BANCA D'ITALIA

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Questioni di Economia e Finanza

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The series is available online at www.bancaditalia.it .

ISSN 1972-6643 (online)

Designed by the Printing and Publishing Division of Banca d'Italia

ENHANCING UNIVERSITY STUDENTS' RETENTION: THE ROLE OF FACULTY MEMBERS

by Francesca Modena*, Giulia Martina Tanzi**, Marco Tonello***
and Antonio Veronico****

Abstract

This paper examines how the characteristics of the faculty members, mainly in terms of gender and age, affect university students' retention. Using student-level administrative data from the census of Italian university students, we exploit the quasi-random variation in the exposure to female and young professors across cohorts, within the same degree program, department, and university. Students' retention improves when the characteristics of the students match those of faculty members: while younger professors benefit all students, female faculty members have positive effects on female students only.

JEL Classification: I23, I28, J16, J18.

Keywords: university, student retention, dropout, professors' gender and age.

DOI: 10.32057/0.QEF.2026.1038

* Bank of Italy, Trento Branch, Economic Research Unit.

** Bank of Italy, Milano Branch, Economic Research Unit.

*** Bank of Italy, Venezia Branch, Economic Research Unit.

**** Bank of Italy, Bari Branch, Economic Research Unit.

1. Introduction[1]

The determinants of university students' retention have gained increasing attention in recent years, as early academic disengagement is associated with substantial individual and social costs. Understanding why students drop out or switch degree programs is crucial for improving the efficiency of higher education systems, strengthening human capital accumulation, and reducing inequalities in educational opportunities. While a large body of research has investigated the role of students' background characteristics, financial constraints, and institutional features, considerably less is known about how the composition of university faculty may influence students' persistence during the initial phases of their academic careers. In particular, demographic traits such as gender and age - traditionally studied in relation to labor market outcomes or organizational dynamics - may also shape the learning environment in ways that affect students' early academic decisions.

In this paper we study whether some salient demographic characteristics of the university faculty members (notably: gender and age) may play a role in affecting university students' retention. Indeed, existing literature has shown that these characteristics might potentially affect university students' retention in several ways.

The role of the teachers' gender in influencing students' performance has been widely acknowledged in recent years. The literature has generally shown the positive effect of the gender match between students and teachers in all levels of the education, especially for females (Canes-Wrone and Rosen (1994), Rothstein (1995), Neumark and Gardecki (1996), Carrell et al. (2010)). This result is explained by role models theory: people are most likely to emulate someone who is similar to them in terms of external characteristics (Hoffmann and Oreopoulos, 2009)[2].

While the impact of teachers' gender has been extensively studied in the literature, the impact of professors' age has been less investigated and it is not *a priori* obvious.

[1]We would like to thank Raffaello Bronzini, Giulia Bovini, Francesca Carta, Federico Cingano and Vincenzo Mariani for useful comments and suggestions. The views expressed in the paper are those of the authors and do not necessarily reflect those of the Bank of Italy. The usual disclaimers apply.

[2]More in general, the positive effect of the gender matching can be also related to the fact that professors (students) may respond differently depending on the gender of the student (professor). The professors may have preferences for students of their own sex and there may be unintended biases with respect to how they engage or evaluate boys and girls in the classroom. This may generate a students' reaction when they fear being viewed through negative stereotype threats (Carlana (2019), Spencer et al. (1999)). Finally, differences in teaching styles, possibly correlated with gender, may further elicit heterogeneous reactions from students, increasing the beneficial effect of the gender match.

Two opposing mechanisms may be at play. On the one hand, older professors may have more teaching experience and be better able to anticipate and overcome the difficulties freshmen students may face in the first months of their academic career. These professors may be also stronger role models, because of their experience and knowledge. On the other side, younger teachers may be more ambitious, may have more innovative teaching techniques that make learning easier, may be better at motivating students due to the smaller age gap and the possible communicational advantages.

The Italian case is particularly interesting in this context because it represents a sort of worst-case scenario both in terms of university attainment and in the absence of balance of professors' age and gender within the university departments. Indeed, Italy displays one of the lowest share of population with tertiary degree among OECD countries: in 2024 only 22.3% of individuals aged between 25 and 64 hold a tertiary degree (41.2% the OECD average). Faculty members in Italian universities present large gender and age disparities as compared to other OECD countries (OECD, 2025). Between 2013 and 2023, Italian universities constantly recorded the highest share of academic staff aged 50 and over among all OECD countries, and, at the same time, one of the smallest proportions of female academics.

In order to understand the role of the faculty members' demographic characteristics on university students' retention, we exploit student-level administrative data that cover the census of the Italian university students enrolled in Italian universities from 2010 to 2021. Thanks to an anonymous individual-level longitudinal identifier, the data make it possible to follow students from the enrollment onward, allowing to establish the year of graduation (for those who succeed) and the year of dropout for those who do not. We merge this data source with administrative data collecting the information on the faculty composition of each university department over the years.

In order to characterize students' retention, we construct two main indicators. The first one is the probability of students' dropout in the first year of enrollment. These are students who formally enroll in a degree but are not even able to pass the exams of the freshmen year. This indicator has been extensively used in the literature to characterize students' retention (Manski, 1989; Montmarquette et al., 2001; Adamopoulou and Tanzi, 2017). Second, we propose a new indicator by calculating, for the students who do not dropout in the freshmen year, the probability of switching from the degree chosen to another one. The degree switch is not a bad outcome *per se*, but, it mechanically increases the time spent to graduation. On top of that, we show that the

degree switch, especially when a student switches to degrees very distant from that chosen first, entails a lower probability of graduation at all. It is worth mentioning that both the indicators embed the non-negligible advantage of allowing comparisons across fields, majors and degrees, over the years, which is necessary for our empirical strategy.

We identify the causal effect by exploiting idiosyncratic variations in the exposure of students to the share of female and young professors within the same university, the same department, and the same degree program over time. The basic idea is to compare the outcomes of students from adjacent cohorts who are enrolled in the same university and degree, exposed to different fractions of female and young professor due to purely random factors. This strategy, pioneered by Hoxby (2000), is based on the assumption that a student may make decisions based on the overall characteristics of the degree program and university, but that she cannot decide to enroll on the basis of the specific characteristics of their cohort (in terms of age and gender of the professors) within the same degree program and university, which remain mainly unobserved.

We find that students' retention improves when the characteristics of the students match those of faculty members. Younger professors benefit all students - indeed, all students in the sample have a similar young age (between 19 and 22) - while female faculty members have positive effects on female students only. Our results entail that a student exposed to relatively younger professors (i.e., in the third quartile of the share of young professor distribution) is about 0.5 p.p. less likely to dropout or to change degree with respect to a student exposed to older faculty members (i.e., in the first quartile of the share of young professor distribution). Similarly, a female student exposed to a more gender-balanced faculty is about 0.8 p.p. less likely to dropout or to change degree with respect to a student exposed to a less gender-balanced faculty. These effects are also relevant in terms of magnitude as they correspond approximately to about 1/10 of the standard deviation (SD) of the dependent variables.

The literature has examined whether and how professors' characteristics influence students' academic performance, mainly in terms of their age, gender and race[3]. The impact of the age of the professors has been not investigated widely and the empirical

[3]In the Italian setting the study of the impact of race and ethnicity is less relevant, due to the fact that the majority of teachers are white and born in Italy. For this reason, we do not consider this dimension of analysis, explored instead in other papers of the literature (Dee, 2005; Llamas et al., 2021; Lau, 2022).

findings are mixed. For example, Joye and Wilson (2015) shows that, while students tend to rate younger professors more positively, older female professors are actually associated with higher student test performance, indicating that age-related biases in evaluations do not necessarily reflect true teaching effectiveness. Also Burroughs et al. (2019) highlights that teacher experience (measured in terms of age) is one of the observable characteristics consistently associated with improved student achievement. Altindag et al. (2025), examining whether the positive racial match between student and teacher may depend on the teachers' age, find that older professors could benefit more for their same-race student, since they can be better role models. On the other side, Bryson et al. (2022) provide causal evidence that exposure to older teachers significantly reduces students' graduation marks in Italian secondary schools, with a six-year increase in average teacher age leading to a one-standard-deviation drop in attainment.

The role of the gender in influencing students' performance is less debated due to the extensive literature that has shown the positive effect of the gender match between students and teachers in all levels of the education, based on the role model theory. Students perform better when taught by a teacher of the same gender, through improved achievement and more favorable teacher evaluations (Rask and Bailey (2002), Dee (2005)). However, many works find that gender-match effects are far more asymmetric, emerging consistently only for female students. As regard the tertiary education, Hoffmann and Oreopoulos (2009) show that female college students perform better when taught by female professors, particularly in quantitative fields (with negligible effects for men) while Carrell et al. (2010) estimate that female professors in introductory STEM courses significantly increase female students' continuation and success in STEM, again with no measurable effect on male students. These tertiary-education findings are confirmed by earlier evidence by Canes-Wrone and Rosen (1994), Rothstein (1995) and Neumark and Gardecki (1996). Similar results, that confirm the benefits of the gender match only for females, are reported in Hwang and Fitzpatrick (2021), Antecol et al. (2012) and Bettinger and Long (2005).

Our findings contribute to the literature in two main ways. First, we provide extensive evidence that age and gender of the faculty members may affect students' retention grounding our analysis on a large administrative dataset, which merges several administrative data sources and covers university students on a census basis for about a decade. To the best of our knowledge, this is the first time that this research question

is investigated by making use of such a large, consistent and precise set of data. Second, we focus our analysis on university students, whose retention causes appear less investigated in the existing literature, despite being crucial for each country human capital accumulation and developing process. Examining whether and how students are influenced by having young and female professors could be an important leverage for designing interventions that enhance their academic success. Our results could guide institutional policies and practices aimed at improving gender and age balance in the universities. Indeed, we show that creating such environments might also have positive non-intended effects in that they may help students pursue more successful careers in all fields.

