

Italian Statistical Society Series on Advances in Statistics

Francesca Martella
Serena Arima
Maria Francesca Marino
Cristina Mollica *Editors*

Statistical Science: From Theory to Applied Research III

SIS-FENStatS 2026, Short Papers,
Contributed Sessions 2



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Advances in Statistics**

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Francesca Martella · Serena Arima ·
Maria Francesca Marino · Cristina Mollica
Editors

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Assessing the Gender Peer Effect in University Enrolment in Italy

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Abstract. This paper investigates whether peer environments in upper secondary school influence the transition to university in Italy, with a specific focus on gendered dynamics. Using the MOBYSU.IT database, which links INVALSI administrative records on secondary school students with the National Student Registry on university enrolment, we analyse 13th grade students enrolled in 2018, 2019 and 2021, for a total of over 1.2 million individuals. We construct a school-level index aiming at measuring the degree of concentration in university field-of-study choices of school peers, female peers and male peers. We estimate two-level logistic models with students nested within school–year combinations for estimating students’ propensity in university enrollment. Results show a positive and statistically significant association between peer choice homogeneity and the likelihood of university enrolment. Moreover, the effect of same-gender peer homogeneity is stronger for female students, suggesting that gendered peer environments may reinforce aspirations and perceived access to higher education.

Keywords: Peer effects · University enrolment · School-level indicators · Italy

1 Background

University enrolment decisions are shaped by a complex interplay of social, cultural and individual factors. In Italy, peer environments and gender stereotypes are particularly salient in influencing post-secondary trajectories [1]. As in Europe women have progressively increased their participation in higher education [4, 5], in Italy women are over-represented in traditionally female-dominated areas, but their presence has also grown in STEM compared with the European average [6, 7]. Secondary school performance and curricular pathways explain this convergence [8].

Despite this, the role of classmates in shaping the transition to tertiary education remains underexplored. Research on peer effects has shown that classroom gender composition may impact on educational choices and academic outcomes. Male classmates improve their performance when exposed to a higher proportion of female classmates [9], but female-majority classes raise women’s achievement in academic tracks while

encouraging men to shift towards vocational pathways [10]. Moreover, exposure to same-gender peers may affect females' aspirations and subject choices, including entry into less gender-typical fields [11]. Peer composition interacts with contextual risk factors: high shares of low-performing or socio-economically dissimilar classmates can depress achievement, especially in highly gender-homogeneous classes [12]. Indeed, during adolescence peer environments shape academic confidence, aspirations and expectations that persist at the university level [13, 14]. Understanding whether and how peer influences carry over into the transition to university – considering both the two educational stages – is therefore essential to clarify the mechanisms underlying gendered enrolment patterns and field-of-study choices.

One key obstacle to this line of research has been the difficulty of linking secondary and tertiary administrative data. This study exploits the MOBYSU.IT database, which allows us to address three research questions: (RQ#1) how does homogeneity in field-of-study choices among school peers influence the probability of university enrolment? (RQ#2) how does homogeneity among same-gender peers affect enrolment, and does this differ between males and females? (RQ#3) does the influence of same-gender peers vary across high school curricula?

2 Data and Methods

This work intends to assess the impact of same-sex and different-sex peers within upper secondary schools, on university enrolment in Italy. To do so, we rely on the MOBYSU.IT¹ database, which merges two administrative data sources. The main data source is the Istituto Nazionale per la VALutazione del Sistema educativo di Istruzione e di formazione (INVALSI), i.e. the National Institute for the Evaluation of the Education and Training System. This dataset covers all Italian upper secondary schools and their students and allows us to examine students enrolled in the 13th grade during the 2018–2019, 2019–2020, and 2021–2022 school years (s.y.), who graduated in the same s.y. A second source is the Anagrafe Nazionale Studenti (ANS), i.e. the National Student Registry, which records information on all students enrolled in Italian universities from 2019–2020 to 2022–2023 academic years (a.y.). In total, our sample includes 1,256,785 students of 13th grade, of whom 674,983 enrolled in an Italian university in the year following graduation (Fig. 1).

