceived Academic Impact of Mental Health
	(1)	(2)	(3)
Prop. of Female Classmates	-0.644*	0.014	-0.528*
	(0.298)	(0.130)	(0.236)
Prop. of Female Classmates × Female Student	0.037	0.097	-0.426
	(0.478)	(0.265)	(0.460)
Obs	3,131	3,131	3,131
Mean Y	3.17	3.31	3.42
St Dev Y	0.66	0.54	1.08
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 (Column 1), students' perceptions of peers' conformity to masculinity (Column 2), and their levels of perceived academic impact of mental health (Column 3) as in Table 5. In addition, each regression includes an interaction term between the proportion of female classmates and the dummy for females, to assess whether the effect of female peers differs between male and female students. 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-value < 0.1; ** p-value< 0.05; *** p-value< 0.01.

Table A4: Effect of Proportion of Female Peers on Classroom Interactions, By Gender

	(1) Experience Peers Sharing Notes	(2) Experience Greater Attention to Successful Peers	(3) Experience Diminishing Comments	(4) Heard High Grade needed for Success
Prop. of Female Classmates	1.364**	-1.205**	0.254	-1.375*
	(0.562)	(0.592)	(0.466)	(0.773)
Prop. of Female Classmates × Female Student	-0.321	-0.072	0.008	-0.305
	(0.400)	(0.344)	(0.386)	(0.483)
Obs	3,131	3,131	3,131	3,131
Mean Y	3.47	2.52	2.02	3.11
St Dev Y	1.16	1.25	1.16	1.38
Course-Year FE	Yes	Yes	Yes	Yes
Student Controls	Yes	Yes	Yes	Yes

Notes: The table reports the estimated effects of peer gender on measures of classroom interactions, as in Table **??**. In addition, each regression includes an interaction term between the proportion of female classmates and the dummy for females, to assess whether the effect of female peers differs between male and female students. 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. Standard errors are clustered at the class level. * p-value < 0.1; ** p-value< 0.05; *** p-value< 0.01.

Table A5: Effect of Proportion of Female Peers on Students' Academic Performance, By Gender

	(1) GPA (Std.)	(2) GPA (Std.) Quantitative	(3) GPA (Std.) Qualitative	(4) Share of Exams (out of Total)	(5) Plan to Stay Same Course for Master
Prop. of Female Classmates	0.926**	0.562	0.633	0.162*	0.348**
	(0.466)	(0.470)	(0.645)	(0.091)	(0.171)
Prop. of Female Classmates × Female Student	0.492	0.489*	0.064	0.001	-0.227
	(0.316)	(0.293)	(0.279)	(0.045)	(0.180)
Obs	3,131	3,131	3,131	3,131	3,131
Mean Y	0.00	0.00	0.00	0.92	0.25
St Dev Y	1.00	1.00	1.00	0.17	0.43
Course-Year FE	Yes	Yes	Yes	Yes	Yes
Student Controls	Yes	Yes	Yes	Yes	Yes