The rest of the paper is organized as follows. Section 2 describes the institutional setting; Section 3 presents the data and the main variables of interest and summary statistics. Section 4 describes the empirical strategy and discusses the identification issues. The results are set out in Section 5, where we investigate also the existence of heterogeneous effects and where we perform some robustness checks. Section 7 concludes.

2. Institutional setting: The Italian university system

2.1. Structure and access

According to the last report of ANVUR, the National Agency for the Evaluation of the University and Research System, in 2025 the Italian university system comprehends 100 higher education institutions, including 61 public universities, 8 public higher schools, 20 non public universities and 11 online private universities. Universities are evenly and widely distributed across the national territory: 34 institutions are located in the North, 34 in the Center and 32 in Southern Italy. Admission to most undergraduate programs is open to all high-school graduates, although a number of fields, especially medicine, health sciences, engineering, and architecture, require passing national or local entrance examinations, which are often highly competitive. Tuition fees in public universities are relatively moderate compared to other European countries and are determined based mainly on household income[4], while private institutions generally have higher fees. In particular, in the 2023/24 academic year (the most recent available), the average per-capita contribution calculated on the entire

[4]University fees are also based and other factors such as academic performance.

enrolled student population amounted to €943; when considering fee-paying students only, the average per-capita contribution rose to approximately €1,500. The share of students fully exempt from tuition fees accounted for 37.7% of total enrolments. For private universities, the average contribution amounted to €6,985 when calculated over all students (€7,939 for fee-paying students only), whereas for online universities the corresponding figures were €2,155 and €2,360, respectively. The student enrolls at a precise degree program since the freshman year, and switching to another program is costly, both in terms of time spent and from a monetary point of view. The student must restart from scratch the program, and can only be waved of the exams eventually already taken.

2.2. Teaching and organization

Universities maintain an independent organization, within the framework defined by the national law. They decide which degrees to offer and how to organize them. Albeit they are largely supported by the public finances, they may also look for private funding. Each university is organized into several departments, which collect faculty members belonging to similar fields of study. The number of departments in a university depend on the degrees offered and on the number of the faculty members. For example, within the same university one may find an Economics Department, an Engineering Department, a Medicine Department, and so on. Morevoer, it possible to have more than one department for the same field, while, on the contrary, it is not necessary for all universities to have departments that cover all fields.[5] The department may also collect faculty members from different fields and, importantly for our work, is responsible for the teaching activities of the degrees offered. Each degree offered by a university pertain to a given department, which is responsible for the teaching and the administrative support to the students enrolled. In our analysis, in order to capture students' exposure to faculty members, we compute the proportion of young and female faculty members according to the departmental affiliation of the degree program they are enrolled in. Moreover, in Section 5.3, we also consider an alternative matching between students and professors, which accounts for the fact that students may be exposed to faculty from other departments as a result of the specific courses they are required to complete in order to graduate.

[5]This organization was introduced in 2010 by the Law N. 240, which strictly disciplines the criteria and the minimum requirements that each department must comply with.

Faculty members hold tenured and non-tenured positions. In particular, full and associate professors hold tenure positions, while, in the years analyzed, the group of assistant professors include three main types of contracts: three-plus two-years contracts for assistant professors, and the researcher contract, which is tenured-tracked.[6] All assistant professors may compete in public calls to became associate professors, and, in a similar way, associate professors may compete to become full professors.

3. Data and descriptive statistics

3.1. Data sources

Our empirical analysis relies on two different administrative sources of micro-level data. First, we use the University Students National Registry[7], a unique dataset which contains census administrative records on students' academic careers, high school background, and university degrees' supply (municipality, field, degree type, department, university) for all Italian universities. For each student enrolled in any Italian university the National Registry records all main administrative steps, from the enrollment to graduation, along with basic demographic characteristics, such as gender, month, year and place of birth, high school track attended and the high school GPA obtained, citizenship, and the precise indication of the degree attended. In the National Registry all degrees are mapped with a unique id code, so that we precisely know for each degree the corresponding field of study and the department to which is associated.

In our analysis, we consider all students enrolled for the first time[8] in an Italian public or private university during the period 2013-2021, and we focus on students between 18 and 20 years of age, which represent the vast majority of those first enrolled at any university degree.[9] That is, we focus on the students who enroll at university

[6]The Law N. 240/2010 revised this system by introducing the two types of assistant professorship contracts (with or without tenure), which substituted the researcher contract, which was in all cases tenured. If the assistant professor is hired with a tenured contract, at the end of the three-plus-two years contract, may became associate professor with tenure, after passing an internal evaluation and if possessing the national habilitation.

[7]ANS from the Italian acronym *Anagrafe Nazionale Studenti*.

[8]We restrict the sample to first-time enrollees (*immatricolati*) rather than all first-year students because the latter group includes transfers and re-enrollees who have already self-selected into persisting in higher education. Including them would confound the effect of teachers' characteristics on the initial dropout.

[9]Indeed, in this way we select all high school graduates who enroll at university within two years from the high school graduation, which represents about 90% of those who enroll at university for the first time.

right after their high school graduation. Since we are interested only in face-to-face relationships between students and the teaching staff, in this paper we focus the analysis only on public and private universities, thus excluding online private universities. For each student, we will consider her freshmen year to construct two main measures of academic progress. This entails the notable advantage of not being subject to biases introduced by student failure and degree repetition.[10]

The second data source collects individual-level information about professors' personal characteristics. These are collected by the Ministry of University and Research for administrative reasons, and correspond to a yearly snapshot of the characteristics and career steps of all faculty members in Italian universities. From this data source, we can map several characteristics of the faculty members, such as gender, age, region of residence, as well as information on their careers, such as the role, the field of specialization, and, importantly, the department where the teaching activity takes place.

The final sample consists of roughly 1.8 million freshmen students, belonging to eight adjacent cohorts (from academic year 2013-14 to 2020-21), 927 departments, and 24.500 degrees.

In order to retrieve additional information on students' contextual characteristics, which lack in the National Registries, we manage to link the students enrolled at university with their records provided by the Italian Authority fro the Evaluation of the Education System (Invalsi). Specifically, since the school year 2009-10 Invalsi performs census low-stake assessments at given grades in primary and secondary school. For our purposes, we linked the university students' records with their last assessment, taken in grade 10 during high school. For a subsample of students (about 53% of the baseline sample) for whom this longitudinal link is available, we are able to retrieve important information, such as standardized test scores and a precise indicator of the family socio-economic status (Campodifiori et al., 2010).

3.2. Variable definitions

To measure the students' performance, we focus on their first academic year of attendance, which is crucial for a student's academic success. Moving from high school to university is a significant change: students must adapt to a new environment, different

[10]For the sake of completeness, and bearing this caveat in mind, we will also present additional results concerning the graduation outcomes of the students.

study methods, and greater independence. Moreover, in the first year students start building relationships with peers and professors, which can be valuable for support during studies and future career opportunities. As variables capturing the students' performance we focus on the probability of dropping out from university in the freshmen year, and the probability of changing the degree of study. Both measures have the notable advantage of allowing fair comparisons across fields and majors, and across universities, as they do not consider the exams taken and their grades, which are extremely heterogeneous both across fields and majors, and across universities. In both cases, these are measured at the end of the freshmen academic year for each student. This is, indeed, the year when most drop outs and degree changes occur: about 48% of dropouts and 70% of degree changes occur precisely between the first and the second year of enrollment. In section 6 we consider additional indicator of students' performances, mainly the probability of graduating and graduating on time. We do not consider these as our preferred measures of students' performances since these outcomes are recorded some years after enrollment. As a consequence, the effects of first-year professors may be attenuated over time or confounded by subsequent factors.

Let i be the student, c the degree, d the department, and t the generic academic year, and t_0 the freshmen year. For all students enrolled in their freshmen academic year, we compute the probability of degree switch, and, for those who do not switch degree, the probability of dropout:

$$dropout_{it} = \begin{cases} 1 & \text{dropout between } t_0 \text{ and } t_0+1 \\ 0 & degree_{idt_0} = degree_{id(t_0+1)} \end{cases} \tag{1}$$

$$degree\ switch_{icdt} = \begin{cases} 1 & degree_{idt_0} \neq degree_{id(t_0+1)} \\ 0 & degree_{idt_0} = degree_{id(t_0+1)} \end{cases} \tag{2}$$

While the dropout measure has been extensively used in the literature (see, among others: Manski (1989); Adamopoulou and Tanzi (2017); Montmarquette et al. (2001); Modena et al. (2022)) to qualify university students' performance, the measure of the degree switch is an innovation we introduce in this work. Indeed, a degree switch not only entails a slowing in the student's academic progression as compared to students who do not change their degree (69% versus 39% are the shares of those who gradate on time in the two cases), but also a non-negligible drop in the probability of graduating at all (76% versus 61%; see Table Appendix A.1). Notably, while the dropout measure

certainly indicates the failure of the student's academic path, the switch from one degree to another might be interpreted in a different way, and, more broadly, as a signal of a student's difficulty in coping with the activities of the degree chosen[11].

To capture the potential exposure of each student to the faculty, we compute for each department the share of young and female faculty members, considering full professors, associate professors, and assistant professors. Young professors are defined as those with an age below the median, as observed in the entire sample, corresponding to 51 years of age. Then, we link each student to the age and gender composition of her teachers through the department to which the degree attended by the student belongs to (see Section 2). This is obviously a proxy of the professors' to whom a student is exposed, since the student could be exposed to a smaller fraction of the department's professors in her first year. As a matter of fact, our result implies the estimate of an Intention-To-Treat (ITT) parameter (see also Section 4). Nevertheless, we will prove the robustness of our results by using an alternative measure of students' exposure to teachers, built at the degree rather than at the department level, which largely confirms our main findings.