2.1 School-level and Individual-level Variables

The database allows us to identify the geographical location, the school track, the field of study chosen for tertiary education studies, and consequently the specific university

¹ The data processed in accordance with the RESEARCH PROTOCOL FOR THE STUDY “From high school to the job placement: analysis of university careers and university mobility from Southern to Northern Italy” among the Ministry of University and Research, the Ministry of Education and Merit, the University of Palermo as the lead institution, and the INVALSI Institute. The reference researcher for the University of Florence is Bruno Bertaccini.

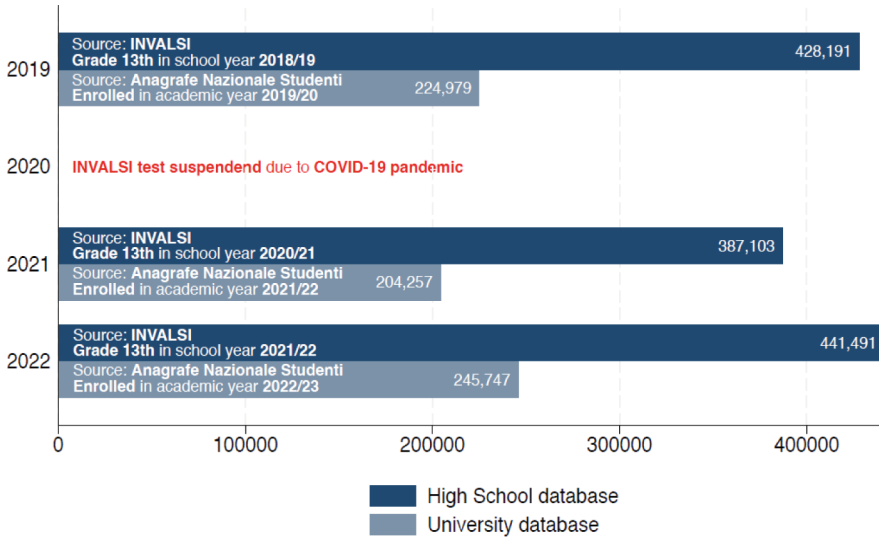


Fig. 1. Number of observations available by data source and cohort.

chosen by each student. Using this information, we are able to calculate a school-level indicator, called Choice Similarity Index (CSI) [15]:

$$CSI_j = \frac{\sum_k n_{j,k}(n_{j,k} - 1)}{N_j(N_j - 1)},$$

Where (j) denotes the upper secondary school of origin and (k) identifies a specific combination of one of the ten fields of study and a given university. Let $(n_{j,k})$ denote the number of students from school (j) who enrol in a given field of study at a specific university, and let (N_j) denote the total number of students from school (j) who enrol in an Italian university. The CSI measures the extent to which enrolment choices are concentrated among students from the same school. Higher values indicate that students from school (j) tend to cluster in a limited number of university–field-of-study combinations, whereas lower values indicate a more diversified distribution of enrolment choices across universities and fields of study.

Of course, for the purposes of this work it is very important to provide a deeper focus on gendered pattern, computing a Gendered Choice Similarity Index (GCSI), as:

$$GCSI_{gj} = \frac{\sum_k n_{gj,k}(n_{gj,k} - 1)}{N_{gj}(N_{gj} - 1)},$$

Where g represents the gender (male or female) of the selected students. The GCSI quantifies peer clustering in field of study choices, but specifically focusing on same-gender peers. Namely, for a female (male) student in school j , the GCSI value is calculated only for female (male) students in school j .

Then, we include in our analysis also individual-level covariates. The first variable analyzed is the student's gender, categorized in female or male. It is important to recall

that this study stands on administrative data, so that we identify with gender the biological sex. The second variable included in the models is an indicator summarizing the Economic, Social and Cultural Status (ESCS) of the family of origin [16] provided by the INVALSI Institute. Other individual-level covariates include native Italian citizenship and students' INVALSI scores in Italian and Mathematics obtained in the 13th grade.

On the other side, school-level covariates include curricula (i.e. traditional lyceums, other lyceums, and technical and vocational schools), macro-region (i.e. North, Centre, South and Islands), public vs. private school, and year fixed-effects.