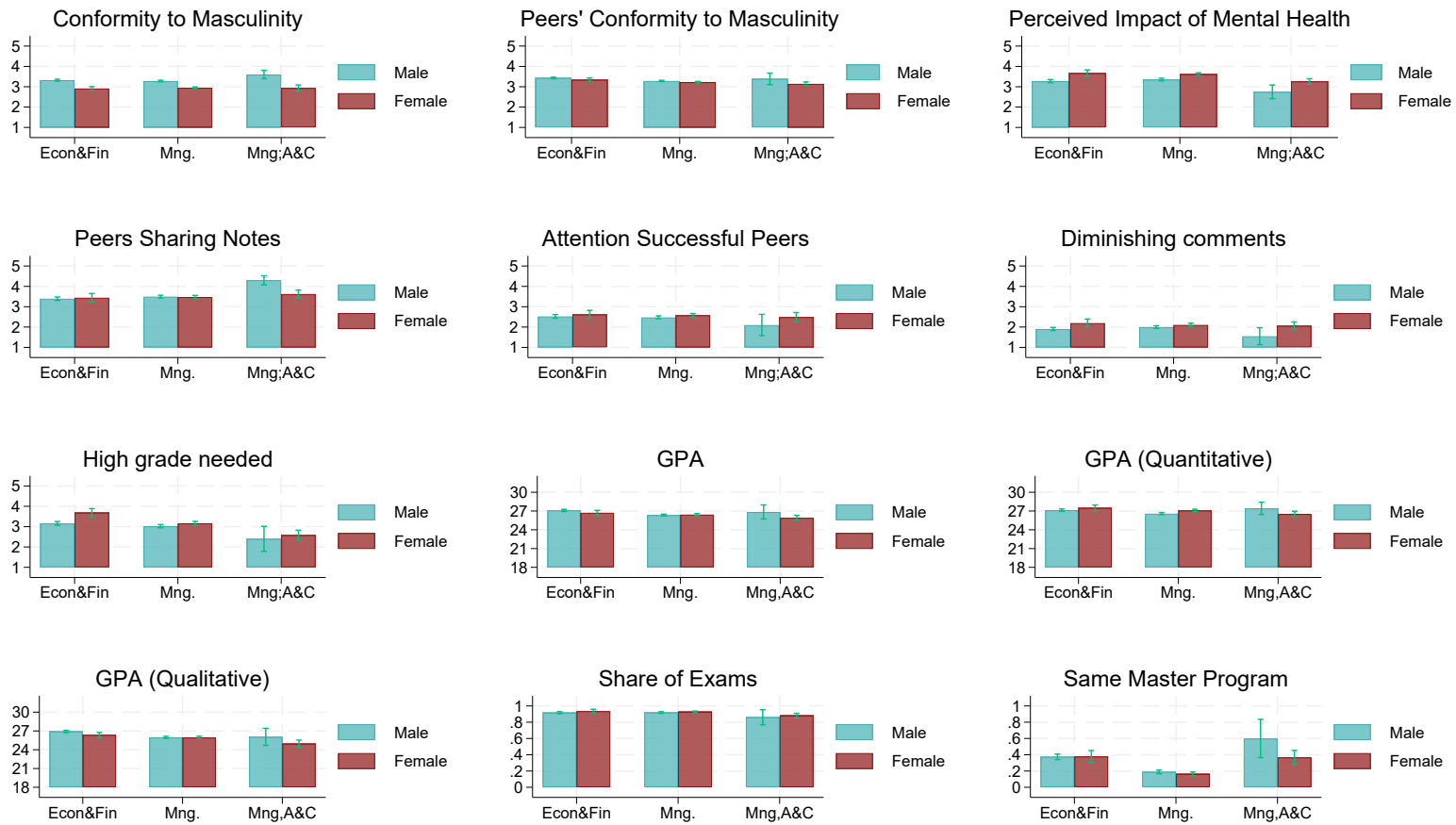
Notes: The table reports the estimated effects of peer gender on students' performance (Columns 1-3), on the proportion of exams given (Column 4), and on the likelihood to enroll in the same course for Master Degree (Column 5). Students' GPAs are standardized within each year and grade level. In addition, each regression includes an interaction term between the proportion of female classmates and the dummy for females, to assess whether the effect of female peers differs between male and female students. 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. Standard errors are clustered at the class level. * p-value < 0.1; ** p-value< 0.05; *** p-value< 0.01.

Table A6: Placebo Effects of Gender Composition of Peers in Previous and Later Years

	Conformity to Masculinity	Peers' Conformity to Masculinity	Perceived Impact of Mental Health	Peers Sharing Notes	Attention Successful Peers	Diminishing Comments	High Grade needed	GPA (Std.) All	GPA (Std.) Quantitative	GPA (Std.) Qualitative	Share of Exams	Same Master Program
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Previous Year, Same Class, Course, Grade	-0.066	0.150	0.455	-0.561	1.629**	0.004	0.157	-0.496	-0.711	-0.154	-0.099	0.134
	(0.185)	(0.135)	(0.367)	(0.290)	(0.456)	(0.343)	(0.414)	(0.297)	(0.334)	(0.155)	(0.064)	(0.227)
Obs	2,529	2,498	2,529	2,529	2,529	2,529	2,529	2,529	2,529	2,529	2,529	2,529
Later Year, Same Class, Course, Grade	0.512	0.116	-0.096	-0.622***	0.401	0.568	1.255	0.523	0.791	-0.375	0.046	0.134
	(0.332)	(0.223)	(0.478)	(0.088)	(1.435)	(0.532)	(0.743)	(0.702)	(0.571)	(0.999)	(0.043)	(0.104)
Obs	1,753	1,738	1,753	1,753	1,753	1,753	1,753	1,753	1,753	1,753	1,753	1,753

Notes: This table reports the estimates for the effect of peer composition on masculinity attitudes, perceived impact of mental health, and on measures of classroom interactions, where the main treatment effects are replaced with placebo effects. These placebo effects are calculated using 1] the proportion of female peers in the previous calendar year, but in the same class, course and grade; and 2] the proportion of female peers in the later calendar year, but in the same class, course and grade. 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. Standard errors are clustered at class level. Standard errors are clustered at the class level. * p-value < 0.1; ** p-value< 0.05; *** p-value< 0.01.

Figure A1: Students' Outcome, by Undergraduate Course



Notes: The figures show the distribution of masculinity attitudes, perceived academic impact of mental health, classroom interactions and academic performance, separately for male and female students, and for the three undergraduate programs (Economics and Finance, Management, and Management Art and Culture).