3.3. Descriptive evidence

[Table 1 about here]

Table 1 shows some descriptive statistics of our sample of students. About 10% of the students does not enroll in the second year of degree, while about 8% of those who enroll in the second year change their degree of study. Students who enroll at university prevalently come from an academic high school and are for the majority females (57%). Only a small fraction are non-natives (about 3%), and less than one quarter attend a university located outside the region (NUTS 2 level) of residence (that we labeled *non-local students*). Using the individual-level link with the students' high school career, we identify low achievers as students who score in the bottom quintile of the Invalsi NEPSA test in grade 10 in high school, and students with low socio-economic background, those in the bottom quintile of the socio-economic family status indicator (ESCS, Campodifiori et al. (2010)).

[Figure 1 about here]

[11] This outcome is also a measure of the mismatch between students' expectations and reality about a degree course which may be induced by inadequate orientation activities before the enrollment.

Figure 1 reports the students' outcomes across fields and students' gender. The probability of changing the degree is especially high in STEM fields and for females in STEM fields, almost 3 times the one registered in the other fields. On the contrary, the dropout rates are quite similar across fields, but systematically higher for males.

[Figure 2 about here]

Concerning professors' characteristics, about 39% of faculty members are females. There is, however, a relevant heterogeneity across fields and age (see Table Appendix A.2): while in the Humanities we are close to gender equality, in the STEM less than one third of the faculty is female. On top of that, female representation decreases with age, pointing to a progressive increase of the recruitment of females professors and assistant professors in most recent times, which does not manage to counterbalance the sharply lower representation in the age range above 60. While the share of young professors, is close to 50% in the whole sample by construction, there is also in this case a substantial heterogeneity across fields: faculty members tend to be older in the Humanities and Health sciences, as compared to STEM and Social sciences. The composition by roles of the faculties is quite homogeneous across fields (see the left panel of Figure Appendix A.4). The professors' age increases with their role, from assistant to full professor, but there is a substantial variability also within each role (see the right panel of Figure Appendix A.4).

4. Empirical strategy

4.1. Baseline estimating equation

To analyze the impact of faculty demographic characteristics on students' educational outcomes, we exploit the (arguably) as-good-as random variation in the exposure to young and female professors across cohorts within academic departments. Following the approach pioneered by Hoxby (2000), we leverage within-department differences in the share of young and female faculty members experienced by each cohort of students.

Our main estimating equation is specified as follows:

$$Y_{itcd} = \alpha + \beta P_{td} + \rho Z_{td} + \gamma X_{it} + \delta X_{itd}^{-i} + \lambda_c + \lambda_d + \lambda_t + \epsilon_{itcd} \tag{3}$$

where i identifies the student, t the cohort, c the degree and d the department. The dependent variable Y_{itcd} captures the educational outcome of interest, primarily degree-switching and dropout. The key explanatory variable P_{td} is the share of young or female

professors in department d to which cohort t is exposed. We will perform several variants of this baseline specification, whereby we start from including separately the two shares, then progressively augment the specification including both and further specifying them (e.g. by including contemporaneously the share of young female professors and the share of young male professors, while senior faculty members represent the omitted category). We also include several controls to isolate the causal effect of faculty demographics: Z_{td}, the total number of professors in department; X_{it} and X_{itd}^{-i} which account for, respectively, student's and peers' characteristics. X_{it} include dummies for type of high school, nationality, gender, fee exemption, non-local student and two measures that capture the ability of student. In particular, the high achiever student dummy is equal to 1 if the student reports an high school graduation grade above the 80th percentile of the grade distribution within the school-year. Symmetrically, the low achiever student dummy is equal to 1 for students whose grade is below the 20th percentile of the distribution. X_{itd}^{-i} includes the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt. The model also incorporates fixed effects for department (λ_d), degree (λ_c), and cohort (λ_t), thereby addressing unobserved heterogeneity at multiple levels.

Our parameter of interest (β) captures an Intention-To-Treat effect, as it embeds all direct and spillover effects from being exposed to given characteristics of the faculty members. Moreover, we cannot exactly match to which professors each student is precisely exposed to, so that the exposure can be intended in a broad way, as both the professor directly experienced in the teaching activities and those in the faculty. Finally, it is worth mentioning that the main outcome variables are measured at the end of the freshmen year, which implies that students have been exposed to their faculty members for at least one entire academic year. Consistently, the characteristics of the faculty members and the characteristics of the students are included as observed at the beginning of each academic year.

4.2. Evidence corroborating the identifying assumptions

The identification strategy assumes that no omitted variable satisfies the following three conditions (Hoxby, 2000; Brenøe and Zölitz, 2020): (i) is time-variant and department-specific; (ii) is correlated with both the age (gender) composition of faculty and student outcomes; (iii) is not accounted for by the included covariates.

To address the first condition, equation (3) includes a comprehensive set of time-varying, department-specific covariates. Moreover, to account for unobserved differ-

ential time paths across fields, we also include field-specific linear time trends in all our specifications. A potential caveat we verify is whether we are left with sufficient variability in the data, once we account for such a long list of fixed effects and control variables. Indeed, the unexplained variation amounts to 29% of total variation for the share of young professors, and 19% for the share of women professors, our two main explanatory variables. These figures are in line with similar works in the literature (e.g. Olivetti et al. (2018); Mertz et al. (2025)). As a further confirmation that the variability we exploit can be considered as good as random, once we control at least for department and cohort fixed effects, Figure Appendix A.5 shows that the residual variation is approximately normal distributed.

Regarding the second condition, as a sort of balancing test, we verify if variations in the exposure to young and female professors is associated with observable individual-level students' characteristics. In Tables Appendix A.3 and Appendix A.4, Panels A, show the results of several regressions in which each pre-determined student characteristic is regressed the share of young professor (Table Appendix A.3) and on the share of female professor (Table Appendix A.4), after controlling for department and cohort fixed effects, and field-specific linear, quadratic and cubic trends. As a matter of fact, we do not detect any systematic correlation: a few coefficients are statistically significant, though not in a systematic way across the specifications tested; moreover, all estimates are extremely close to zero. Finally, we repeat this exercise using students' peers' characteristics as main explanatory variables (Tables Appendix A.3 and Appendix A.4, Panels B), and the results still confirm no meaningful correlation.

5. Results

5.1. Baseline results: The role of professors' age and gender

We begin our core analysis by assessing the impact of the presence of young and female professors on students' likelihood of dropping out or switching degree at the end of the freshmen year. We perform OLS regressions with robust standard errors clustered at the department level; in a later section (Section 5.3) we will test several variations of this baseline specification.

[Table 2 about here]

Table 2 reports our baseline results. Columns (1) to (3) evaluate the effect of the share of young professors, while Columns (4) to (6) that of female professors on,

respectively, the probability of dropout (Panel A) and the probability of degree switch (Panel B). The specifications progressively add the fixed effects (FE) of department, academic year, degree and region (Columns 1 and 4), the control variables pertaining to the student's and student's peers' characteristics (Columns 2 and 5), and field-specific linear trends (Columns 3 and 6). We find that the share of young professors reduces dropout probability and the probability of degree switch, while the share of female faculty members does not seem to impact students' outcomes in the freshmen year. In details, increasing by one percentage point the share of young professors decreases by about 0.03 percentage points (p.p.) the probability of dropout and the probability of degree switch in the most saturated specification (Col. 3). These effects correspond approximately to about 1/10 of the standard deviation (SD) of the dependent variables. The size of the effects are also economically meaningful. Assuming linearity in the main effects, we find that a student exposed to relatively younger professors (i.e., in the third quartile of the share of young professor distribution) is about 0.5 p.p. less likely to dropout or to change degree with respect to a student exposed to older faculty members (i.e., in the first quartile of the share of young professor distribution).

5.2. The interplay with students' gender

Existing literature has pointed so far that some beneficial effects of teachers' characteristics might arise in presence of a match between these characteristics and those of the students (notably: same ethnicity or same gender; Dee (2005)). In our analysis it is therefore of paramount importance to study the interplay between faculty members' gender and that of the students.[12] These analysis are conducted using our more saturated specification (i.e., that of columns 3 and 6 of Table 2).

[Table 3 about here]

In Table 3 we thus interact our main explanatory variables (the share of young and the share of female faculty members) with a dummy variable indicating if the student is a female. In line with the literature, we find that female professors do have a beneficial effect, but on female students only; consistently, the professors' age does not have differentials effects based on students' gender. Also in this case, a female

[12]Indeed, concerning age differentials we do not have heterogeneity in the students' characteristics because our sample considers all high school students who enroll at university within two years from high school graduation (about 90% of the total). See Section **??** for details.

student exposed to a more gender-balanced faculty (i.e., in the third quartile of the share of young professor distribution) is about 0.8 p.p. less likely to dropout or to change degree with respect to a student exposed to a less gender-balanced faculty (i.e., in the first quartile of the share of young professor distribution).

We can rationalize our results as follows: while we can posit that being in contacts with younger professors help all the students to reduce their dropout and switch degree probability, interacting with female professors is beneficial only for girls. However, it is worth to point out that the vast majority of the university students can be considered as being *young*, being aged between 18 and 20, so that the match with the characteristics of the faculty members is somehow mechanically achieved for all the students, and not for a given subgroup (as for the case of gender). In this sense, we believe that both the results - the baseline beneficial effects of younger professors for all students and the beneficial effects for female professors for female students only - provide additional evidence that the match between teachers and students characteristics matter to achieve positive impacts on human capital accumulation, more than the characteristics *per se*.

[Table 4 about here]

Finally, we further dig into the mechanics of our main effects by distinguishing young male and young female professors, and interacting these shares with the student being female. The results are provided in Table 4: notice that in these regressions the share of older professors (male and female professors together) has to be considered the omitted reference group of the estimated parameters. The results confirm our previous findings. Indeed, while both women and man young professor have beneficial and similar effects on students' first year retention, the effects of young female professors is concentrated on female students only, while this is not the case for young male professors who benefit all students. Only for the probability of degree change (column 4) it seems that young male professors have a more beneficial impact on male students, which is still in line with the gender-match effects described so far.