2.2 Empirical Strategy

We adopt a two-level logistic model, in which students i are nested within school-year combinations j, t . This specification accounts for the hierarchical structure of the data and for the potential intra-school correlation in students' enrolment decisions. Formally, the likelihood of university enrolment is modelled as:

$$\logit P(Y_{ijt} = 1) = \beta_0 + \beta_1 CSI_{jt} + D'_{ijt}\theta + X'_{jt}\gamma + \delta_t + u_{0jt},$$

where Y_{ijt} denotes whether student i , from school j in year t , enrolls in university; CSI_{jt} (or, in alternative specifications, $GCSI_{jt}$) captures the degree of homogeneity in university field-of-study choices at the school-year level; D_{ijt} is a matrix collecting all individual-level covariates; X_{jt} includes observed school-level characteristics; δ_t are year fixed effects; and u_{0jt} is a random intercept at the school-year level, assumed to be normally distributed with mean zero and variance σ_u^2 . Within this framework, the coefficient on CSI_{jt} (or $GCSI_{jt}$) identifies the association between peer choice homogeneity and the individual probability of enrolment, net of both the individual characteristics summarised in D and the observed school characteristics included in X .

To investigate gender-specific peer dynamics (RQ#2), in the specifications using $GCSI$ we include an interaction term between the index and the student's gender. Moreover, we introduce interaction terms between school curriculum and selected individual-level controls, so to answer RQ#3.

3 Preliminary Results

Figure 2 reports the estimated association between peer choice homogeneity and the likelihood of university enrolment. Looking at Model 1, the results show a positive and statistically significant relationship between the CSI and individual enrolment: students attending schools where peers' post-secondary choices are more concentrated in a limited set of combinations between universities and fields of study - namely, with a high CSI value - are more likely to enroll in higher education.

When focusing on gender-specific peer dynamics, the evidence reveals meaningful heterogeneity. The interaction between the $GCSI$ and the female dummy (Model 2) indicates that the positive association between same-gender peer homogeneity and enrolment is stronger for female students than for males. Women appear more responsive to clustering within their same-gender peer group, consistent with the idea that gendered peer environments may reinforce the perceived feasibility of university pathways.

Analyses by curriculum track (not shown and answering our RQ#3) indicate that both the magnitude and, to some extent, the direction of these associations vary across school types. In particular, peer homogeneity appears to play a relatively stronger role for males in lyceums, whereas in technical and vocational tracks the association is more pronounced for females. Taken together, these preliminary findings suggest that peer effects are not uniform, but instead interact with both gender and institutional context in shaping the transition from upper secondary education to university.

Further research will be devoted to refining these preliminary results in order to confirm the positive association between peers’ post-secondary education choices and the likelihood of university enrolment.

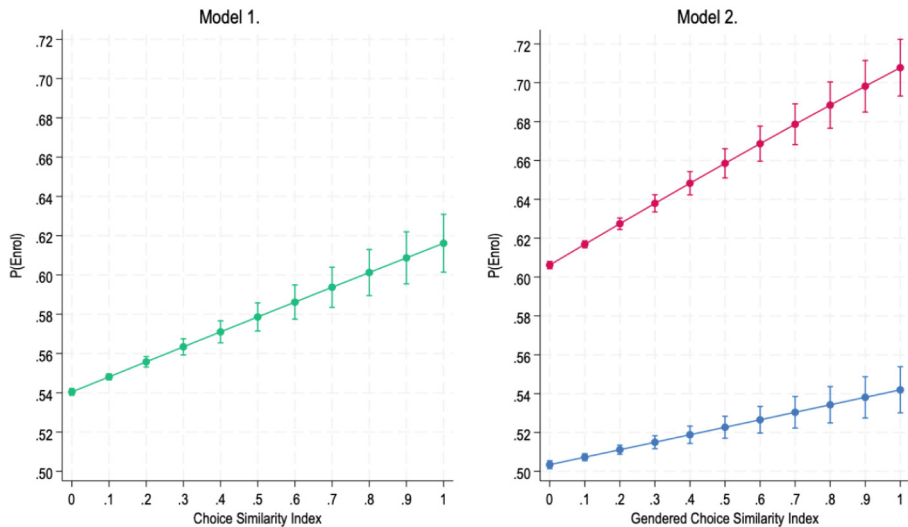


Fig. 2. Predicted probabilities of enrollment based on CSI (Model 1) and GCSI (Model 2).

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