5.3. Robustness and sensitivity checks

In this section we perform some robustness and sensitivity checks to provide a comprehensive assessment of the validity and of the reliability of our findings. Table 5 presents the results for teacher age under some alternative specifications, while Table 6 report robustness checks for the analysis of teacher gender.

[Tables 5 and 6 about here]

First, to account for potential bias arising from department size and prevent larger departments from influencing the overall results, we weight the regressions by the number of departmental professors (columns 1 of the mentioned tables), where are shown results, respectively, for the share of young and female teachers. Second, we include department-by-cohort fixed effects, following the identification proposed by Brenøe and Zölitz (2020) and Merlino et al. (2019). In this specification, which flexibly controls for any department-by-year unobserved factor, identification is possible only for the male versus female students differential (columns 2). Third, we check whether the results are robust to alternative ways of dealing with the covariance structure of the error term, such as clustering at the department levels (columns 3). Finally, we account for heterogeneity in teaching loads across academic ranks (e.g., full professors versus assistant professors), computing a weighted measure of the share of female professors at the department level and assigning lower weights to assistant professors (column 4 of Table 6).

The results confirm the baseline findings. The exposure to young professors is associated to a reduction of both dropout and of the degree switch, across all the considered specifications. Again, the exposure to female professors has no significant effect on dropout and degree switching overall, but a robust and negative differential effect is observed for female students, across all specifications.

Then, as an additional robustness check, we test an alternative match between students and professors, constructing the share of young/female professors at the degree level, rather than at the department level. Specifically, we use a public data source that records, for each degree program active in 2012, the competencies in terms of educational credits (ECTS) required to obtain the degree, as well as the academic disciplines of the faculty members qualified to teach those competencies. These academic disciplines define the scientific and educational domain in which each faculty member operates. Based on this data, it is possible to calculate the weight, in terms of hours, of each academic discipline (and thus of the faculty members) to which each student must be exposed in order to graduate. Assuming that the distribution of educational credits across academic disciplines has mostly remained unchanged over time for each degree program, it is possible to adjust students' exposure to the demographic characteristics of faculty members by weighting the shares calculated at the level of academic discipline, department, and university by the ECTS weight of the disciplines associated

with each degree program.[13]

[Table 7 about here]

Estimates based on this refined measure of students' teacher exposure are reported in Table 7. Although this specification reduces sample size due to data limitations, the results remain generally consistent. Specifically, the interaction between the share of female professors and the female student indicator remains negative and statistically significant with respect to both drop out and degree switching. The effect of younger professors, however, loses statistical significance, although the coefficient retains a negative sign across both outcomes. It is important to note, however, that even when we replicate the baseline estimates on this sample of observations (Panel B), the effect on the degree switch mainly remains statistically insignificant. This may partly be conditioned by the fact that the sample may be not fully representative of the overall population, as some degree aggregations under the new methodology could not be constructed. Taken together, the consistency of these results across levels of aggregation suggests that the estimated effects are not sensitive to the definition of faculty exposure, thereby strengthening the credibility of the baseline findings.

In the Appendix we provide additional robustness checks concerning: (*i*) the test for non linear effects (Table Appendix A.6; (*ii*) the sensitivity to alternative cutoff to define the share of young faculty members (Table Appendix A.7); (*iii*) and the additional control for the stocks of new hires (by role) from one academic year to the following, in each department (Table Appendix A.9). Overall, these additional checks confirm the robustness of our baseline estimates: we do not find relevant non-linear effects, the effects are largely confirmed while modifying the definition of the age thresholds, and while controlling for the new hires.

6. Heterogeneous effects

[Table 8 about here]

We explore heterogeneous effects along several dimensions. We start from studying if the effects of the age and of the gender of the professors vary according to the field of study. Table 8 reveals substantial heterogeneity across macro-fields of study. The

[13]The drawback of this procedure is that we lose almost half of the observations due to the impossibility of correcting the share for the degree programs created after 2012.

most robust pattern concerns young professors, whose presence is associated with more favorable student outcomes particularly in STEM and health sciences, where exposure to younger faculty is linked to both lower dropout and lower degree switching; a negative association with dropout also emerges in humanities. By contrast, female students benefit relatively more from exposure to female faculty especially in social sciences and STEM. Interestingly, these are also the fields characterized by comparatively lower shares of female professors, which may indicate that the beneficial effect is stronger where female faculty are less represented. This interpretation is consistent with the idea that role-model or belonging effects may be more salient in environments in which female students are exposed to fewer women in academic positions.

[Table 9 about here]

Second, we explore the effects of the characteristics of faculty members on additional students' outcomes. Table 9 investigates whether exposure to younger professors or female professors affects students' probability of graduating and graduating on time, and whether these effects vary by student gender. These outcomes are recorded after some years after enrollment and, consequently, the effects of the first year professors could be lower with respect to those found for drop out and degree switch in the first year. The table reports estimates from specifications that focus on professor age (columns 1 and 3) and professor gender (columns 2 and 4), for graduation and timely graduation, respectively. Across all specifications, the presence of younger professors does not appear to have a statistically significant impact on either graduation or graduation on time. In contrast, professor gender is more strongly associated with differential outcomes for female students. While having a female professor is not, on average, significantly associated with graduation or on-time graduation for the full sample, the interaction between female professors and female students is, again, positive and highly statistically significant. Thus, the effect of females professors seem to be more persistent on time, with respect to that of young professors.

[Table 10 about here]

Third, we assess whether the influence of faculty members varies across different students' characteristics, mainly ability and familiar financial conditions. We firstly consider the effects on low ability students. To compute these, we exploited the Invalsi archives for 10th grade students. In particular, we define low ability students those that

reported a test score in Mathematics in the first quintile of the distribution. In a similar way, we consider disadvantaged students those that present a SES indicator about the familiar economic conditions in the first quintile of the distribution (low-SES). Table 10 examines whether the effects of age and gender vary for low-skill students (Panel A) and low-SES students (Panel B). Results show that younger professors are associated with lower dropout and lower degree switching on average, but these gains are not concentrated among disadvantaged students. On the contrary, female professors exhibit strong, targeted gains for disadvantaged students: while the average effects are not significant, the interactions with low skill and low SES are negative and statistically significant. Thus, the main effect of younger professors appears broad-based rather and it likely reflects general features of early-career teaching that help the average student but do not differentially benefit low-skill or low-SES students. By contrast, the female professors may particularly support students with weaker prior preparation or fewer family resources.

[Table 11 about here]

The last heterogeneity analysis is reported in Table 11, that examines whether students' propensity to drop out (columns 1) or switch degree (columns 2) varies according to the instructor's academic role. In panel A we focus on assistant professors and estimate the coefficients relative to associate and full professors. For both outcomes the effect is negative but only marginally significant. Despite assistant professors being younger than associate and full professors, there is nonetheless a substantial share of them who fall above the median of the age distribution (about 30%; see Figure Appendix A.4). In fact, assistant professors exhibit significant heterogeneity depending on the type of contract under which they are hired. For this reason, in panel B we distinguish between those with temporary contracts without tenure track, those with temporary contracts with tenure track, and finally those with open-ended contracts. As in panel A, the omitted category is associate and full professors. The estimated coefficients are negative and statistically significant only for temporary researchers without tenure track. A plausible interpretation for why the effects are concentrated among assistant professors without tenure relates to differences in teaching incentives and roles within the academic hierarchy. Temporary assistant professors are typically in a early-career positions and, consequently, they may face stronger incentives to invest in teaching quality and student engagement, for example because teaching evaluations are salient for contract renewals.

7. Concluding remarks

This paper investigates whether salient demographic characteristics of university faculty—namely gender and age—affect students' retention at the beginning of their academic careers. By exploiting administrative, census-based longitudinal data on Italian university students and detailed information on faculty composition, we identify the causal impact of exposure to younger and female professors within the same institution, department, and degree program over time. Our results show that students' early academic decisions are indeed shaped by the demographic features of the teaching staff: younger professors improve retention for all students, while female faculty members have positive effects on the persistence of female students only.

These findings contribute to the literature in two main ways. First, they provide robust evidence that faculty composition can influence students' outcomes even at the university level, a setting where retention dynamics remain relatively understudied despite their relevance for long-term human capital accumulation. Second, they highlight that demographic diversity among faculty members—both in terms of age and gender—may generate positive externalities on students' academic trajectories.

From a policy perspective, our evidence suggests that efforts aimed at fostering a more balanced age and gender structure within university departments may yield additional, unintended benefits for students' success. In particular, the presence of younger faculty appears to facilitate students' persistence into higher education, while an increased representation of women in academia may support the persistence of female students, potentially contributing to narrowing gender gaps in tertiary education.

Overall, our research highlights how the demographic composition of faculty can meaningfully influence student retention, offering valuable insights for policies aimed at fostering inclusion and supporting talent in higher education.

Tables

Table 1: Descriptive statistics

	Mean	Std. dev.	P25	P50	P75	Obs.
Outcomes						
First year dropout	0.10	0.31	0.00	0.00	0.00	1,530,099
Fist year degree change	0.08	0.26	0.00	0.00	0.00	1,482,348
Graduated	0.69	0.46	0.00	1.00	1.00	750,881
Graduated on time	0.61	0.49	0.00	1.00	1.00	750,881
Professors' characteristics						
Share of young professors	0.48	0.13	0.40	0.48	0.56	1,865,304
Share of women professors	0.39	0.15	0.30	0.40	0.49	1,865,304
Share of young women professors	0.21	0.09	0.14	0.20	0.26	1,865,304
Share of young male professors	0.27	0.12	0.19	0.25	0.34	1,865,304
Students' characteristics						
Classical/scientific high school diploma	0.63	0.48	0.00	1.00	1.00	1,840,997
Italian	0.97	0.18	1.00	1.00	1.00	1,865,304
Female	0.57	0.50	0.00	1.00	1.00	1,865,304
Fee exempt	0.37	0.48	0.00	0.00	1.00	1,865,304
Non-local student	0.21	0.40	0.00	0.00	0.00	1,865,304
High achiever student (diploma grade)	0.14	0.35	0.00	0.00	0.00	1,824,427
Low achiever student (diploma grade)	0.16	0.37	0.00	0.00	0.00	1,824,427
Low achiever student (INVALSI grade)	0.12	0.33	0.00	0.00	0.00	1,049,825
Low SES student	0.14	0.34	0.00	0.00	0.00	1,026,287
Student peers' characteristics						
% female	0.57	0.21	0.42	0.61	0.73	1,865,292
% foreign	0.03	0.03	0.01	0.02	0.05	1,865,292
% high achiever student (diploma grade)	0.14	0.08	0.09	0.12	0.17	1,824,418
% non-local student	0.21	0.18	0.06	0.15	0.32	1,865,292
% fee exempt	0.37	0.28	0.16	0.32	0.56	1,865,292

The table reports summary statistics for the variables used in the regression analysis. The displayed statistics are in order the mean, the standard deviation, the first quartile, the median, the third quartile and the number of observations. The statistics refer to the cohort of students enrolled between the a.y. 2013-14 and 2020-21.

Table 2: Academic Performance by Professor Gender and Age

	Panel a: Dropout					
	FE	FE+contr	ALL	FE	FE+contr	ALL
	(1)	(2)	(3)	(4)	(5)	(6)
young prof.	-0.0234**	-0.0207**	-0.0301***			
	(0.0094)	(0.0086)	(0.0089)			
women prof.				-0.0069	-0.0073	-0.0096
				(0.0126)	(0.0118)	(0.0119)
Observations	1,512,075	1,463,631	1,463,631	1,512,075	1,463,631	1,463,631
AdjustedR^2	0.027	0.061	0.061	0.027	0.061	0.061
Mean of Y	0.104	0.103	0.103	0.104	0.103	0.103
	Panel b: Degree switch					
	FE	FE+contr	ALL	FE	FE+contr	ALL
	(7)	(8)	(9)	(10)	(11)	(12)
young prof.	-0.0176**	-0.0216**	-0.0266***			
	(0.0085)	(0.0087)	(0.0091)			
women prof.				-0.0008	-0.0014	-0.0039
				(0.0116)	(0.0117)	(0.0116)
Observations	1,465,236	1,421,445	1,421,445	1,465,236	1,421,445	1,421,445
AdjustedR^2	0.084	0.087	0.087	0.084	0.087	0.087
Mean of Y	0.076	0.077	0.077	0.076	0.077	0.077
Student ctrl	No	Yes	Yes	No	Yes	Yes
Group ctrl	No	Yes	Yes	No	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Field linear trend	No	No	Yes	No	No	Yes

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Columns (2) and (5) include all FE, student-level controls (classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student) and group-level controls (share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt). Columns (3) and (6) include the same set of controls, additionally controlling for a field-specific linear trend.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Academic Performance by Professor Gender and Age. The Role of Student Gender

	Dropout		Degree switch	
	(1)	(2)	(3)	(4)
young prof.	-0.0251**		-0.0214**	
	(0.0102)		(0.0101)	
x fem. stud.	-0.0087		-0.0089	
	(0.0079)		(0.0071)	
women prof.		0.0131		0.0169
		(0.0135)		(0.0127)
x fem. stud.		-0.0447***		-0.0400***
		(0.0085)		(0.0075)
Observations	1,463,631	1,463,631	1,421,445	1,421,445
Adjusted R^2	0.061	0.061	0.087	0.087
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes
Mean of Y	0.103	0.103	0.077	0.077

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Academic Performance by Professor Gender-Age

	Dropout		Degree switch	
	no interact.	interact.	no interact.	interact.
	(1)	(2)	(3)	(4)
women young prof.	-0.0339***	-0.0127	-0.0350***	-0.0057
	(0.0117)	(0.0130)	(0.0121)	(0.0130)
x fem. stud.		-0.0400***		-0.0545***
		(0.0107)		(0.0102)
men young prof.	-0.0273***	-0.0308**	-0.0204**	-0.0276**
	(0.0105)	(0.0125)	(0.0098)	(0.0110)
x fem. stud.		0.0088		0.0164*
		(0.0103)		(0.0089)
Observations	1,463,631	1,463,631	1,421,445	1,421,445
AdjustedR^2	0.061	0.061	0.087	0.087
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes
Mean of Y	0.103	0.103	0.077	0.077

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Academic Performance by Professor Age. Robustness

	Dropout			Degree switch		
	weight.reg.	FE dt	cluster dep.year.	weight.reg.	FE dt	cluster dep.year.
	(1)	(2)	(3)	(4)	(5)	(6)
young prof.	-0.0367***		-0.0251***	-0.0281***		-0.0214***
	(0.0101)		(0.0079)	(0.0094)		(0.0076)
x fem. stud.	-0.0102*	-0.0053	-0.0087*	-0.0073	-0.0046	-0.0089*
	(0.0061)	(0.0053)	(0.0052)	(0.0056)	(0.0048)	(0.0047)
Observations	1,463,631	1,463,631	1,463,631	1,421,445	1,421,445	1,421,445
AdjustedR^2	0.063	0.062	0.061	0.088	0.091	0.087
Student ctrl	Yes	Yes	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt. Columns (1) and (4) weight the regressions by the number of departmental professors. Columns (2) and (5) include department-by-cohort fixed effects. In columns (3) and (6) the error terms are cluster at the department level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Academic Performance by Professor Gender. Robustness

	Panel a: Dropout			
	weight.reg.	FE dt	cluster dep.year.	w.sh.fem.prof.
	(1)	(2)	(3)	(4)
women prof.	0.0260		0.0131	0.0128
	(0.0166)		(0.0105)	(0.0105)
x fem. stud.	-0.0428***	-0.0440***	-0.0447***	-0.0452***
	(0.0062)	(0.0051)	(0.0051)	(0.0051)
Observations	1,463,631	1,463,631	1,463,631	1,463,631
AdjustedR^2	0.063	0.063	0.061	0.061
	Panel b: Degree switch			
	weight.reg.	FE dt	cluster dep.year.	w.sh.fem.prof.
	(5)	(6)	(7)	(8)
women prof.	0.0526***		0.0169	0.0168
	(0.0163)		(0.0103)	(0.0105)
x fem. stud.	-0.0467***	-0.0401***	-0.0400***	-0.0390***
	(0.0055)	(0.0047)	(0.0048)	(0.0047)
Observations	1,421,445	1,421,445	1,421,445	1,421,445
AdjustedR^2	0.088	0.091	0.087	0.087
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt. Columns (1) and (5) weight the regressions by the number of departmental professors. Columns (2) and (6) include department-by-cohort fixed effects. In columns (3) and (7) the error terms are cluster at the department level. Columns (4) and (8) assign lower weights to assistant professors.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Academic Performance by Professor Gender and Age. Robustness - alternative student-professor match

	Dropout		Degree Switch	
	age	gender	age	gender
	(1)	(2)	(3)	(4)
	Panel a: robustness estimates			
young prof.	-0.0102		-0.0169	
	(0.0091)		(0.0106)	
x fem. stud.	-0.0144*		-0.0015	
	(0.0084)		(0.0099)	
women prof.		-0.0065		0.0244
		(0.0111)		(0.0163)
x fem. stud.		-0.0232***		-0.0478***
		(0.0084)		(0.0101)
Observations	633,643	633,643	633,512	633,512
Adjusted R^2	0.067	0.067	0.111	0.111
	Panel b: baseline estimates on subsample			
young prof.	-0.0397***		-0.0251*	
	(0.0133)		(0.0148)	
x fem. stud.	-0.0145		0.0010	
	(0.0105)		(0.0134)	
women prof.		-0.0177		0.0042
		(0.0201)		(0.0244)
x fem. stud.		-0.0324***		-0.0453***
		(0.0116)		(0.0121)
Observations	633,643	633,643	633,512	633,512
Adjusted R^2	0.067	0.067	0.111	0.111
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes
Mean of Y	0.100	0.100	0.097	0.097

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt. In Panel a professors' characteristics have been computed using weighted shares based on the ECTS requirements of each degree program.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Academic Performance by Professor Gender and Age. Heterogeneity by macro-field of study

	Panel a: Dropout							
	age				gender			
	humanities	social sciences	STEM	health sciences	humanities	social sciences	STEM	health sciences
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
young prof.	-0.0371**	-0.0101	-0.0303*	-0.0471***				
	(0.0181)	(0.0154)	(0.0162)	(0.0176)				
women prof.					0.1251***	0.0027	0.0055	-0.0535**
					(0.0335)	(0.0266)	(0.0238)	(0.0218)
x fem. stud.					-0.0870***	-0.0599***	-0.0320**	-0.0105
					(0.0175)	(0.0171)	(0.0162)	(0.0124)
Observations	300175	495571	439919	227966	300175	495571	439919	227966
Adjusted R^2	0.051	0.055	0.074	0.069	0.052	0.055	0.074	0.069
	Panel b: Degree Switch							
young prof.	0.0038	-0.0193	-0.0598***	-0.0264**				
	(0.0158)	(0.0126)	(0.0228)	(0.0118)				
women prof.					0.0567**	-0.0235	-0.0081	0.0098
					(0.0224)	(0.0165)	(0.0229)	(0.0200)
x fem. stud.					-0.0498***	-0.0031	-0.0377**	-0.0112
					(0.0125)	(0.0080)	(0.0191)	(0.0140)
Observations	280530	469603	450599	220713	280530	469603	450599	220713
Adjusted R^2	0.016	0.028	0.111	0.034	0.017	0.028	0.111	0.034
Mean share of young/female prof.	0.41	0.52	0.50	0.42	0.50	0.40	0.31	0.42

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Academic Performance by Professor Gender and Age. Additional outcomes

	Graduation		Graduation on time	
	age	gender	age	gender
	(1)	(2)	(3)	(4)
young prof.	0.0189		0.0205	
	(0.0238)		(0.0245)	
women prof.		0.0129		-0.0280
		(0.0213)		(0.0264)
x fem. stud.		0.0517***		0.0771***
		(0.0125)		(0.0134)
Observations	719,611	719,611	719,611	719,611
Adjusted R^2	0.128	0.128	0.143	0.143
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes
Mean of Y	0.688	0.688	0.611	0.611

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Academic Performance by Professor Gender and Age. Heterogeneity by students skill and SES

	Dropout		Degree Switch	
	age	gender	age	gender
	(1)	(2)	(3)	(4)
	Panel a: low skill student			
young prof.	-0.0306***		-0.0340**	
	(0.0115)		(0.0140)	
x low skill stud.	0.0126		0.0259**	
	(0.0137)		(0.0101)	
women prof.		0.0063		-0.0115
		(0.0147)		(0.0184)
x low skill stud.		-0.0693***		-0.0648***
		(0.0136)		(0.0109)
Observations	765,010	765,010	751,558	751,558
Adjusted R^2	0.059	0.059	0.094	0.094
	Panel b: low SES student			
young prof.	-0.0299***		-0.0334**	
	(0.0115)		(0.0135)	
x low SES stud.	0.0038		0.0060	
	(0.0104)		(0.0083)	
women prof.		0.0045		-0.0155
		(0.0148)		(0.0174)
x low SES stud.		-0.0271***		-0.0164**
		(0.0102)		(0.0073)
Observations	747,642	747,642	734,553	734,553
Adjusted R^2	0.058	0.058	0.094	0.094
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes
Mean of Y	0.093	0.093	0.075	0.075

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt. 'Low skill student' is a dummy equal to one if the student reported a test score in Mathematics in the first quintile of the distribution. 'Low SES student' is a dummy equal to one if the SES indicator about the familiar economic conditions is in the first quintile of the distribution.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 11: Academic Performance by Professor Gender and Age. Heterogeneity - professors' role

	Dropout	Degree Switch
	(1)	(2)
	Panel a: total	
assistant professor	-0,0154*	-0,0144*
	(0,0089)	(0,0077)
	Panel b: type of contract	
assistant prof. w/o tenure-track	-0,0277***	-0,0169**
	(0,0103)	(0,0085)
assistant prof. with tenure-track	0,0061	-0,0240
	(0,0137)	(0,0183)
assistant prof. open-ended	-0,0131	0,0018
	(0,0111)	(0,0108)
Observations	1,463,631	1,421,445
Adjusted R^2	0,061	0,087
Student ctrl	Yes	Yes
Group ctrl	Yes	Yes
Year FE	Yes	Yes
Department FE	Yes	Yes
Course FE	Yes	Yes
Region FE	Yes	Yes
Field linear trend	Yes	Yes
Mean of Y	0.093	0.075

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figures

Figure 1: Outcomes distribution by field and student's gender

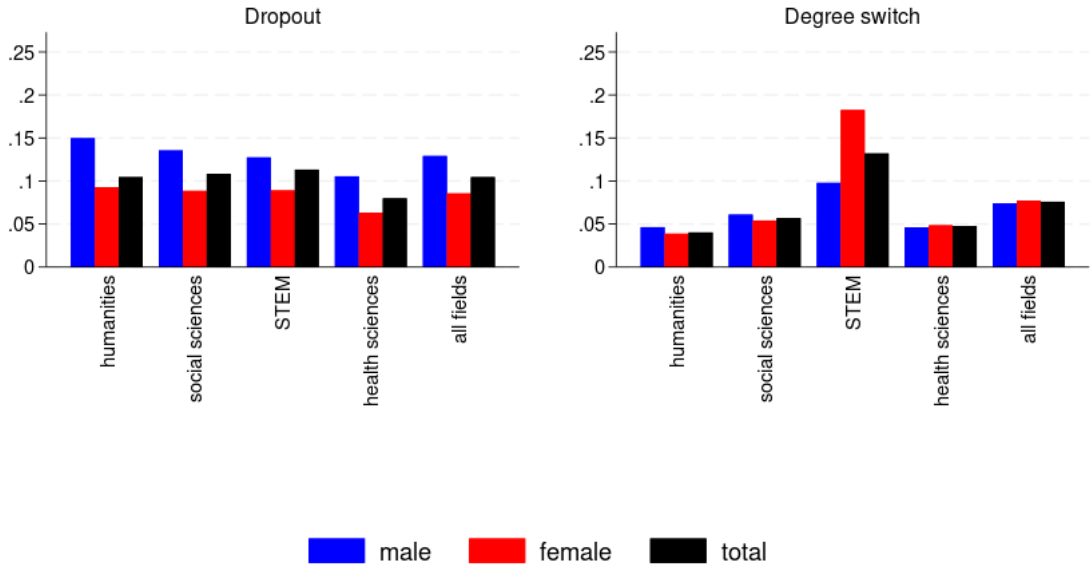
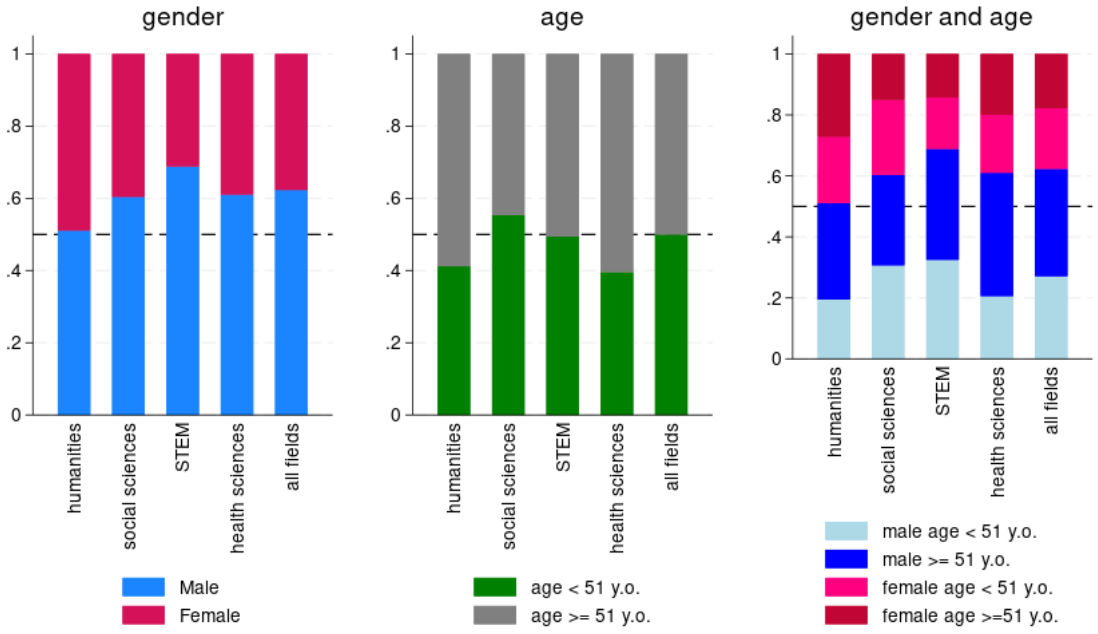


Figure 2: Distribution of professors' characteristics by field



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Appendix A. Additional Tables and Figures

Figure Appendix A.1: Tertiary education, share over 25-64 population

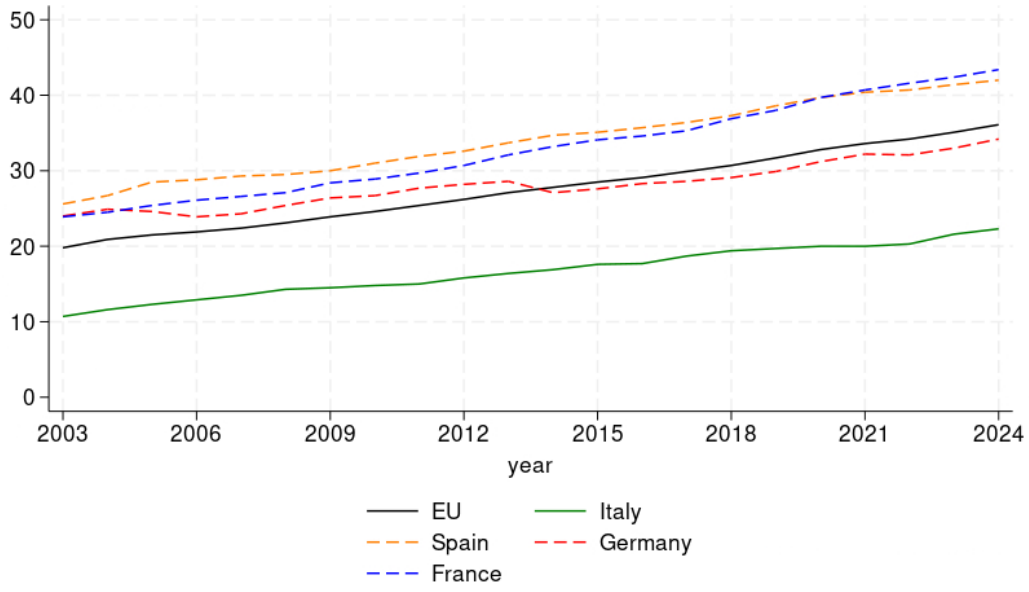
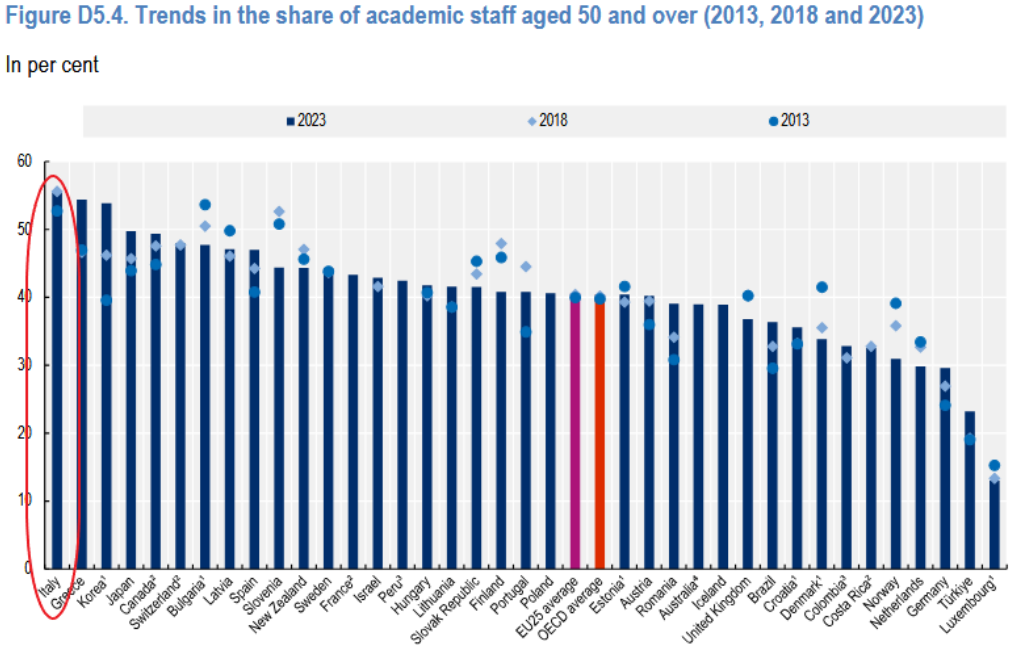
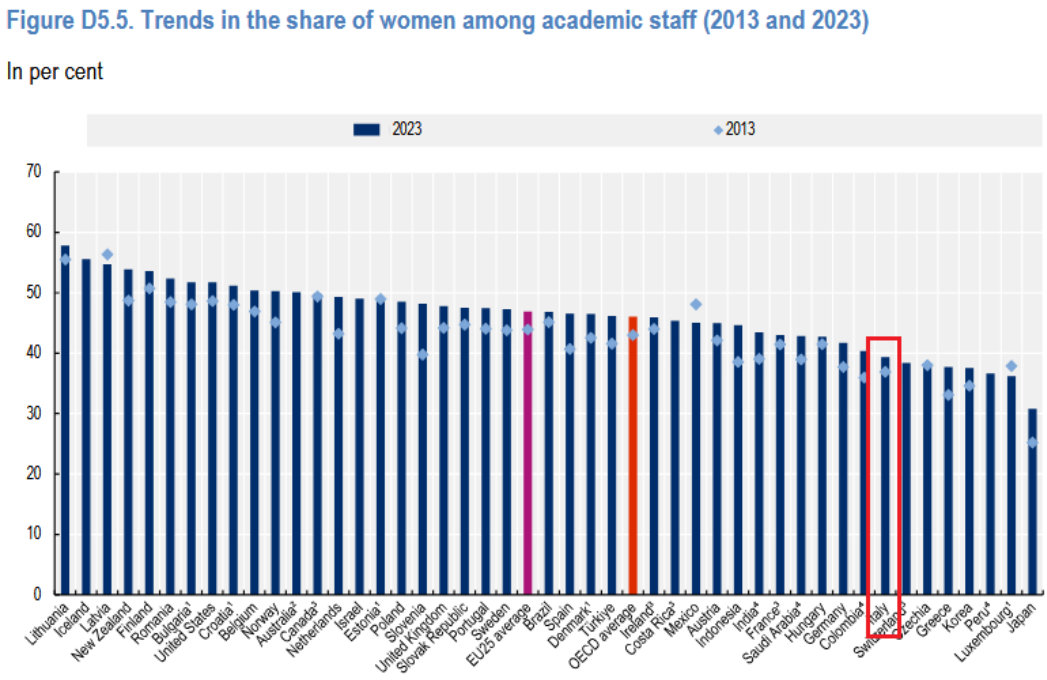


Figure Appendix A.2



Source: OECD, Education at a Glance, 2025

Figure Appendix A.3



Source: OECD, Education at a Glance, 2025

Figure Appendix A.4: Distribution of professors' role by field and age

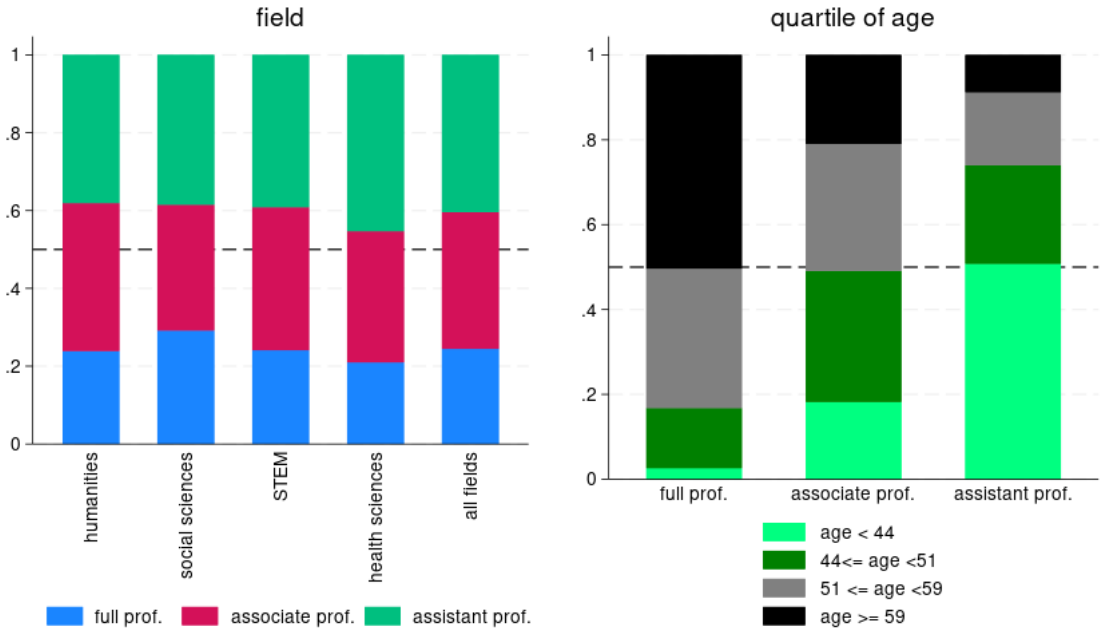


Table Appendix A.1: The costs of degree switching

	prob of grad.	prob. of grad. on time
	Total	
Non switchers	0.76	0.69
Switchers	0.61	0.39
	Humanities	
Non switchers	0.79	0.74
Switchers	0.61	0.42
	Social Sciences	
Non switchers	0.76	0.71
Switchers	0.63	0.48
	STEM	
Non switchers	0.72	0.63
Switchers	0.59	0.34
	Health Sciences	
Non switchers	0.77	0.72
Switchers	0.67	0.46

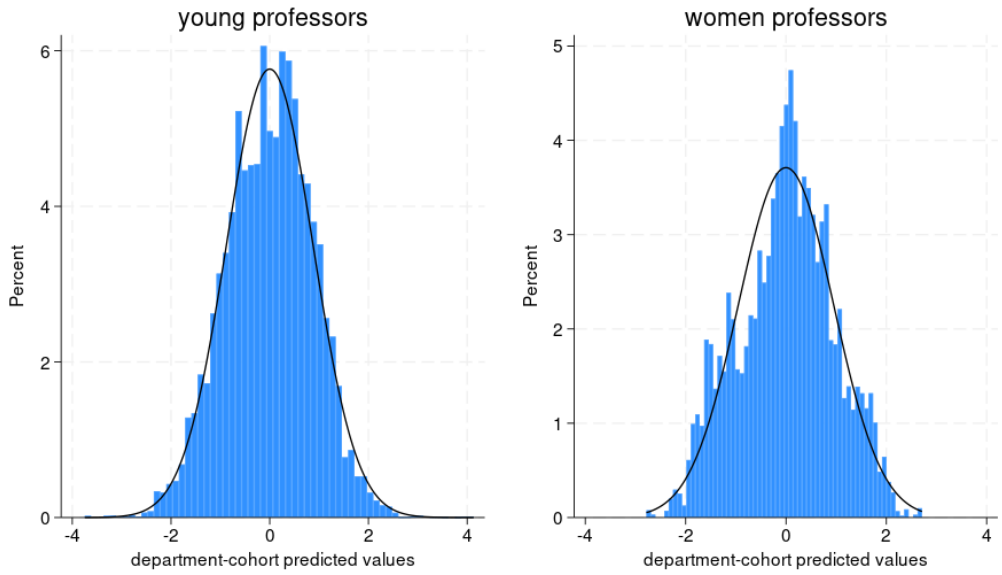
The table reports for each category of student and field of study the probability of graduation and the probability of graduating on time. The "Switchers" are students who change degree between the first and the second year of study; instead, the "Non switchers" are the group of students who stay in the same degree between the first and the second academic year. We consider the cohorts of students enrolled between the a.y. 2013-14 and 2016-17.

Table Appendix A.2: Age and gender distribution of teachers by field

	Field				
	Humanities	Social sciences	STEM	Health sciences	All fields
Prof. age $<$ 51 y.o.	0.41	0.55	0.50	0.42	0.48
Women prof.	0.50	0.40	0.31	0.42	0.39
Women prof. age $<$ 51 y.o.	0.22	0.24	0.17	0.21	0.21
Male prof. age $<$ 51 y.o.	0.19	0.29	0.33	0.21	0.27

Note: The table shows the average share of professors' characteristics across fields of study bewtween the a.y. 2013-14 and 2021-22.

Figure Appendix A.5: Cohort-to-cohort variation in professors' characteristics within department



Note: the figures show the distribution of the predicted values of the share of young professors (left) and the share of women professors (right) after netting out departments and cohort fixed effects. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2021-22.

Table Appendix A.3: Balancing for students' characteristics - young professors

Outcome: % of young professors	**No Trend** (1)	**Linear Trend** (2)	**Quadratic Trend** (3)	**Cubic Trend** (4)
		Panel a: students' characteristics		
Classical/scientific high school	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Italian	0.000	0.000	0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Fee exemption	0.002*	0.001**	0.001*	0.001*
	(0.001)	(0.000)	(0.000)	(0.001)
Non-local	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
High school grade	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
High achiever	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Low achiever	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
		Panel b: students' peers characteristics		
% of female	0.096**	0.008	0.017	0.029
	(0.028)	(0.020)	(0.018)	(0.019)
% of foreign	-0.011	-0.009	-0.003	-0.002
	(0.066)	(0.043)	(0.043)	(0.046)
% of high achiever	-0.042	-0.016	-0.001	0.006
	(0.032)	(0.026)	(0.026)	(0.026)
% of non-local	-0.014	0.002	0.009	0.006
	(0.030)	(0.019)	(0.019)	(0.020)
% of fee exempt	0.021*	0.023**	0.019*	0.016*
	(0.010)	(0.007)	(0.007)	(0.007)

Note: Clustered standard errors at the department level are in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2021-22. Each row represents the results from a regression of the share of young professors on the respective characteristic, controlling for department and cohort fixed effects. Columns (2)-(4) include an interaction term between a trend and department FE.

Table Appendix A.4: Balancing for students' characteristics - women professors

Outcome: % of women professors	**No Trend** (1)	**Linear Trend** (2)	**Quadratic Trend** (3)	**Cubic Trend** (4)
		Panel a: students' characteristics		
Classical/scientific high school	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Italian	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Fee exemption	-0.000	0.000	0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Non-local	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
High school grade	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
High achiever	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Low achiever	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
		Panel b: students' peers characteristics		
% of female	0.031	0.005	0.000	-0.004
	(0.017)	(0.014)	(0.014)	(0.014)
% of foreign	0.033	0.022	0.029	0.034
	(0.033)	(0.031)	(0.028)	(0.025)
% of high achiever	0.005	-0.010	-0.006	-0.006
	(0.020)	(0.016)	(0.015)	(0.014)
% of non-local	-0.012	-0.020	-0.012	-0.008
	(0.015)	(0.014)	(0.014)	(0.013)
% of fee exempt	-0.003	0.004	0.003	0.001
	(0.006)	(0.006)	(0.006)	(0.005)

Note: Clustered standard errors at the department level are in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2021-22. Each row represents the results from a regression of the share of women professors on the respective characteristic, controlling for department and cohort fixed effects. Columns (2)-(4) include an interaction term between a trend and department FE.

Table Appendix A.5: Baseline estimates with all regressors

	Dropout		Course Switch	
	age	gender	age	gender
	(1)	(2)	(3)	(4)
young prof.	-0.0301***		-0.0266***	
	(0.0089)		(0.0091)	
female prof.		-0.0096		-0.0039
		(0.0119)		(0.0116)
dep. size	0.0001	0.0001	-0.0000	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
classical/scientific high school	-0.0905***	-0.0905***	0.0021*	0.0021*
	(0.0021)	(0.0021)	(0.0013)	(0.0013)
italian	-0.0285***	-0.0285***	0.0009	0.0009
	(0.0024)	(0.0024)	(0.0016)	(0.0016)
female	-0.0336***	-0.0336***	0.0061***	0.0061***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)
fee exempt	-0.0213***	-0.0213***	-0.0120***	-0.0120***
	(0.0014)	(0.0014)	(0.0010)	(0.0010)
off-site	-0.0114***	-0.0114***	-0.0079***	-0.0079***
	(0.0011)	(0.0011)	(0.0012)	(0.0012)
high achiever	-0.0493***	-0.0493***	-0.0149***	-0.0149***
	(0.0013)	(0.0013)	(0.0014)	(0.0014)
low achiever	0.0769***	0.0769***	0.0163***	0.0163***
	(0.0019)	(0.0019)	(0.0013)	(0.0013)
female peer	-0.0004	-0.0035	-0.0014	-0.0042
	(0.0121)	(0.0121)	(0.0140)	(0.0139)
foreign peer	0.0046	0.0051	0.0337*	0.0339*
	(0.0243)	(0.0241)	(0.0201)	(0.0200)
high achiever peer	-0.0384**	-0.0372**	-0.0533***	-0.0523***
	(0.0160)	(0.0161)	(0.0132)	(0.0133)
off-site peer	0.0378***	0.0384***	0.0271*	0.0277**
	(0.0112)	(0.0112)	(0.0138)	(0.0138)
fee exempt peer	0.0316***	0.0312***	0.0220***	0.0217***
	(0.0040)	(0.0041)	(0.0038)	(0.0038)
Observations	1463631	1463631	1421445	1421445
Adjusted R^2	0.061	0.061	0.087	0.087
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Course FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes
Mean of Y	0.103	0.103	0.077	0.077

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2021-22.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table Appendix A.6: Academic Performance by Professor Age - Non linear effects

	Dropout		Degree switch	
	(1)	(2)	(3)	(4)
young prof.	-0.0301***	-0.0551**	-0.0266***	-0.0197
	(0.0089)	(0.0262)	(0.0091)	(0.0261)
young prof. squared		0.0224		-0.0067
		(0.0243)		(0.0226)
Observations	1,463,631	1,463,631	1,421,445	1,421,445
Adjusted R^2	0.061	0.061	0.087	0.087
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes
Mean of Y	0.103	0.103	0.077	0.077

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table Appendix A.7: Academic Performance by Professor Age - Alternative age cutoffs

	Dropout		Degree switch	
	(1)	(2)	(3)	(4)
age < 40	-0.0244***		-0.0220**	
	(0.0091)		(0.0091)	
age in [40,55)	-0.0207**		-0.0121	
	(0.0101)		(0.0094)	
age in [45,55)	-0.0288***		-0.0032	
	(0.0090)		(0.0095)	
first tertile < 46		-0.0279***		-0.0164*
		(0.0088)		(0.0088)
second tertile [46,56)		-0.0277***		-0.0024
		(0.0094)		(0.0096)
Observations	1,463,631	1,463,631	1,421,445	1,421,445
Adjusted R^2	0.061	0.061	0.087	0.087
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes
Mean of Y	0.103	0.103	0.077	0.077

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt. In columns (1) and (3) the omitted category is professors with age ≥ 55. In columns (2) and (3) the omitted category is professors in the third tertile of the age distribution.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table Appendix A.8: Estimates by professors' role

	Dropout			Degree switch		
	(1)	(2)	(3)	(4)	(5)	(6)
assistant professor	-0,0154*			-0,0144*		
	(0,0089)			(0,0077)		
associate professor		0,0182**			0,0217**	
		(0,0092)			(0,0091)	
ordinary professor			-0,0009			-0,0116
			(0,0133)			(0,0146)
Observations	1463631	1463631	1463631	1421445	1421445	1421445
Adjusted R^2	0,061	0,061	0,061	0,087	0,087	0,087
Student ctrl	Yes	Yes	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes
Course FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Y	0.093	0.093	0.093	0.075	0.075	0.075

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2021-22.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table Appendix A.9: Academic Performance by Professor Age - sensitivity to hires

	assistant prof. (1)	associate prof. (2)	ordinary prof. (3)	total prof. (4)
		Panel a: Dropout		
young prof.	-0.0324***	-0.0325***	-0.0326***	-0.0323***
	(0.0088)	(0.0088)	(0.0088)	(0.0088)
Δ assistant prof.	0.0000			
	(0.0001)			
Δ associate prof.		-0.0001		
		(0.0001)		
Δ ordinary prof.			-0.0000	
			(0.0001)	
Δ total				-0.0000
				(0.0000)
Observations	1,448,325	1,448,325	1,448,325	1,448,325
AdjustedR^2	0.061	0.061	0.061	0.061
		Panel b: Degree switch		
young prof.	-0.0282***	-0.0276***	-0.0277***	-0.0279***
	(0.0091)	(0.0089)	(0.0090)	(0.0090)
Δ assistant prof.	0.0000			
	(0.0001)			
Δ associate prof.		0.0001*		
		(0.0001)		
Δ ordinary prof.			0.0000	
			(0.0001)	
Δ total				0.0000
				(0.0000)
Observations	1,407,105	1,407,105	1,407,105	1,407,105
AdjustedR^2	0.087	0.087	0.087	0.087
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2020-21. Student-level controls include dummies for classical high school diploma, Italian, female, fee exempt, non-local student, high achiever student, low achiever student. Group-level controls include the share of peers who are female, foreign, high-achieving, non-local, and tuition-fee exempt. Columns (1) to (4) add among the controls the change in the stock of a type of professsor between t and $t-1$.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table Appendix A.10: Baseline estimates on INVALSI subsample

	Dropout		Course Switch	
	age	gender	age	gender
	(1)	(2)	(3)	(4)
young prof.	-0.0303***		-0.0313**	
	(0.0116)		(0.0138)	
women prof.		0.0186		0.0021
		(0.0158)		(0.0184)
x fem. stud.		-0.0417***		-0.0396***
		(0.0095)		(0.0089)
Observations	765010	765010	751558	751558
Adjusted R^2	0.057	0.058	0.094	0.094
Student ctrl	Yes	Yes	Yes	Yes
Group ctrl	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes
Course FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Field linear trend	Yes	Yes	Yes	Yes
Mean of Y	0.093	0.093	0.075	0.075

Standard errors clustered at the department level in parentheses. The sample consists of freshmen students enrolled between the a.y. 2013-14 and 2021-22.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.